

ACCELERATE

ADVANCING HVAC&R NATURALLY

AUSTRALIA & NZ

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Low Charge Systems
Finding Favour
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Woolworths -
'Big Players' Taking
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THE POWER OF TWO

Major Retailers United on Natural Refrigerants

Coles' World-first CO₂ Transcritical System Turns Heads

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#GoNatRefs





Publisher's note
by Marc Chasserot

BECAUSE WE CAN

Over the past decade I've had the pleasure of observing and interacting with many industry experts in Australia and New Zealand. I'm often told that this part of the world is too far away, too small to make a difference in the HVAC&R industry. I disagree. I firmly believe that Australians and New Zealanders play an important role in bringing natural refrigerant-based technologies faster to market. Further to that, I see the remoteness from much of the global market as a positive, as it enables companies and individuals to take risks and test new ideas and products far away from the limelight. Many of these innovations will be exported to other regions.

That's why, today, I'm very proud to announce *Accelerate Australia & NZ*. Following in the footsteps of its sister publications in America, Europe and Japan, we expect this quarterly magazine to become the voice of the growing natural refrigerant community Down Under.

The HVAC&R industry is at full speed, driven by legislation and standards and the need to find cost-efficient, safe and low-GWP solutions. We're moving quickly from a world where the use of synthetic refrigerants did not matter as long as they were cheap and efficient, to a world where customers care not only about their bottom dollar, but also the environment.

Key to this shift is a change in mindset, which has created a massive opportunity for CO₂, hydrocarbons, ammonia, air and

water to displace all HFCs. Equipment manufacturers are no longer locked in to a particular family of synthetic refrigerants. They can innovate, knowing that there are viable alternatives known as natural refrigerants, able to fulfill their customers' needs with future-proof solutions that will only be improved by future generations. This trend is occurring across all applications the HVAC&R industry supplies and services.

It is very exciting to be part of this change. Over the years, I've engaged with hundreds of these innovators who want to do the right thing. These early adopters have stories to tell and we at *Accelerate Australia & NZ* want to share them in order to help the remaining 95% of the industry transition to a more sustainable future.

Accelerate Australia & NZ will look at all aspects of the industry. Everywhere refrigerants are used, we will go: whether for heating or cooling, large or small applications. End-user experiences will be at the heart of this quarterly magazine. We'll tackle not just the technologies themselves but also training and servicing. We'll attend every major trade show in the region and report on the policy trends shaping our market. We'll provide data to measure these trends and hear the opinions of industry leaders. Last but not least, we'll bring you stories from other markets around the world that are helping to drive our global industry.

Enjoy our first issue! I look forward to receiving your comments at marc.chasserot@shecco.com

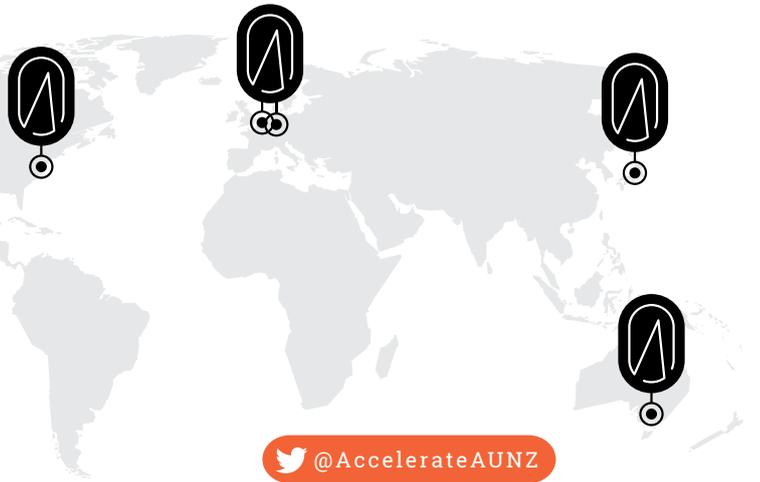
AUSTRALIAN & NZ EDITION ISSUE #1, AUTUMN 2016

ACCELERATE

ADVANCING HVAC&R NATURALLY

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.

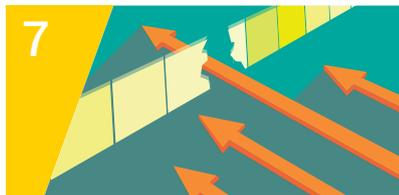
<http://accelerateAUNZ.com>



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Because we can

Publisher's note by Marc Chasserot



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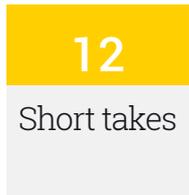
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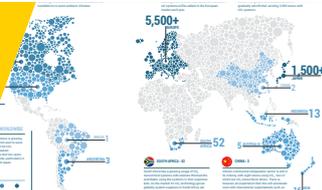
Coles putting CO₂ on the map

A world-first CO₂ transcritical system combining 100% of the store's air conditioning and refrigeration requirements in the one plant design is at the heart of Coles' long-term strategy to slash its operating costs and eliminate direct emissions.

Stuart Saville

National Engineering Refrigeration Manager
Coles

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Low-charge NH₃ systems find foothold Down Under

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Woolworths stands tall with industry

Woolworths views a market-wide shift to natural refrigerants as a 'no-brainer' and plans to lead the transition by adopting the most innovative technology and upskilling the industry with collaborative training initiatives.

Michael Englebright

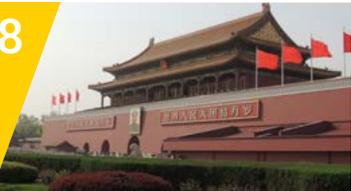
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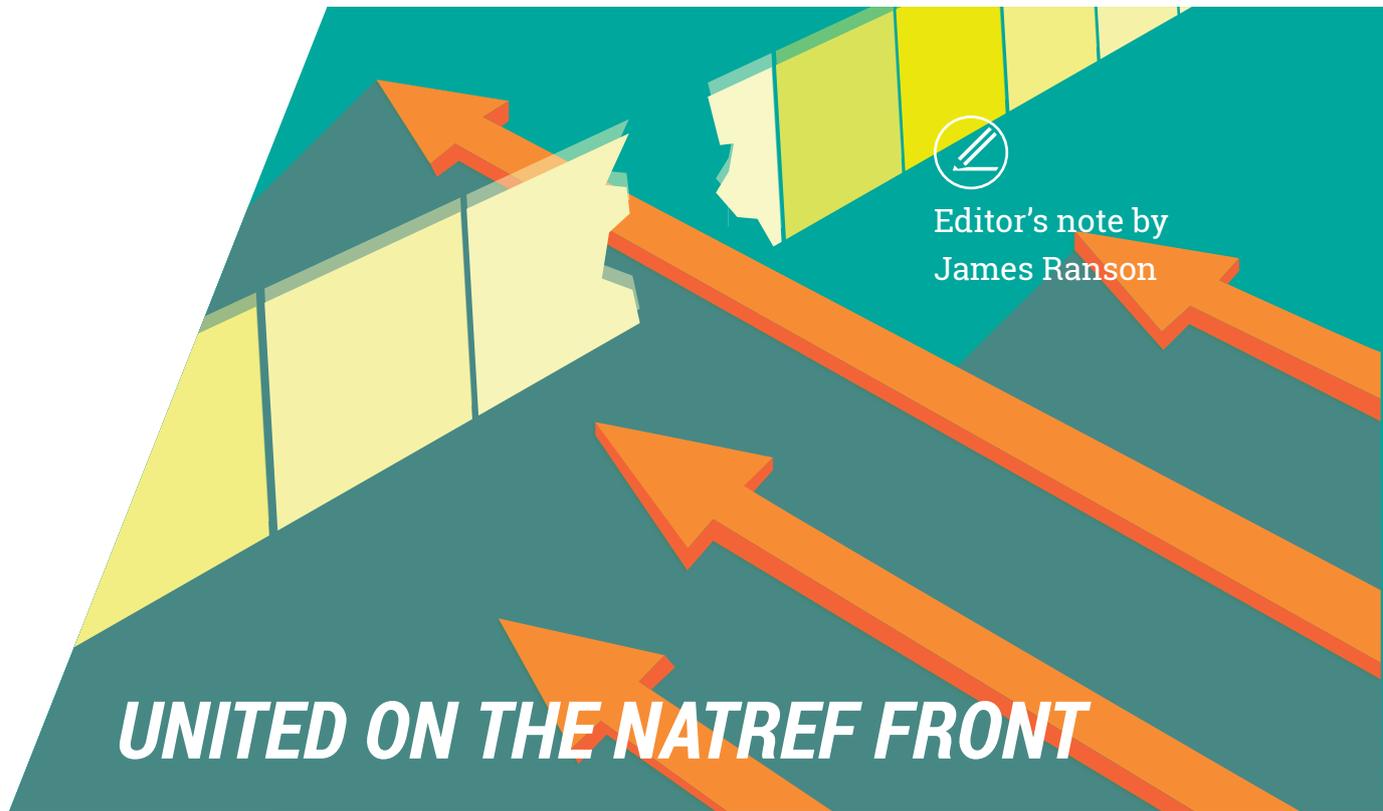
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Accelerate's network of offices stretches from Brussels and Tokyo to New York. *Accelerate Australia & NZ* is published every quarter. The views expressed by the contributors are not necessarily those of the Publisher. Every care is taken to ensure the content of the magazine is accurate but we assume no responsibility for any effect from errors or omissions.

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Editor's note by
James Ranson

UNITED ON THE NATREF FRONT

Australia has long been dubbed 'The Lucky Country', the tag's first incarnation stemming from author and social critic Donald Horne's famous novel published in 1964 with the very same title.

Horne's prophecies and warnings about Australia's future - the challenge of geographical position, the need for "a revolution in economic priorities" as he lamented "a lucky country run by second-rate people who share its luck" - are nothing if not harsh, but sadly, in some circles, they still ring true over five decades later.

As Australia, with one of the highest per capita rates of carbon emissions in the world, battles to divest from an economy heavily reliant on its 'fossil-fuelled' resources sector, and reduce its carbon emissions by 26-28% by 2030 based on 2005 levels, enormous opportunities are presenting themselves in every sector to achieve these targets.

Luckily for HVAC&R, it is one of the most cost-effective sectors on the globe to transition to sustainable technology. There already exist viable, energy-efficient alternatives to harmful hydrofluorocarbon (HFC) refrigerants, like CO₂, hydrocarbons, ammonia, water and air. These have already, or are quickly reaching, economies of scale in Europe, parts of Asia and North America.

Mega Australian food retailers Coles and Woolworths may have separate corporate agendas, but they stand as allies heading down the same sustainable path. Both boast a long history using CO₂ as a refrigerant and understand the commercial benefits and energy-efficiency savings to be gained.

In the first edition of *Accelerate Australia & NZ*, we take a tour of Coles' first state-of-the-art CO₂ transcritical store in Melbourne with the company's National Refrigeration Engineering Manager Stuart Saville ([see full story on p. 20](#)). Woolworths' National Engineering Manager Michael Englebright, meanwhile, says it's up to the big players in Australian food retail to transition the market to natural refrigerants ([p. 42](#)).

There is no doubt this transition will require all of Australia's renowned collective spirit, as Danfoss' Indy Saund testifies to the need for increased government support and improved training initiatives ([p. 60](#)).

Scantec's Managing Director Stefan Jensen gives *Accelerate Australia & NZ* a window into the future of low-charge ammonia technology with systems that can reduce energy consumption by 40-70% compared to conventional HFC technology ([p. 36](#)).

In our overseas focus we visit brewing giant SABMiller in the UK to hear about their commitment to natural refrigerants in all fridges by 2020 ([p. 70](#)) as well as German retailer METRO AG's pioneering F-Gas Exit Program ([p. 54](#)).

Australia could also prove the testing ground for overseas conglomerates to enter the market en masse. We investigate Panasonic's acquisition of US manufacturer Hussmann Corporation and what it means for the global CO₂ market ([p. 50](#)).

As leading OECD nations in the region, Australia and New Zealand have the opportunity, and more importantly the responsibility, to set the tone for the Asia-Pacific region by becoming true technological innovators.

Continuing to relegate natural refrigerants – the only truly future-proof solution in HVAC&R – to complementary status will deny the country significant commercial opportunities in neighbouring regions and even more significant emission reductions.

In a federal election year, with all the talk of innovation and direct action on emissions, the question is: will Australia take this opportunity to unite its HVAC&R sector with natural refrigerants or count its blessings with another saunter in the sun?



EVENTS GUIDE MAY 2016

- 1** May 2-4, Sydney, Australia
CeBIT Australia
<http://www.cebit.com.au/>
twitter : #CeBITAus @CeBITAus
- 2** May 4-6, Melbourne, Australia
DesignBUILD 2016
<http://designbuildexpo.com.au/>
twitter : @DesignBUILDEXPO
- 3** May 5-7, Ho Chi Minh City, Vietnam
ECOTECH VIETNAM 2016
<http://www.ecotechvietnam.com/home/en>
- 4** May 5-8, Jakarta, Indonesia
16th INDONESIA FOOD & BEVERAGE INDUSTRY EXPO 2016
<http://www.agrofood.co.id/foodindustry/index.html>
- 5** May 16, Melbourne, Australia
ATMO Australia
http://www.atmo.org/events_details.php?eventid=43
twitter : #ATMOAus #ATMOEvents #NatRefs #HVACR @ATMOEvents
- 6** May 17-19, Melbourne, Australia
arbs 2016
<http://www.arbs.com.au/>
twitter : #ARBS2016 @arbsexpo
- 7** May 18-20, Jakarta, Indonesia
INAGREENTECH-The Indonesia International Green Technology and Eco Friendly Exhibition 2016
<http://www.inagreentech-exhibition.net/>
- 8** May 22-24, Sydney, Australia
Foodservice Australia
<http://www.foodserviceaustralia.com.au/>
twitter : @FoodserviceShow
- 9** May 23-25, Kuala Lumpur, Malaysia
REVAC 2016
<http://www.revac.org/>
- 10** May 25-29, Bangkok, Thailand
THAIFEX - World of Food Asia 2016
<http://www.worldoffoodasia.com/>
- 11** May 25-29, Bangkok, Thailand
World of Seafood 2016
<http://www.worldofseafood.com/>
- 12** May 26-29, Sydney, Australia
HIA Sidney Homeshow
<http://www.sydneyhomeshow.com.au/index.htm>
- 13** May 30-June 1, Singapore
Countering Urban Heat Island (UHI)
<http://www.ic2uhi2016.org/>
twitter : #IC2UHI2016 @ic2uhi2016
- 14** May 31-June 2, Manila, Philippines
SIAL Asean
<http://sialasean.com/>
twitter : #SIALASEAN2016 @SIALASEAN



EVENTS GUIDE JUNE 2016

- | | |
|---|--|
| <p>1 June 1-3, Yangon, Myanmar (Burma)
Food & Hotel Myanmar 2016
www.foodhotelmyanmar.com</p> | <p>5 June 14-17, Ho Chi Minh City, Vietnam
RAHV Vietnam 2016
http://www.construction-vietnam.com/vicb/home.php</p> |
| <p>2 June 1-4, Bangkok, Thailand
Asean Sustainable Energy Week 2016
http://www.entechpollutec-asia.com/</p> | <p>6 June 15-18, Bangkok, Thailand
ProPak Asia
http://www.propakasia.com/</p> |
| <p>3 June 14-16, Ho Chi Minh City, Vietnam
Vietnam International Construction & Building Exhibition-VICB 2016
http://www.construction-vietnam.com/vicb/home.php</p> | <p>7 June 28-29, Melbourne, Australia
Green Building + Homewares 2016
http://greenbuildingexpo.com.au/</p> |
| <p>4 June 14-16, Singapore
17th International Conference on Green and Sustainable Technology-GSUS
http://singaporegsus.com/</p> | <p>8 June 26-28, Brisbane, Australia
Foodtech QLD 2016
http://www.foodtechqld.com.au/</p> |



1 July 2-3, Auckland, New Zealand
Ecobuild Expo
<http://www.organicexpo.co.nz/ecobuild/>
twitter :

2 July 6-8, Bangkok, Thailand
Asia Cold Chain Show (ACCS)
<http://www.asiacoldchainshow.com/>
twitter : #ColdChain @AsiaColdChain

3 July 6-8, Bangkok, Thailand
ASIA WAREHOUSING SHOW 2016
<http://asiawarehousingshow.com/>

4 July 10-14, Singapore, Singapore
World Cities Summit
<http://www.worldcitysummit.com.sg/>
twitter : @WCS_16

5 July 10-14, Singapore, Singapore
CleanEnviro Summit Singapore
<http://www.cleanenviros Summit.sg/>

6 July 12-14, Melbourne, Australia
CeMAT Australia
<http://www.cemat.com.au/>
twitter : #CeMATAus @CeMATAus

7 July 12-14, Yangon, Myanmar (Burma)
Myanmar International Food tech Industry Exhibition
<http://10times.com/myanmar-food-tech>

8 July 20-23, Ho Chi Minh City, Vietnam
6TH INTERNATIONAL EXHIBITION ON PRODUCTS, TECHNOLOGIES OF ENERGY SAVING & GREEN POWER - ENERTEC EXPO 2016
<http://vietnam-ete.com/enertec-expo.html>

9 July 21-22, Singapore, Singapore
12th Data Center Summit
<http://www.questexevent.com/DCS/2015sg/>

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SHORT TAKES

– By James Ranson

NEW WORKING GROUP ESTABLISHED FOR NATURALS

Refrigerants Australia will establish a working group and hold three meetings in June, August and November 2016, to “examine policy barriers and technical challenges associated with natural refrigerants”.

Refrigerants Australia Executive Director Greg Picker said the 12-month working group would be “very solutions focused” and a tool to help pool industry knowledge, identify policy areas that need addressing and educate the industry on the safe use of natural refrigerants.

On its home page, Refrigerants Australia refers to itself as the “peak organisation representing Australian refrigerant suppliers and users,” noting “a strong environmental imperative to minimise the emissions of all fluorocarbon [synthetic] refrigerants”. It is inviting Australian companies interested in adopting natural refrigerant technology to attend the three meetings for a fee of \$1,000.

The most recent study by the Australian Department of the Environment at the end of 2012 revealed there were approximately 43,500 tonnes of synthetic refrigerants such as HFCs stored in refrigeration and air conditioning equipment in Australia, compared to 4,800 tonnes of natural refrigerants such as carbon dioxide, ammonia and hydrocarbons.

The Australian government has proposed to reduce the use of HFCs by 85% by 2036 based on 2005 levels. [@JR](#)

CONSUMER GOODS FORUM EXTENDING REACH

The Consumer Goods Forum (CGF) hopes to pass a second resolution by the end of 2016 featuring stronger commitments to natural refrigerants from all its members and greater influence in regions like Australia, South East Asia and Latin America.

With over 400 members globally, the CGF’s aim is to bring together the world’s leading retailers and manufacturers in pursuit of ‘business practices for energy efficiency’ – including natural refrigerant technology.

Its first resolution closed in December 2015 and included commitments from its members – including the Coca-Cola Company, co-chairs SABMiller and Sainsbury’s, and Australian retailers Woolworths and Metcash – to phase out HFC refrigerants and replace them with HFC-free equipment (natural refrigerants) by 2015.

In Sydney for the Energy Efficiency Seminar in April, CGF Director of Sustainability Ignacio Gavilan said he was “looking for the 2-3 leaders in the retail sector of countries such as China, India, Indonesia and Australia to drive change”.

“So far we have not been as active in Australia as we would like to be, but we are working on that. In Australia we’re missing ALDI and Coles from the big retailers so we’re working on adding them as members.”

In December 2015, the board – led by co-chairs SABMiller and Sainsbury’s – challenged the group to create a new commitment. “The focus is to move explicitly into natural refrigerants,” he said. “Obviously there are a lot of alternatives to natural refrigerants that are low-GWP, but we’d much rather jump into naturals as opposed to expanding the synthetic refrigerant window.” [@JR](#)



CALIFORNIA STRATEGY TO SLASH 'SUPER POLLUTANTS'

California continues to stay a step ahead of the regulatory curve in the US with proposals to ban refrigerants with a GWP greater than 150 in all new commercial and industrial refrigeration systems by 2020.

In April, the California Air Resources Board (CARB) published its "Proposed Short-lived Climate Pollutant Reduction Strategy" with which it intends to drastically reduce HFC emissions while supplying a budget of US \$20 million to incentivise industry to shift the market towards natural refrigerants.

"The impact of these super pollutants is real and the fight against climate change must include a strategy to aggressively reduce them," said California Governor Edmund G. Brown.

As well as a proposed ban on HFCs with a GWP > 150 in new residential refrigeration and HFCs (GWP > 750) in new air conditioning systems by 2021, California is considering a state-wide HFC phase-down in the absence of an international agreement in 2016.

CARB wants to cut HFC emissions by 40% by 2030, based on 2013 levels, in order to achieve the state's goal of cutting all greenhouse gas emissions in California by 40% below 1990 levels by 2030. "Without early action to reduce unnecessary emissions now and into the future, the State [of California] would need to take additional – likely more costly – steps to meet its 2030 climate targets," the document read. [@JR](#)

NZ TAILOR-MADE FOR TRANSCRITICAL

Italian manufacturer SCM Frigo hopes to have installed 10 CO₂ transcritical systems in New Zealand by the end of 2016 and believes the market will grow rapidly "for CO₂ in both commercial and industrial applications".

The company's Technical Director Mirko Bernabei touched on the rollout of SCM's Plug 'n Cool booster units in New Zealand, with one installed in a Countdown store in Wellington and two further to be commissioned for the Pak'nSave supermarket chain.

SCM Frigo, a Beijer Ref company, works closely with local partners Patton and Beijer Ref Australia and is supporting its clients, technicians and service engineers with on-site CO₂ training. "Training is a key component and must be improved to make the expansion of this kind of solution possible," Barnebei said.

"The standard CO₂ booster technology has been well tested in Europe and has reached a level of standardisation that makes the it very competitive in terms of price of the equipment and cost of installation [in New Zealand]." [@JR](#)





WHY THE RESISTANCE TO CHANGE?

– By Tim Edwards

This year promises to be fundamentally important for the industry. The Australian Refrigeration Association welcomes ATMOSphere Australia and shecco's new publication *Accelerate Australia & NZ* because the country has a great opportunity to capitalise on many important initiatives.

shecco has been delivering the news on the value of natural refrigerants for years. Finally their work can be fully recognised for its value in Australia. But why all the fuss about refrigerants?

Natural refrigerants deliver major energy savings and major emissions reductions across all HVAC&R sectors. Why then the resistance to change? Here are some considerations:

First, smoke stacks and wind farms (carbon) dominate the understanding of global warming. The fact is that high GWP HFCs will add up to 90% to the radiative forcing of carbon emissions by 2050 if we don't stop using them. Despite the growing urgency for emissions reduction, right now it is focused on carbon.*

Second, the role of refrigerants is often not well understood. Most end users, specifiers and even mechanical engineering consultants just don't understand how refrigerants work and their impact on energy efficiency and emissions.

Third, the commercial interests that support the continued use of hydrofluorocarbons (HFCs) and the transition to HFOs (lower GWP HFCs) are considerable. Their influence, from policy development to end-user perceptions, inhibit and often overwhelm consideration of the value of natural refrigerants.

Avoidance is just as important as reduction. The growth in HFC use in the developing world is driving HFC emissions and energy inefficiency. But there is no need for this to occur. Australia has a responsibility to demonstrate and guide the developing world in the use of natural refrigerants. Preemption is just as valid as reduction.

We need to reach the vast number of end users who want to reduce their HVAC&R costs and greenhouse gas emissions, but aren't yet embracing the important contribution that natural refrigerants can make.

We need to cause the full range of HVAC&R policy developments to be a balanced and science-based assessment. Standards, regulations, education and our collective communication need to reflect the facts rather than perpetuating the misinformation surrounding natural refrigerant technology.

There are huge opportunities for improvement. Education is vital. Training of HVAC&R

technicians in the use of natural refrigerants is a very large task given that there are about 70,000 licensed HVAC&R technicians in Australia. At least another 50,000 professionals in the supply chain need to understand the opportunity for cost savings and emissions reduction; arguably everyone.

These are major tasks but it is also clear that we need all of the organisations in Australia and worldwide that have proven and endorsed natural refrigerants to be heard. Accelerating the adoption of natural refrigerant-based technology is in the national interest for cost reasons and in the global interest for emissions reduction reasons. @TE

Tim Edwards is president of ARA. A tenacious champion for natural refrigerant technology, Edwards has over 40 years of commercial experience with General Foods, PepsiCo, DHL, Qantas and GECA.

*This forecast is based on the 20-year GWP of HFC refrigerants. Dr. Gus Velders, who states that HFCs will add 28-45% to radiative forcing if we stabilise carbon emissions at 450 ppm but addresses HFC emissions base on their 100-year GWP. The average atmospheric life of HFCs is 20 years.

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NEW ZEALAND SET FOR GREENER PASTURES

The fourth IIR Conference in Auckland highlighted a maturing HVAC&R sector in New Zealand, one that is looking to natural refrigerants in greater numbers.

– By James Ranson

The Land of the Long White Cloud has long been lauded for embracing change and new technology, with its reputation for environmental activism dating back to campaigns in the 1970s opposing nuclear weapons testing in the Pacific.

That resolve was clear at the International Institute of Refrigeration's biennial conference promoting sustainability in the cold chain, a sector that accounts for 17% of the globe's electricity use.

What was also apparent amid the domestic and international HVAC&R fraternity at the event was the need for New Zealand to embrace the industry's next chapter by phasing down harmful HFCs and meeting the nation's commitments under the Montreal Protocol.

Held across three days (6-8 April) and organised by New Zealand's Institute of Refrigeration, Heating & Air Conditioning Engineers (IRHACE), the event comprised a seminar component, welcoming a host of international delegates and speakers, and the trade exhibition dimension.

THE CO₂ IS GREENER ON THE OTHER SIDE

Like in Europe, New Zealand's moderate climate, initiatives from leading retailers and an Emissions Trading Scheme (ETS) implemented in 2013 have helped shape a bright future, particularly for CO₂ refrigeration.

As Heatcraft's Mark Meyer asserted on the show floor, the ETS in New Zealand has helped accelerate the price of conventional HFC refrigerants by a factor of three in the past 12 months alone.

continued on p.18 →

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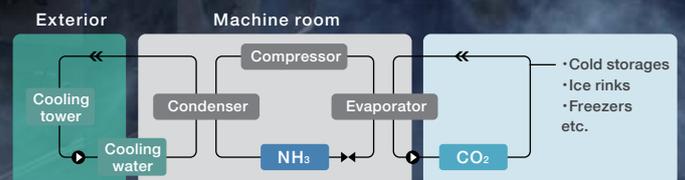
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→ "There's no question about it that the ETS is driving CO₂ developments. They're saying that it might double again in the next 3-12 months so it's happening quicker than people expected," he said.

HFCs like R404A cost end users \$20/kg under the ETS in New Zealand, putting the squeeze on harmful synthetics and driving the market towards natural refrigerants.

Heatcraft and GEA have worked with McAlpine Hussmann (Hussman's Australian and New Zealand subsidiary) to supply CO₂ racks, evaporators, compressors and condensers to major retailers Foodstuffs (Pak'nSave, New World and Four Square) in New Zealand, as well as Woolworths and Wesfarmers in Australia.

Retailer Pak'nSave has been entirely committed to CO₂ refrigeration for close to two years and has completed five CO₂ transcritical stores, with more in the pipeline.

Hussmann's Technical Director Brian Rees said that his company has worked on 10 CO₂ transcritical stores. Hussmann works closely with Swedish manufacturer Green & Cool and supplies CO₂ showcases, racks and is also a contractor and installer throughout New Zealand.

Heatcraft is currently conducting total cost of ownership studies with the major chains in Australia to bring its own CO₂ transcritical system to the market there and in New Zealand.

During the Energy Efficiency seminar Klaas Visser of KAV Consulting presented a CO₂ solution designed to meet stricter regulations on maintaining milk temperature for New Zealand's 12,000 dairy farms. The watercooled subcritical CO₂ refrigeration system, Visser said, saves in the order of 39% in energy consumption compared to conventional HFC systems.



ECOCHILL LEADING HYDROCARBON CHARGE

Matthew Darby, Managing Director at EcoChill, who chairs the Climate Control Companies Association (CCCA), gave an insightful presentation on future prospects for the HVAC&R industry around the globe.

EcoChill is the preeminent producer and supplier of remote and plug-in hydrocarbon equipment in New Zealand and has also installed several CO₂ transcritical systems, including the country's first (in a New World supermarket in Devonport in 2012).

Announcing a partnership between New Zealand's EECA (Energy Efficiency and Conservation Authority) and Australia's CCCA to recognise businesses working to improve training and energy efficiency standards and implement an installer accreditation scheme, Darby said advanced international regulation on HFCs would continue to put pressure on domestic imports.

Jane Gartshore from Cool Concerns, a trading, consultancy and technical support firm in the UK, focused on the safe use, supreme efficiency (20% better) and low density (45% less) of hydrocarbons over HFCs like R404A.

Used safely in the UK since the middle of the 1990s by major end users like Unilever and Waitrose, Gartshore cited the latter's commitment to hydrocarbons in 100% of its stores.

SMALLER INDUSTRIAL SOLUTIONS

Rob Lamb, group sales and marketing director at Star Refrigeration, said there was growing demand globally from end users wanting "smaller plug-in" systems like the company's low-charge ammonia solution.

Lamb said "the challenge from industry was to get those systems down to a smaller scale and face the challenges of [ammonia's] toxicity". Star's low-charge systems range from 70kW to 350kW with less than 0.65kg/kW charge.

Brisbane-based Scantec has distributed its low-charge systems throughout Australia and is working on a project in China in 2016. The systems use a slightly higher charge of around 1-1.2kg/kW of ammonia but retain similar efficiencies; 20-50% return on retrofits of conventional HFC plants. @JR



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COLES PUTTING CO₂ ON THE MAP

A world-first CO₂ transcritical system combining 100% of the store's air conditioning and refrigeration requirements in the one plant design is at the heart of Coles' long-term strategy to slash its operating costs and eliminate direct emissions.

– By James Ranson and Jan Dusek

 That would be the end game for us - to deliver an all natural solution for our stores."

Stuart Saville is a man of purpose. Charged with the task of driving Coles' sustainable agenda, one of the two dominant food retailers in Australia with Woolworths, Saville is measured in his thoughts but knows he is sitting on a good thing.

Decked out with "all the bells and whistles," Coles' first CO₂ transcritical installation at its recently opened flagship store in North Coburg, Melbourne, has so far performed above and beyond expectations. Management were hoping for energy reductions of 10%, but since the store opened in August 2015 the refrigeration system has so far seen an impressive 15% and up to 22% efficiency improvement during the cooler months, compared to its baseline CO₂/R134a systems.

It's little wonder industry figures and rival retailers have been keeping their ears close to the ground for news on one of Australia's five commercial transcritical installations, which include three at Metcash IGA stores.

Accelerate Australia & NZ was invited inside to see it in the flesh and strolled through the bustling store with Saville, Coles' National Engineering Refrigeration Manager and Brian Toulson, Senior Project Engineer for UK-based City Refrigeration Holdings, whose Australian arm City Facilities Management partner with Coles on all its installations.

Described as a 'concept' store, the 3,700m² premises includes and adjacent Liquorland and is as close as you can get to an all-natural solution. Only one back-up compressor is running on HFC R134a. Coles is eager to implement CO₂ transcritical systems in two more stores as early as 2016 and is all but convinced ejector technology will accompany one or both. "At Coles we think, from an efficiency and emissions point of view, that it [transcritical] is the right way to go, but there are just a couple of steps we need to take before we make a blanket commitment to the technology."



Coles National Engineering Refrigeration
Manager Stuart Saville

continued on p.22 



→ The installation in Melbourne's north is striking to say the least. Little was left to the imagination with the booster system including parallel compression, two Bitzer CO₂ centralised racks for all temperature ranges, adiabatic cooling, hot gas defrost, 250 kilowatts (kW) chilled water capacity to supply all store air conditioning, heat reclaim supplying store hot water and heating and four solar inverters generating up to 100kW.

Toulson, who has been in the engine room and seen the system under stable operation on a 43°C day, said no stone had been left unturned in ensuring the store was as advanced as possible. "We looked at everything that would help the energy profile and we really wanted to get rid of synthetic refrigerants and also to hit the optimum energy savings that we could."

Following efficiency monitoring starting last autumn, through spring and now summer, Toulson recalls the collective interest from technical staff, who would scurry to the plant room to monitor the operation of the system on the first 30°C and 32°C days. "That's no longer the case and in fact on the 43°C day, the operation

of the [CO₂ transcritical] system was very stable. We've got to the stage now where our mechanics and technicians don't even bother coming here on the hot days, they go to the stores which have heat issues on hot days."

That's high praise for technology previously questioned in high ambient regions like Australia's. "When we opened it, ironically, it was a 6°C day so we were actually trying to get heat into the store just to get it started," Toulson said. "Once we started monitoring efficiencies, during the cooler climate months, we found that we were able to save 22% on power consumption compared to our baseline stores."

Toulson said the savings during those cooler periods couldn't be accounted for by the parallel compression as the system would have been operating in subcritical mode for the majority of that time, while the adiabatic cooling would have had been under minimal operation, too. "That was a unique challenge: we've built this system designed to handle a 45°C day and we were operating it in a 6°C climate!"

Coles measured the transcritical system against one of its benchmark stores fitted with a CO₂/R134a cascade system using all the key metrics considered to be pertinent to get a true measure: overall refrigeration capacity, sales floor area, climatic region, case length. "We were expecting to see in the vicinity of a 10% reduction in power consumption but after a full six-month period (August-January) we found that the consumption has actually come in at about 15% under one of our benchmark stores," Saville said.

"The critical time for us to find a firm footing and be able to go back to the business is the summer months so that we can clearly demonstrate what the savings have been. Hopefully then we can seek endorsement for two further stores," Toulson said.

A SIMPLE SYSTEM

Avoiding the intricacies involved with installing any HVAC&R system is imperative for end users like Coles. The company ideally wants to use the technology as a template. "We'll trial another couple of stores with transcritical, we'll take the learnings that

continued on p.24 →



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→ we've had, take some of the complexity out of what we've done here and try to simplify it and drive down the capital cost," Toulson said.

The entire process from design to installation took roughly six months with the system eventually craned into the store. "We spent a lot of time on the fixtures in the plant so that it could essentially be 'dropped in' to avoid installation time and hassles." The full installation alone took 14-16 weeks.

"The remit initially was for a standard store but it wasn't until about halfway through planning that we decided to go for CO₂ transcritical because we realised it was very feasible and we wanted a 100% natural refrigerant store solution," Toulson said.

Bitzer and Danfoss were chosen as key suppliers due to their "experience and excellent track record in Europe," Saville said. Bitzer and Danfoss helped both Coles and City with the design and installation. "We had buy-in from both of them [Bitzer

and Danfoss] to ask for their assistance to ensure our technicians were fluent in installation, servicing and maintenance of the system."

The two booster systems each contain four mid-temperature (MT) and three low-temperature (LT) Bitzer compressors, supplying a total fixture load of 610kW. Two Alfa Laval heat exchangers facilitate the heat reclaim and supply hot water and heating for the store, while the 250kW chilled water from the racks is re-circulated to power 100% of the store's air conditioning. Four solar inverters linked to 399 roof-mounted panels were supplying 40kW of additional power capacity on the day *Accelerate Australia & NZ* toured the store, but they can supply up to 100kW.

The adjacent Liquorland store, one of parent company Wesfarmers' many franchises, which include Bunnings Warehouse, Target, K-Mart and Office Works, runs on a closed-loop condenser waterloop system with three hydrocarbon R1270 showcases (850g charge) from UK-based supplier Carter

Refrigeration, and includes adiabatic spray systems.

Even though Saville and Toulson are restrained in their appraisal of the system's performance, there is an undeniable sense of achievement so far. Reining in higher capital costs remains the major barrier to tackle and ensuring the technology is transferrable to Coles' more remote stores in higher ambient temperatures. The addition of ejector technology will no doubt help in that regard.

"Probably if [the installation] had been six months later we would've run ejectors in unison with parallel compression in this plant, but we'll definitely be looking at ejectors in our next iteration of a transcritical plant," Saville said. "We've had initial discussions with quite a few primary producers who are saying that they could look at this for us if we're to take the next step."

Although the southern city of Melbourne can reach temperatures of 45°C in summer, the other seasons are typically

AUSTRALIA'S LARGEST COMPANIES BY TOTAL REVENUE (FY 2014/15)

NEW POSITION	PREVIOUS POSITION	CHANGE	COMPANY	TOTAL REVENUE (\$M)	CHANGE (%)
1	3	2	Wesfarmers	62,777.00	3.9
2	2	0	Woolworths	61,149.40	-0.1
3	4	1	Rio Tinto	60,276.61	-6.9
4	1	-3	BHP Billiton	59,342.24	-21.3
5	6	1	Commonwealth Bank of Australia	45,310.00	2.3
6	5	-1	NAB (9/15)	43,650.00	-2.8
7	7	0	Westpac Banking Corporation	39,670.00	2.7
8	8	0	ANZ Banking Group	36,356.00	3.1
9	9	0	Telstra	26,764.00	1.2
10	10	0	Caltex Australia	24,240.16	-2.0

SYSTEM SPECS

Coles' CO₂ booster system in Coburg North has the following specifications:

- 3,700m² store/sales floor
- Total fixture load of 610kW
- 2 centralised CO₂ Bitzer racks supplying three temperature ranges: LT, MT and HT
- Booster system with parallel compression into the flash gas bypass
- 320kW MT display cases and rooms
- 40kW LT fixtures (-27.5°C and -35°C)
- Bitzer compressors: 4 MT, 3 HT and 2 LT compressors per rack
- Hot gas defrost for all LT fixtures
- 2 x 90kW Alfa Laval heat exchangers for heat reclaim used for potable water and store heating
- 250kW chilled water from racks recirculated to power 100% of store AC through plate heat exchanger
- ARNEG hydrocarbon (R290) display cases
- 108 evaporators connected to MT, LT
- 4 solar inverters generating 100kW power capacity
- 2 Alfa Laval (Bitzer/Buffalo Trident supplier) roof-mounted adiabatic gas coolers
- Gas coolers fitted with K65 copper/steel heat exchanger

LIQUORLAND STORE:

- Closed-loop condenser waterloop system with adiabatic spray systems
- Supplying 3 water-cooled Carter HC plug-ins with 850g R1270 charge
- R290 display showcases containing 80-100g charge (supplier ARNEG)
- Each showcase fitted with 2 variable speed scroll compressors
- Carter Retail Equipment (R1270) open showcases
- Buffalo Trident roof-mounted dry cooler fitted with Carel adiabatic cooling system



much cooler than in the northern states, which pose CO₂ transcritical a more consistent challenge in terms of high ambient temperatures.

The team estimates that initial capital costs of their first CO₂ transcritical store are around 27-28% higher than their 'business as usual' cascade CO₂/R134a system, noting that it took Coles around two years when it installed its first cascade system in 2005 to reach cost parity with its now obsolete all-HFC model. "We would expect to see the same kind of timeline for the transition to transcritical once it's up and running," Saville said. "[In 2005] we were able to simplify the systems and saw the added interest in CO₂ in retail in Australia, there were more end users actually using the technology. The market penetration of CO₂ in Australia is really quite deep."

"With some of the global suppliers entering the Australian market we'll definitely see, and we're already starting to see, costs come down. If [ejectors] enable us to simplify the design and

maybe drop some compressors off the rack, there's big capital savings when we start looking at those."

ENVIRONMENTAL CONSCIENCE A HEAVY BURDEN

A father of two young boys, Saville has over 21 years experience in the HVAC&R sector, starting out with now defunct domestic turnkey solution provider Frigrite, who at a time accounted for around 50% of Coles' and Woolworths' business. "They were a pioneering company as far as CO₂ technology in the Australian market. They developed one of the first CO₂ (subcritical) stores for Coles back in 2005, in Gisborne."

From there Saville spent over four years with construction firm CBES Limited before landing the job at Coles in 2009. Following a transition period Wesfarmers has now leapfrogged rival Woolworths and mining conglomerate BHP as the largest Australian company by total revenue ([see graphic, page 24](#)).

"From an environmental and energy efficiency perspective Coles is very progressive when it comes to technology like this; we can see the benefit [of being] able to deploy a store that has very little by way of direct emissions. It is of great importance to the Coles business; it's good for our customers, it's good for the business, and it's good for the environment."

Saville has seen wave after wave of synthetic refrigerants fall by the wayside and sees them for what they are: a short-term solution. "I've always paid attention to what's going on both domestically and internationally and the effects of our industry on the environment from the time when it was found that CFCs were having a damaging impact and there was a hole above the ozone layer, so it weighed very heavily on everyone during that time. When industry started to mobilise to look for alternatives I think that kind of brought that environmental element into everything that we do."

continued on p.26 →



Brian Toulson, Senior Project Engineer for City Facilities Management



SELF-SUFFICIENT TRAINING

Like Woolworths, Coles has a dedicated team of technicians and servicing staff at its disposal as a by-product of its partnership with City. Contractor Melbourne Refrigeration Services also helped with the installation and design of Coles' first transcritical store, in effect, upskilling multiple parties already very familiar with CO₂ as a working fluid.

"They're all competent with the operation of CO₂ in the subcritical operation and we know now that there needs to be a step change in the level of expertise in the field to be able to maintain our first CO₂ transcritical store. We didn't enter into this without considering that transition - it's very important for us to be able to seamlessly integrate all those parties to a come up with a sustainable solution."

With City, Coles has dedicated 'clusters' made up of four or five technicians each responsible for a set of stores, including 24-hour support. Before the first Coburg North store was completed Toulson engaged with industry and Box Hill TAFE (Technical and Further Education) in Melbourne to put an internal course together that would upskill the team in

CO₂ transcritical refrigeration so "that [Coles] could walk away from the store with the knowledge that there would be no issue," Saville said.

Coles/City conducts similar training for hydrocarbon systems and would like to adapt the courses in each location new technology is implemented: in a sense, staying one step ahead of the curve to avoid training deficiencies. "We wouldn't have gone to this effort with the capital outlay, training and time investment if we didn't see it as the solution for us moving forward," Saville said.

HERE COMES THE COMPETITION!

"It's really exciting to see the scope of increase as far as what CO₂ looks like from everything from full-line supermarkets right down to the CVS. It's exciting to be a part of it," Saville said. From predominant showcase suppliers ARNEG and Hussmann to rack and heat exchanger suppliers Bitzer and Heatcraft, Coles and the broader market are now seeing a wave of new natural refrigerant technology make its way to Australia from Europe and other regions.

COLES' NATURAL REFRIGERANT BREAKDOWN

- Gross revenue FY14/15: Coles \$38.2 billion; Wesfarmers (\$62.8 billion)
- Number of stores in Australia: 780 supermarkets
- Types of natural refrigerant equipment: R134a/CO₂ Hybrid DX, R134a/CO₂ hybrid liquid recirculation, R717/CO₂ cascade, hydrocarbon showcases
- Number of subcritical CO₂ installations: 120
- Number of transcritical CO₂ stores: 1
- Number of hydrocarbon showcases: 20+ (Coburg North store)
- Number of ammonia installations: 1 (R717/CO₂ cascade supermarket)
- Number of stores converted to natural refrigerants/year: 25-30 stores





“ On the 43°C day the operation of the [CO₂ transcritical] system was very stable. We’ve got to the stage now where our mechanics and technicians don’t even bother coming here on the hot days, they go to the other stores which have heat issues on hot days.”

Showcase supplier Carter, Hillphoenix (Advansor), Green & Cool and the EPTA Group have either moved or are moving into the market, while Beijer Ref Group are working with SCM Frigo in New Zealand. In addition, Panasonic’s acquisition of Hussmann will open the door for packaged transcritical units with further potential to transition the market.

“Other manufacturers wouldn’t like that because it forces you to be more competitive,” Saville said. “It opens us up to other trials and innovations that these manufacturers can bring to the table. We’re really looking forward to working with these new companies and seeing what they bring, we’ll never stop looking for new solutions that are cost-competitive and perhaps simpler.”

“The packaged units would be very interesting to see, we’ve already asked the question of Hussmann to get visibility on what they are doing in that space to see if it’s a suitable solution for our smaller format stores and we’re keen to see the offer.”

AUSTRALIA ALWAYS LOOKING TO CO₂

Coles’ journey with CO₂ started in 2004 while Saville was still in his role at Frigrite. “At that stage Frigrite was playing very close attention to what was happening on the international market and they could see that there was an emerging trend in the EU to move towards this technology and looking at what we were going to be able to do to future-proof our plant designs,” Saville recalls.

Coles’ ‘business as usual’ standard CO₂/R134a cascade systems installed in around 120 stores nationally all include integrated cooling, handle over about 250kW of cooling duty and use CO₂ as a refrigerant on the LT side. Importantly, Coles’ 11-year association with the refrigerant has laid a solid bedrock to transition to all-CO₂ systems from a technology, installation and servicing perspective.

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END USERS STANDING TALL

As a region, in many ways Australia makes a much more compelling case for the viability of CO₂ technology given the absence of strong policy and subsidies. There are few handouts given here, paving a clear course for self-sufficiency.

“There’s an element of shadow boxing going on in Australia as to which way the chips are going to fall in terms of policy,” Saville said. “All we can do as a company is put our best foot forward and deliver a result that we think is the most efficient, like the great offering you can see on our site here. There are no regulations that made us do this.”

Australia’s Carbon Tax was in place for just under two years until it was famously scrapped in the Australian Senate on 17 July 2014. Designed to encourage Australia’s largest emitters to increase energy efficiency and invest in sustainable energy, Saville said it did start to have a flow-on effect.

“The price of our HFC refrigerants accelerated considerably during that period, but I think more importantly [our] business was forced to look at the way it conducted itself from an engineering and maintenance point of view. It put a spotlight on some of [our] failings as a business.”

Irrespective of the tax, Coles has been able to reduce its overall (direct) emissions by 50% and its refrigerant leakage rate to 7% (the global average is 12-13%). “Whether it [the tax] had an effect, it may have instigated it but I think the Coles business is very focussed internally on these issues.”

Bitzer CO₂ compressors

→ “When you look at our current hybrid plant design, the intent of these has always been with the knowledge that one day we will be able to retrofit that HFC out,” he said. “It will definitely help us to transition. We know that what we’ve done here with the transcritical plant is another step along that road, not without challenges. For quite some years we’ve been watching the global trends with transcritical refrigeration with an understanding that once the technology evolves to suit our climatic conditions we will be in a great position.”

“Initially when CO₂ came onto the market there was a lot of concern in the industry about the skill level to be able to maintain these plants and the intricacies involved with keeping them operational: general repair and maintenance. It’s quite some years ago that we managed to overstep that hurdle, now it’s a very stable platform for us. The CO₂ is very well insulated against ambient conditions, it’s tried and tested.”

Although CO₂ transcritical will be a major focus for Coles, Saville sees the continued use of hydrocarbon plug-ins from suppliers like Carter and ARNEG as essential to the business’ equipment portfolio. Indeed, hydrocarbons are

used for all plug-in showcases at the Coburg North store. “From a retail perspective they are very important at point of sale and the flexibility they offer as opposed to having something that’s hard-plumbed into the plant and the services required to support that.”

Concerns over the practice of ‘retrofitting’ systems with hydrocarbon refrigerants in Australia don’t bother Saville and his team, simply because their staff are trained professionally to handle the refrigerants, install, and maintain the systems. They set a good example for others in the industry. “We comply with the A2 flammable refrigerant restrictions with the amount of charge we have in them and if you approach them in the right way and you’re instilling the skill set into your staff then where’s the risk? It’s pretty much a maintenance-free system.”

From an industrial point of view, the company’s distribution centres are deployed with direct expansion ammonia systems as standard but are run by a separate arm of the business. “It’s something that we’ll definitely be looking into in the future, it will be a focus for us.”

© JR & JD

GREEN STAR ARBS SUBMISSION

In 2014, Coles’ Hallam store in southeast Melbourne was awarded the first Green Star rated supermarket in Australia. The store was awarded a 4 Star rating for reducing its energy consumption by 20% compared to an equivalent supermarket of the same size.

The Coburg North store has also been submitted for a Project Excellence award at ARBS 2016 in Melbourne, one of three contenders in line to achieve a 4 Star plus Green Star rated supermarket.

On top of the refrigeration systems mentioned above, the store includes an air-conditioning system that automatically adjusts based on the number of people in the store, natural refrigerant technology, combined cooling for more efficient temperature control, LED lighting and extra ceiling insulation.

“Because our business is so energy intensive with such a high power demand on all the equipment, refrigeration and mechanical services, we actually worked with them [Green Building Council of Australia] to develop a rating tool,” Saville said.

Saville said the company continues to look to major European retailers like TESCO, Carrefour, METRO and Sainsbury’s for engineering inspiration, but the biggest competition remains internal. “I think I’m more in direct competition with the last store that I built and how can I do that better. How can we deliver a better solution than what we’ve already got?”

“You can see the amount of change that we went through when we deployed our first [CO₂ transcritical] store, there’s a lot of initiatives that we’re conducting that will be used in our other stores. We’re always striving to provide a better offer for our customers and a better environment.”

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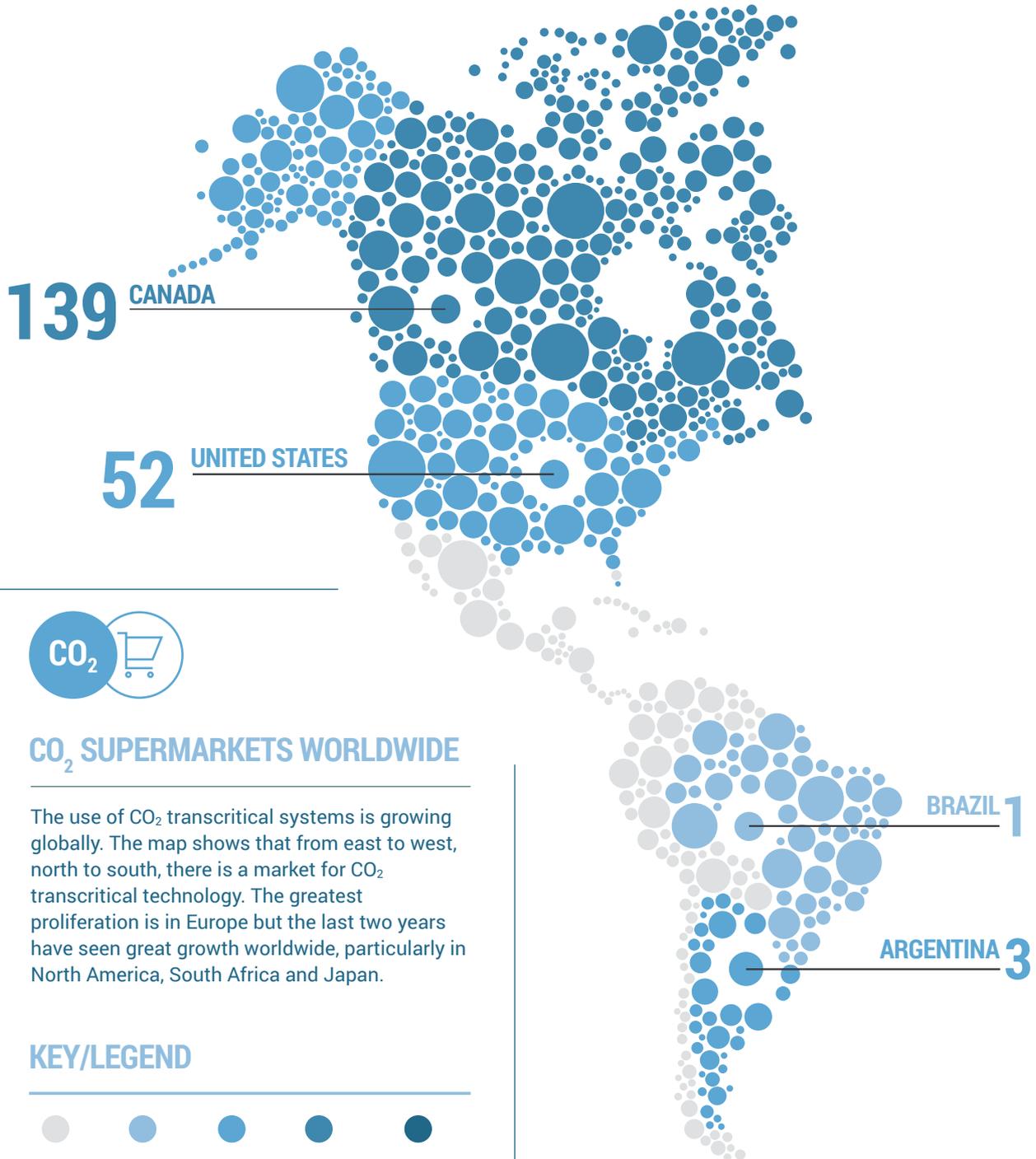
CANADA : 139

Canada leads the charge in North America, benefiting from CO₂ transcritical's excellent efficiency in low-ambient temperatures. Sobeys is the most proactive supermarket in installing CO₂ systems. Sobeys transition was accelerated in Quebec - where 63 of their installations are located - by subsidies provided by Quebec's OPTER programme.



UNITED STATES : 52

The United States has improved its usage of CO₂ supermarkets with an increase from 2 installations in 2013 to 52 in 2015. While the United States may be behind in the total number of transcritical stores, they are at the forefront of technological advancements with innovative CO₂ installations in warm-ambient climates.





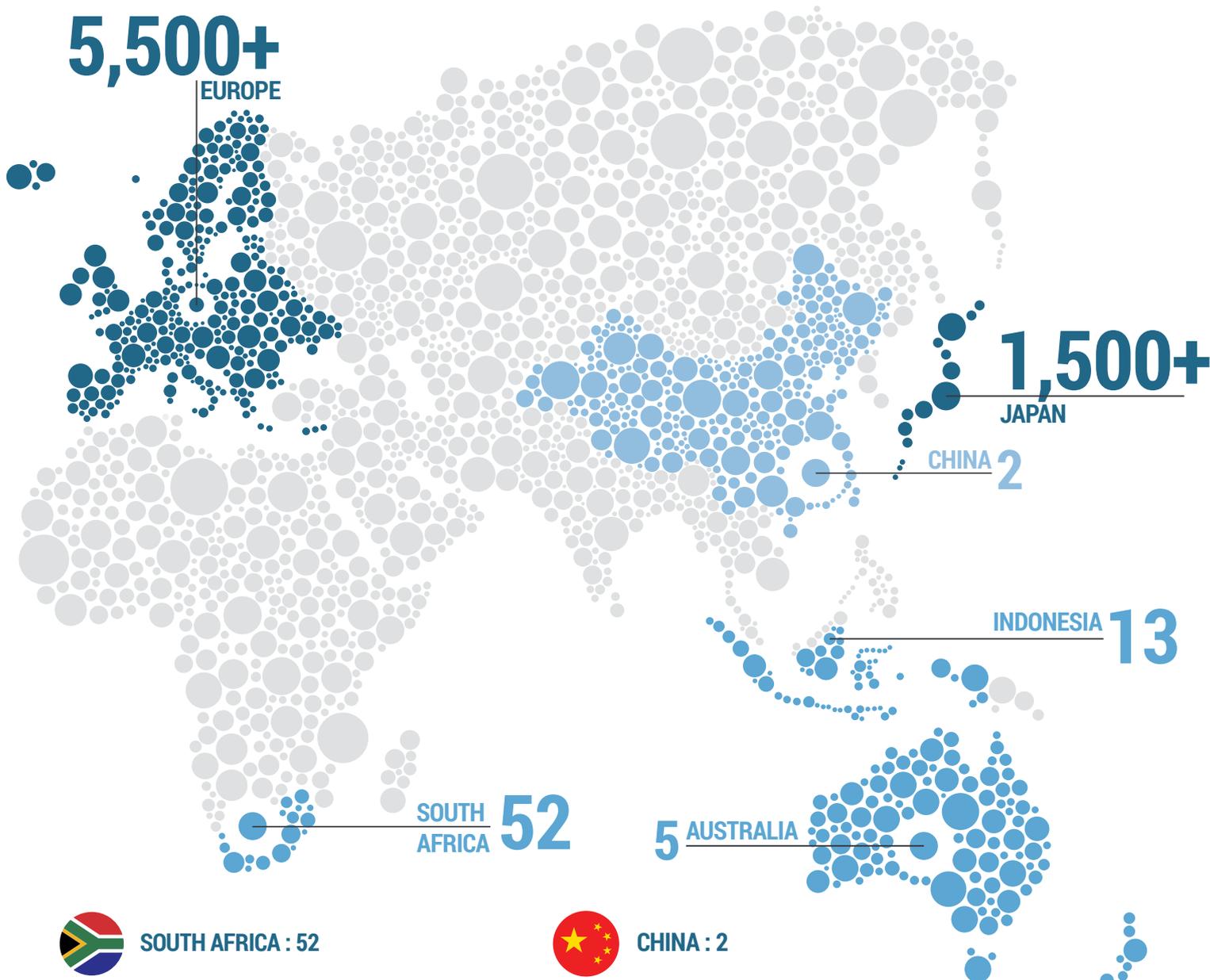
EUROPE : 5,500+

Europe is the world leader in terms of CO₂ adoption in commercial refrigeration, with over 5,500 supermarkets using CO₂ transcritical systems, having risen from 2,885 in 2013 and 1,330 in 2011, and continual growth is expected. Starting in 2016, more than 6,000 CO₂ transcritical systems will be added to the European market each year.



JAPAN : 1,500+

Japan's CO₂ commercial refrigeration sector has exploded into life in the last year with over 1,500 systems in 2015 compared to 190 in March 2014. This growth is engendered by the commitments of two leading retailers, Lawson and AEON. This growth will continue as AEON gradually retrofit their existing 3,500 stores with CO₂ systems.



SOUTH AFRICA : 52

South Africa has a growing usage of CO₂ transcritical systems with retailers Woolworths and Makro using the systems in their supermarkets. As the market for CO₂ technology grows globally, system suppliers in South Africa are confident that this market will continue to prosper.



CHINA : 2

China's commercial refrigeration sector is still in its infancy, with eight stores using CO₂, two of which are CO₂ transcritical stores. There is, however, an expectation that this will accelerate soon with international supermarkets such as Carrefour looking to increase penetration of CO₂ technology in China.

16 NEW ZEALAND

EXCITING DEBUT FOR ATMOsphere AUSTRALIA

shecco's proven ATMOsphere series will give Australia and New Zealand the first chance to showcase their natural refrigerant leadership on 16 May.

– By Linda Toivio



Conquering new territory, the first ATMOsphere Australia will hit Melbourne with a jam-packed one-day conference, welcoming participants from Australia, New Zealand, and around the globe.

The event is the perfect platform to promote energy efficiency practices in Australia and New Zealand and to showcase the next generation of natural refrigerant-based HVAC&R technology, already adopted across the globe.

ATMOsphere Australia 2016 will serve as a unique forum for disseminating knowledge, lessons learnt and best-practice exchanges between industry experts and stakeholders, facilitating discussions and networking opportunities to help share information about CO₂, ammonia, hydrocarbons and water-based technologies.

BECAUSE EVERY REGION DESERVES AN ATMOSPHERE CONFERENCE!

Organised by shecco, a market accelerator for high energy efficiency HFC-free heating and cooling technologies using natural refrigerants, the aim of ATMOsphere Australia is to help develop the market for these technologies in the Oceania-Asia Pacific region.

After over 25 successful ATMOsphere conferences held in Europe, North America and Asia, the level of global expertise will be high, providing an invaluable tool for leading end users, contractors, suppliers and government representatives on domestic markets to share their latest developments and insights.

With natural refrigerants slowly but steadily taking over the HVAC&R industry worldwide, Australia and New Zealand are also seeing a surge in end users adopting the technology. Europe might still be the leader of the pack when it comes to the race towards a carbon-neutral cooling and refrigeration sector, but the tables could turn sooner rather than later as new regions look to natural refrigerants as the most effective way to mitigate carbon emissions. Australia and New Zealand still have a way to go, but are both well placed, particularly in the commercial sphere, where CO₂ has been prevalent for over a decade.

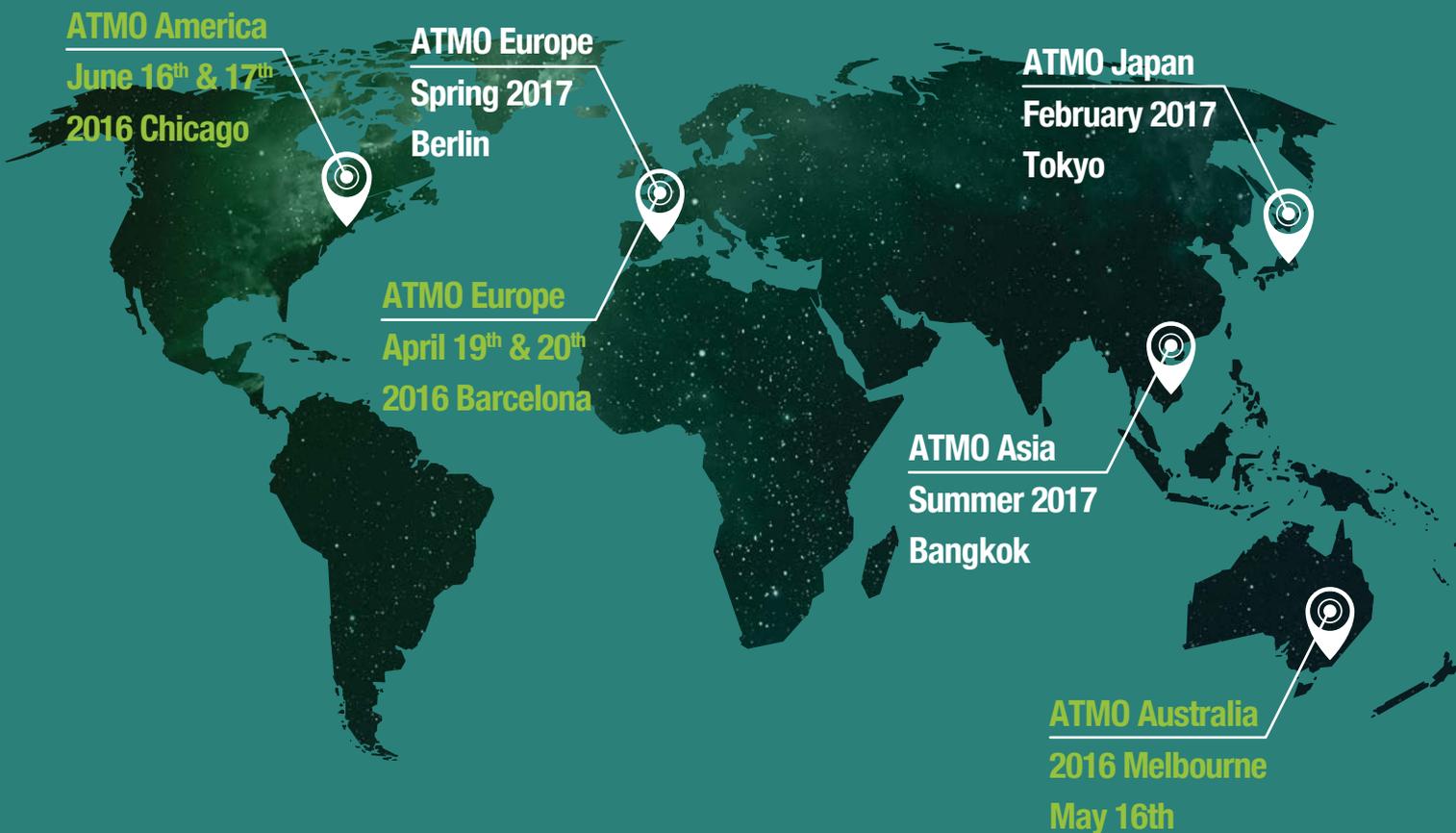
HOW COOL IS DOWN UNDER?

While New Zealand already boasts 16 CO₂ transcritical stores, Australia counts at least five CO₂ transcritical supermarkets, paving the way for many more installations and market competition in the region. This number is likely to double by the end of the year, as we hear exciting plans from the region's biggest food retailers and international suppliers looking to enter the market.

ATMO Australia will open the discussion in the region, which due to its high ambient temperatures poses particular challenges for the refrigeration and air conditioning sectors. Innovative natural refrigerant solutions exist for various applications for hot climates and these technologies are both an environmentally and economically viable solution for the HVAC&R industry. The conference aims to boost the market uptake of these sustainable solutions, while spreading the message that natural refrigerant-based technologies are the future for the HVAC&R market not only in Australia and New Zealand, but worldwide. **LT**

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ARBS 2016 TO MAKE WAVES IN MELBOURNE

Australia's largest international air conditioning, refrigeration and building services trade exhibition – ARBS 2016 – will coincide with the first ever ATMOSphere Australia conference this May.

– by James Ranson

ARBS' long-running event, to be held this year from 17-19 May at the Melbourne Convention & Exhibition Centre, will footnote the first edition of ATMOSphere Australia, exclusively dedicated to natural refrigerants. This one-day event, organised by shecco, follows over 25 successful ATMOSphere conferences in Europe, Japan and the US that have helped propel natural refrigerant technology forward.

ARBS 2016 is a one-stop destination for the HVAC&R service industry and will connect over 250 manufacturers and suppliers with thousands of industry decision-makers, specifiers, engineers, contractors and trade technicians.

International manufacturers like Mayekawa, Mitsubishi Heavy Industries, Evapco and Panasonic will bring their latest technology to Australian shores alongside local suppliers such as Heatcraft Australia and ARNEG Oceania, among others.

PACKED SEMINAR SCHEDULE

Accompanying the bustling trade floor at ARBS will be a number of key seminars, notably an update from shecco's Managing Director Marc Chasserot on the promising future and evolution of natural refrigerant technology – specifically CO₂, ammonia and hydrocarbons – in commercial refrigeration.

Chasserot will present market trends of natural refrigerants, including the increase in centralised systems and hydrocarbon plug-in units, and the key policy changes and technology around the globe leading to exponential increases in use of NR technology in all sectors.

Scantec's Stefan Jensen will present practical examples of how low-charge NH₃ refrigeration systems can reduce energy consumption in refrigerated warehouses by 40-70% compared to conventional HFC and traditional ammonia plants.

Patrick McInerney, Director, Ozone and Synthetic Greenhouse Gas Policy, Department of the Environment will lead another key discussion on the HFC phase-down in Australia. Australia has committed to reducing HFCs by 85% by 2036 based on 2005 levels.

On the last day of the event McInerney, Tetsuji Okada of the Japanese Refrigeration and Air Conditioning Industry Association (JRAIA) and representatives from Refrigerants Australia and the Australian Refrigeration Council will discuss international approaches to reducing HFC emissions.

The conference will also include seminars and panel discussions on cutting-edge HVAC&R energy efficiency rating tools, fault and leak detection devices, and updates to Standard AS/NZS 1668.1.

COLES, DANFOSS SHORTLISTED

To round off the event ARBS will hand out awards for project excellence, outstanding industry education/training and in accordance with WorldSkills Australia, a national refrigeration competition, which shines the light on Australia's top ten refrigeration industry apprentices, trainees and students.

"ARBS is passionate about training and the future of our industry. The WorldSkills Australia awards provide both the competitors and the industry with a snapshot of things to come," said ARBS Exhibition Manager Sue Falcke.

The project excellence category includes Coles' first CO₂ transcritical store in Melbourne's Coburg North and an ammonia glycol chiller installation by Strathbrook Industrial Services and Danfoss. The education and training category includes Sydney TAFE, the Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH) and AMCA & Box Hill Institute as shortlisted finalists.  [JR](#)

Registration for ARBS 2016 is open on the event website www.arbs.com.au

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LOW-CHARGE NH₃ SYSTEMS FIND FOOTHOLD DOWN UNDER

Low-charge ammonia technology is taking off around the globe as stricter regulatory guidelines in regions like the US open the door for reduced-charge systems. The Australian market is following a similar path and is expected to soon face a similar regulatory shift.

– By James Ranson



Low-charge distribution facility
in Perth, Western Australia



Scantec, one of the leading low-charge ammonia system suppliers in Australia, has completed six installations of its low charge NH₃ systems (predominantly for refrigerated warehouses) so far and is now looking into low-charge plate freezers and carcass chilling for abattoirs.

“Since 2011-2012 we have specialised in low-charge ammonia systems for facilities ranging in size from 10,000m³ to 50,000m³ refrigerated volume,” says the company’s managing director, Stefan Jensen. “By the end of 2016 we expect to have 10 such facilities operational, and these reduce the energy consumption by 40-70% compared to conventional HFC-based systems.”

“Right now we are working on four low-charge systems across various locations in Australia and another in China,” said Jensen, explaining that he could not disclose which province but revealing that it had been a region particularly “risk-averse” towards ammonia systems in China.

HOW LOW CAN SCANTEC GO?

Scantec’s plan for the coming years is to bring low-charge ammonia technology into smaller and smaller systems, possibly even to air-conditioning for food production facilities. “We have had preliminary discussions with health and safety officials as to the acceptability of ‘super’ low-charge ammonia applications. We’ll also be looking closely at the abattoir industry, because they’ll be under pressure to reduce their charges as a result of the new refrigeration standard that will be launched in Australia in 2016 – ISO5149.”

Like an increasing number of companies in the US, Scantec develops central low-charge NH₃ plants, where the operating charge in the evaporators is so low that in a typical cold store with three evaporators, loss of charge in one coil will not increase the NH₃ concentration in the freezer beyond ~200 ppm. It takes 5,000 ppm to pose a significant safety risk to humans. The systems typically contain between 3 and 4.5kg of ammonia per ton of refrigeration (TR).

What sets Scantec’s system’s apart is that instead of pumping the refrigerant around, they utilise the normal pressure differences in the system, between condensing and evaporating pressure, to facilitate the process. “We’ve redesigned the way the evaporators are circuited, we have refined the way the temperature, pressure and quality sensors are positioned, and we have paid particular attention to the thermal conductivities of the evaporator materials.”

continued on p.38 →

→ Scantec has also developed a new control system that modulates the injection into the evaporators. The control methodology relies on a combination of super-heat signal and quality signal at the evaporator exit. “We believe this control principle can be applied very broadly and very cheaply to a range of applications, including air conditioning. It’s simply a matter of numbers to get the price down.”

One of the benefits of low-charge NH₃ systems like Scantec’s is that they can be applied in much smaller applications than conventional NH₃ ‘liquid overfeed’ systems, typically for most semi-industrial applications of 30-50 kW cooling capacity and above. On top of this, Jensen asserts that low-charge NH₃ can deliver 3-4 times as much cooling capacity per kilogram of charge.

“We believe that low-charge ammonia systems can have a much broader and longer-term future than most people even give them credit for. We have much work to do in getting the charges down even further, and we have much work to do in the management of oil and water in those systems,” Jensen said.

Other local players on the ammonia front in Australia and New Zealand include Gordon Brothers Industries, Mayekawa, Trittech, Oomiak and Cold Logic. John Mott, general manager at Gordon Brothers, a Melbourne-based specialist in ammonia and hydrocarbon refrigeration technology, said the company had supplied around 15-20 of its low-charge NH₃ ‘Enviro-pack’ systems in Australia, and an additional three in New Zealand.

The units are designed especially for domestic and business air conditioning and contain level 3, secondary containment housing and a very low charge, amounting to roughly 0.8 lbs or 0.36kg/TR.

“ We believe that low-charge ammonia systems can have a much broader and longer term future than most people even give them credit for. We have much work to do in getting the charges down even further and we have much work to do in the management of oil and water in those systems.”

REGULATION TO OPEN DOOR FOR LOW-CHARGE

Scantec is currently designing a larger central plant for a client with a capacity of 2.5MW, containing around 1,700kg of ammonia refrigerant or 5.3lbs/TR.

In some countries like France, safety requirements become very difficult to comply with for charges of 1,500 kg and upwards. Similarly in the US, the regulations are more stringent than in Australia, but Jensen believes it is only a matter of time before this changes.

“When that happens, the market for low-charge NH₃ systems in Australia will grow significantly simply because systems with large NH₃ inventories will attract significant compliance costs. The new ISO5149 (ammonia standards) already has a 4,500kg ammonia charge limit, but it is not yet known what this triggers.”

Jensen estimates that there are currently around 100,000 refrigerated warehouses in Australia, the vast majority of which are using HFC systems and in need of conversion. “Around 3,000-5,000 are candidates for low-charge NH₃ and they all stand to save 40-70% on their power bills if they convert. These systems will all range in capital cost from \$0.5 to \$2 million and all conversions will need to be completed over the next two decades. This gives you an idea of market size just in that sector.”

“Unfortunately, we have a government at federal level that has an agenda of being followers rather than leaders. For a considerable amount of time I’ve tried to convince the Australian government to simply ban HFCs in new systems with a charge above 5kg and they’re very reluctant to do that. The Australian government is paying a lot of attention to the big majority, who are represented by the synthetic refrigerant [manufacturers].”

continued on p.40 →

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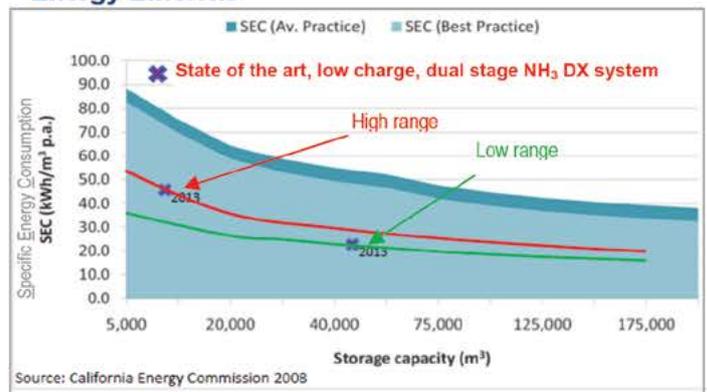
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 2) Average electricity charge \$160/MWh (2014)



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“But there’s no doubt in my mind that HFCs are dead, HFOs are on life support, and the only way ahead is natural refrigerants.”

LOOKING TO THE US

Low-charge ammonia systems are now becoming popular in the US, where, similar to Australia, there already existed a strong tradition of conventional ammonia refrigeration systems (see “Embarking on a New Voyage” in *Accelerate America #13*).

Companies like LA Cold Storage (NXTCOLD systems), Star Refrigeration (through its Azane subsidiary), Colmac Coil, and Evapco (Evapcold systems) – who also distribute in Australia – are helping drive the market. The 10,000 lbs (4,500 kg) NH₃ inventory limit that triggers the US Occupational Safety and Health Administration’s Process Safety Management (PSM) regulation is also forcing many end users to opt for systems with smaller charges in the US, Jensen says.

In some US states this has been reduced even lower to 5,000 lbs (2,268 kg), amounting to even greater compliance costs for end users. Below 100 lbs (45 kg) charge, end users are left alone and this is why there is a big push to sell multiple smaller units, each with under 100 lbs of ammonia. However, this can jeopardise energy performance and affordability, according to Jensen.

For example, the NXTCOLD systems – single stage systems with electric defrost – contain 0.77-1.5kg/TR but in doing so sacrifice energy efficiency for reduced ammonia charge. Meanwhile, Evapco’s units use around 1.13-1.36 kg/TR.

Jensen has spoken with his US counterparts and believes installing multiple low-charge units in large warehouses is simply not cost-effective. But he said he had spoken to a number of industry figures who believe low-charge NH₃ to be the “only future” for ammonia in the US, and that the technology would continue to increase its market share worldwide.

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MAYEKAWA LEADING THE WAY

Japanese manufacturer Mayekawa’s NH₃/CO₂ NewTon cascade systems make the company “world leaders,” according to Mott. Mayekawa cope with very tight restrictions imposed by the Japanese government by implementing extremely low ammonia charges in a cascade combination. “They even have Level 4 safety containment systems which are not available for export outside of Japan,” Mott explained.

Mayekawa is targeting all regions around the globe, announcing at ATMOSphere Asia 2016 that they had now sold 880 units and would release a more compact version of the series using scroll compressors in 2016.

Australia/NZ is one of those regions, with a project at Midfield Meat International Logistic cold storage expected to be finalised in 2016. The Midfield project will include three NewTon R-3000 systems, one NewTon B and one Chris CO₂ heat pump dehumidifier.

Mayekawa Australia’s Sales and Marketing Manager Peter O’Neill said the project had been delayed but that the company was hoping to disclose results at ARBS 2016, held in Melbourne in May.

But Mayekawa is going a step further, turning heads at HVAC&R Japan 2016 with a prototype of a 30kW cascade system for smaller industrial applications, and potentially even commercial applications. At 30kW, the prototype is considerably more compact and contains less than a fifth (4kg) of the ammonia charge used in the smallest NewTon models.



Mayekawa’s compact 30kW low-charge ammonia/CO₂ cascade prototype on display at HVAC&R Japan 2016



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WOOLWORTHS STANDS TALL WITH INDUSTRY

Woolworths views a market-wide shift to natural refrigerants as a 'no-brainer' and plans to lead the transition by adopting the most innovative technology and up-skilling the industry with collaborative training initiatives.

- By James Ranson and Jan Dusek

The natural refrigerant industry in Australia is standing firmly on its own two feet.

And undoubtedly, Australia's two largest food retailers Woolworths and Coles – who share close to 80% of the market – have an equally sizeable role to play in setting the sustainable agenda.

In a relatively closed market with a handful of dominant players in most industries, Woolworths Limited, with extensive interests throughout Australia and New Zealand, is a prime example. The group includes its Dan Murphy's and BWS liquor chains, Masters (home improvement), Big W (retail), ALH (hotel & pubs) and Countdown supermarket franchise (NZ).

Yet sadly, the strong regulatory frameworks that provide a stable platform for markets abroad, are not at work in the same way in Australia. Europe still remains the leader while more recently the US has strengthened at government level to provide more support for sustainable alternatives like natural refrigerants.

But in the absence of these initiatives in Australia the onus rests heavily on the country's major retailers to innovate and excel. "I'd be lying if I said that wasn't true," says Woolworths' National Engineering Manager Michael Englebright amidst the serene surrounds of Melbourne's National Gallery of Victoria. "It's really up to the big players in the industry here in Australia. We'd love to see the government regulating the industry and providing subsidies but if we have to wait for that then our store fleets will be nearing their end of life. We've got to be proactive and get on the front foot and steer the way with a rigorous strategy and programme."

And getting on with it is exactly what Woolworths has done.





National Engineering Manager,
Woolworths, Michael Englebright

continued on p.44



- Its supermarket chain has 150+ CO₂ cascade installations throughout Australia - its current 'business as usual' technology - and is eager to implement CO₂-only waterloop showcases and CO₂ transcritical systems.

The end game is to adopt transcritical technology, a more difficult proposition in Australia (given the warmer climate) than in New Zealand, where Woolworths launched its first transcritical store under its Countdown banner at the end of March 2016.

"Fortunately, here in Australia we have [five commercial] transcritical systems up and running, and they haven't missed a beat. So as the technology continues to develop for us it's a no brainer for the future." With the commercial sector's long history of using CO₂ in Australia, including maintenance, internal training and technological expertise, a market-wide move to CO₂ transcritical would be a "logical transition," says Englebright, as it sees the capital costs of subcritical systems continually lowering.

SOLID FOUNDATIONS OVER A DECADE OF CO₂

Englebright remembers vividly the unrest in the industry back in 2004 when he was starting out with local contractor Frigrite. "It was getting repetitive that every 5-6 years we'd have to go through another phase of transitioning out [refrigerants] and retrofitting stores."

While at Frigrite Englebright worked on the first full CO₂ liquid recirculation system, an experience he described as "a huge stepping stone in [his] career". For two years, Englebright monitored the store including areas of service, maintenance and energy performance.

Around this time Frigrite along with Austral Refrigeration provided turnkey solutions as the two major local manufacturers/vendors. "With [supplier] Hussmann they were supplying showcases to both Woolworths and Coles and part of their strategy was about bringing in innovation," Englebright says. "They had the team and structure to introduce natural refrigerants and begin to look at alternative solutions to phase out HFCs. So looking at the alternatives and lessons learned from Europe they went on a tour of Europe and looked at the technologies available, through a close collaboration with Bitzer and Woolworths."

This clearly peaked Woolworths' interest in CO₂, with their first cascade system fitted at a store in Bankstown, Sydney.

Personally, Englebright continued his natural refrigerants journey in Europe as Danfoss' global applications engineering manager before moving to Carel. All the while Englebright worked closely with market accelerator shecco to promote natural refrigerants before returning to Australia with Woolworths in 2014.

"I'm very passionate about natural refrigerants and wherever you go in the world the biggest challenge is change," Englebright says. "In Australia the industry has been reserved and respectfully so, with very high quality installations."

Yet, Englebright senses the winds of change are inevitable. "Early on [back in 2004] the development of natural refrigerant technology was slow, maybe once or twice a year, whereas now it's continuous, it happens every quarter, I'm getting calls all the time with the latest natural refrigerant solutions. Availability is increasing and cost is coming down. Now it's just picking the right solution for the application."

continued on p.46 →



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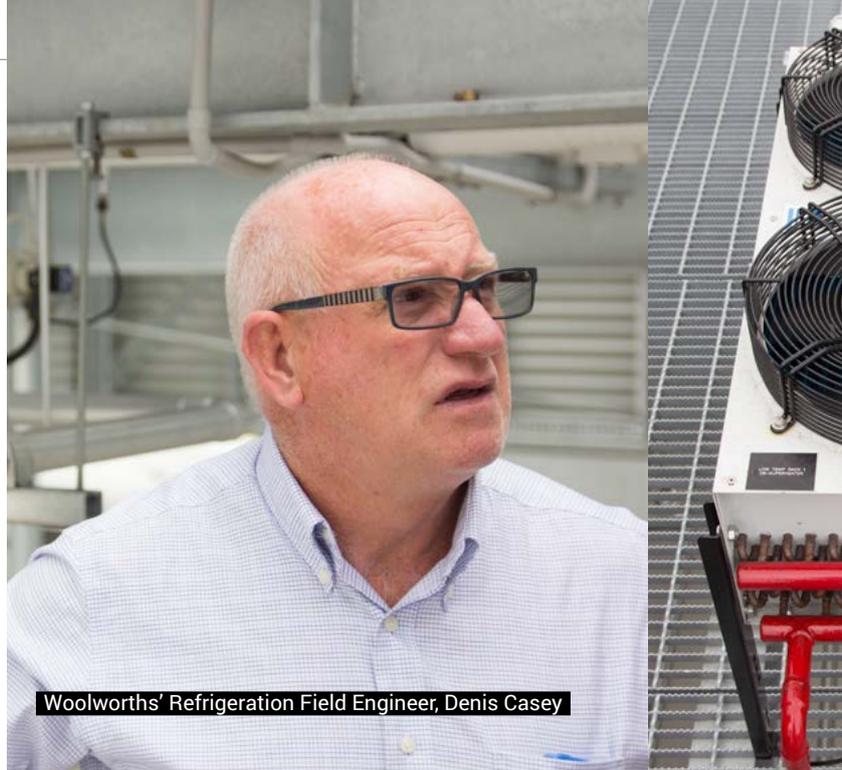
→ From the initial full CO₂ liquid recirculation systems Woolworths transitioned to CO₂/R134a systems as its 'business as usual' technology, and now adopts these for all new stores and refurbished stores where feasible. A typical Woolworths store is much larger than European standards, ranging from around 3,800m² to 4,400m² and requiring around 300kW of refrigeration capacity, predominantly from one or both of its two key rack suppliers Heatcraft and Bitzer.

Woolworths' new meatpacking facility in Truganina (Victoria) uses a two-stage ammonia system in unison with a CO₂ 'business as usual' hybrid system and ammonia.

"Our [hybrid technology] really showed us the way and we have now adopted a highly efficient hybrid system," Englebright says. "With all the changes at EU level with the F-Gas Regulation we are steering towards natural solutions. With the evolution of the CO₂ technology and the adoption of so many different suppliers now it's becoming very competitive to really look at transcritical CO₂."

Waterloop technology equipped with CO₂ for its showcases is of great interest to Woolworths. The retailer trialed the solution with ARNEG Oceania back in December 2015. "We're just waiting on a compressor manufacturer for the availability of a CO₂ 'transcritical-type' version. "With Hussmann (Woolworths' major showcase supplier) being acquired by Panasonic that's great news for us with Panasonic's experience with transcritical CO₂ compressor technology, which we hope can complement the waterloop system. If we can implement that then we would have two great solutions available for our fleet."

- Gross revenue: \$60.7 billion (Woolworths Limited)
- Number of stores in Australia: 3,300 including 750+ Woolworths supermarkets
- Chains: The Group includes Dan Murphy's and BWS (liquor), Masters (home improvement), Big W (retail), ALH (pubs & bars) and Countdown supermarket (New Zealand)
- Types of natural refrigerant equipment: hybrid R134a/CO₂, hydrocarbon waterloop showcases, two-stage ammonia systems (industrial)
- Number of cascade CO₂/R134a installations: 150+
- Number of waterloop stores: 1
- Number new stores/year: 30 (plus 30-40 refurbishments)



Woolworths' Refrigeration Field Engineer, Denis Casey

"There is a threshold where you can apply it and below that you can't, unless you integrate the AC, but that's where the uniqueness of European pack decentralised transcritical systems come to the fore." Sanden is another supplier to have introduced CO₂ waterloop technology for plug-ins, showcasing it at COP21 in Paris in late 2015.

Englebright highlighted initial capital costs as the single biggest challenge, particular for the company's stores located in remote areas, which typically use a combination of HFCs and in future CO₂. "We cannot adopt CO₂ due to the rural challenges of some of our stores in the northern parts of Australia. It can be very challenging from a support perspective in terms of maintenance so we pay a price premium for these locations. But in these far reaches [HFCs are] not a long-term solution, we'll look at natural refrigerants down the track."

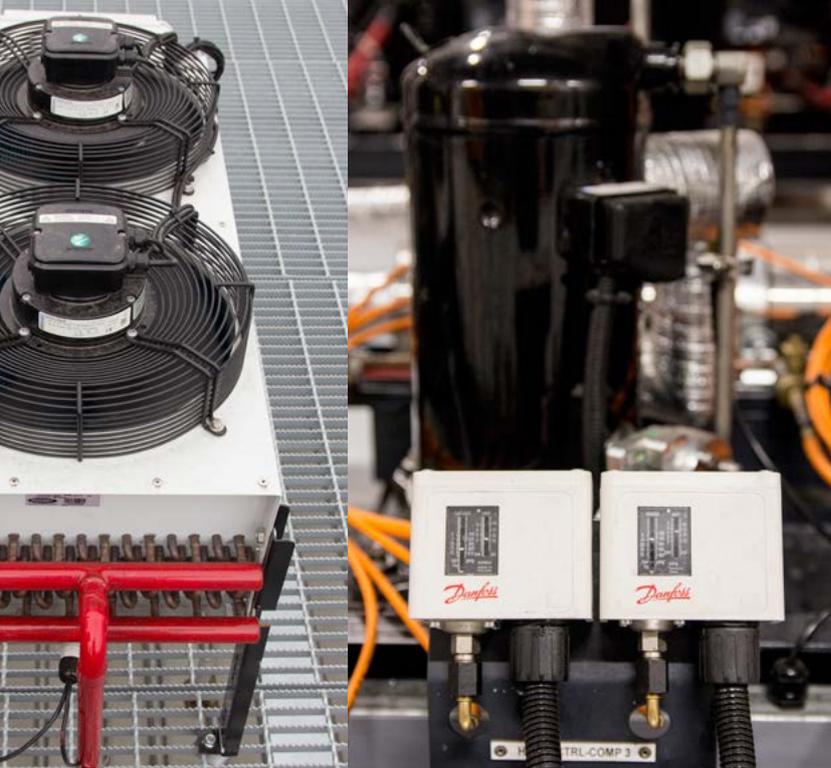
WAVE OF CO₂ TRANSCRITICAL IMMINENT

Blessed with sun, surf and endless space, Australia's climate hasn't necessarily aided the cause for CO₂ transcritical. Above the 'critical point' of 31 °C, reached easily and often in many parts of regional and coastal Australia, CO₂ systems face additional challenges to maintain efficiencies.

"[CO₂ transcritical] is proven with over 5,000 systems in Europe," Englebright says. "But if I'm going to benchmark Australia against the rest of the world the first thing is our climate. Where else in the world is it comparative to our conditions? You have Spain, Canada (Quebec), South Africa... Fortunately, here in Australia we have [five commercial] systems (and a further three industrial) up and running and they haven't missed a beat. So as the technology continues to develop for us it's a no brainer for the future."

"With our high ambients, CO₂ transcritical was not really suited to this environment but now with the progression into parallel compression, adiabatic cooling, it makes it a very, very interesting proposition."





“I hope this first ATMOsphere Australia conference really provides a big injection for the industry and now that we have the attention of local and global industry players at our doorstep, that really gives us a great opportunity to drive forward to deliver natural refrigerant systems in our stores. I’m very positive and really looking forward to the year ahead.”

Woolworths is conducting a feasibility study and sees parallel compression as “vital” for Australia’s high ambient temperatures. “With [parallel compression] you can incorporate AC and the other thing is hot gas defrost; that provides another energy saving benefit in lieu of electric defrost in our glass door showcases and freezer rooms in utilising the redundant heat.”

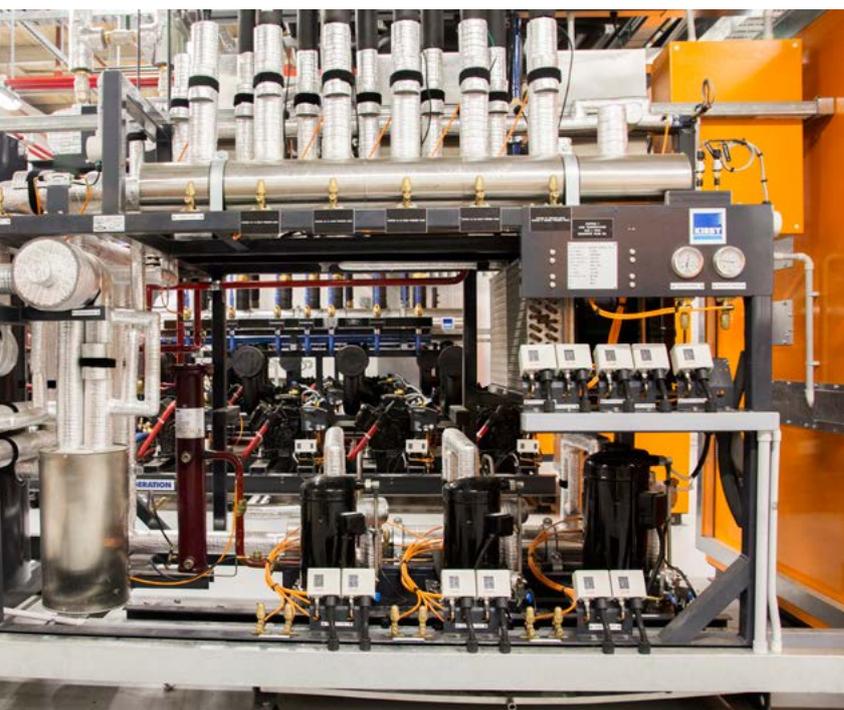
“Some of these [European and US] manufacturers are making a second model of their transcritical systems which is very promising for us. We found that there were a number of things we were able to extract out of the ‘Rolls Royce’ system and make it work here, and parallel compression for the warmer parts of Australia is one of them. To compliment that you have a number of international suppliers like Green & Cool, Enx and Advansor, who can provide the solutions and allow us to work to making the commercial numbers stack up.”

“Add to that Heatcraft and Bitzer Australia who are developing their own versions of a CO₂ transcritical system. It’s a unique challenge for them too with various international suppliers increasing the competition but as a retailer it’s great because with this number of suppliers entering the market, it brings a lot of competitiveness and allows us to reach the hurdle of the capital outlay a lot quicker.”

“The only thing missing for us now is a full natural refrigerant solution, that would really be the icing on the cake and that’s why our biggest focus is on CO₂ transcritical and waterloop technology.”

Englebright said the strong trend of using reclaimed heat in Australia, often needed in regions where humidity is high, the

continued on p.48 →





→ case for transcritical and integrated CO₂ solutions is even stronger. “The first few stores will see us probably looking at a capital uplift but we want to standardise, that’s one key thing. We don’t want to go through a period of five years of various models because then we cannot reach our target of cost parity.”

COLLABORATIVE APPROACH

Yet despite the difficulties and the competition with rival Coles being the fiercest it’s ever been, Englebright and his team’s will to innovate and be at the forefront of natural refrigerant technology has never been stronger.

“The relationship there [with Coles] even though we’re competitors is the closest ever to the point where we both see the benefits of working collaboratively to support the industry. Woolworths has gone through a turbulent year but we’ve put measures in place from a senior leadership perspective to position us back on track. We deployed new technologies last year and will continue to do so this year.”

Not only that, Englebright wants to accelerate industry action through collaborative training initiatives and policy discussion. That’s despite the company owning its own service and installation division through Retail FM.

Last year Woolworths commenced the first stage of its natural refrigerants training strategy with an online e-learning training portal from Danfoss where its 200+ technicians are trained on CO₂ technology followed by a second stage of field days with TAFE (Technical and Further Education) institutions. Each technician’s progress is then tracked. “When we evolve to new technology like CO₂ transcritical they know all the fundamentals, they know the refrigerant, they know the technology; it’s just the operating conditions that change.”

“If companies like Woolworths steer the way, obviously that leads to an industry-recognised training scheme. We would hope that Coles, ALDI and IGA get involved as well so we can take a collaborative approach because at the end of the day it’s the front-line people who are supporting us.”

“One of the best experiences I’ve had was in the UK around the time when Sainsbury’s and TESCO raised the flag to start the race to implement natural refrigerants and you saw the whole industry come together and I think with ATMOsphere Australia coming to Melbourne and Stuart Saville (Coles’ national refrigeration engineering manager) and myself working together... hopefully we can set up a steering group in terms of the training.” @ JR & JD

PROVEN CO₂ HYBRID SYSTEM

Accelerate Australia & NZ met Woolworths’ Refrigeration Field Engineer Denis Casey at its Point Cook store in Melbourne, which was fitted with a CO₂/R134a system in mid-2015.

Installers AJ Baker and Retail FM helped bring to life an old Harris Scarf store over the process of nine months, from design to installation. “AJ Baker and Retail FM both did a great job,” Casey said.

“It’s been a learning curve for us, for instance there are a lot less bypass valves. The CO₂ rack is a lot simpler and more user-friendly than conventional ones. All these head pressures are a new thing but you learn as you go and become more familiar once you have a play - it’s like anything new.”

The bright orange low-temperature CO₂ rack supplied by Heatcraft cools everything from the coolrooms, bakery, freezer room and 13 Hussmann showcases and islands. “Hussmann have about 90% of our business with our showcases and some are from ARNEG.”

The two condensers on the LT side are cooled by the two MT racks with a roof-mounted Heatcraft de-superheater condenser “[taking] the edge off that last little bit of cooling if necessary.” The heat exchanger on the LT side then saves further heat to supply hot water for the store.

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PANASONIC'S HUSSMANN ACQUISITION SIGNALS CONFIDENCE IN CO₂

The Japanese conglomerate eyes rollout of natural refrigerant technology in US and beyond

– By Mark Hamstra and Marc Chasserot



Tetsuro Homma, Panasonic

Panasonic Corporation, the Japanese producer of refrigeration systems, display cases, consumer electronics and a host of other products, sees tremendous potential for the use of CO₂ in commercial refrigeration and plans to leverage its recent acquisition of US refrigeration manufacturer Hussmann Corporation to expand its sales of the technology around the globe.

Panasonic has been deploying CO₂ condensing units in small-format stores in Japan and other Southeast Asian countries for the past several years. In addition to its extensive CO₂ refrigeration deployment in Japan with convenience-store retailer Lawson, in 2014 Panasonic also launched a rollout with Lawson in Indonesia, and it has tests underway in Thailand and Taiwan. Earlier this year Panasonic unveiled a test of its CO₂ refrigeration technology in Europe, with a pilot implementation in Denmark.

In an interview with *Accelerate Australia & NZ* sister magazine *Accelerate America*, Tetsuro Homma, president, Appliances Company, Panasonic Corporation, said the Osaka, Japan-based firm hopes to be able to use Hussmann's established sales and service network to introduce its CO₂ refrigeration technology to foodservice and small-format food retailing businesses in the United States, Canada and Mexico.

"The last three or four years for us has been an experimental stage to prove that CO₂ should be a mainstream, next-generation refrigerant technology, and now we have confidence that CO₂ has the potential to be the most popular technology in this industry," said Homma. "So we'll start to market not only in Japan and other Asian countries, but also Europe and United States."

Homma cited the advantages of CO₂ as a natural refrigerant, including its lack of toxicity, its low global warming potential and its energy efficiency.

"We operate several stores in cooperation with our customers and officials, and we already have evidence that CO₂ refrigeration systems' power consumption is lower than other refrigerant technologies," Homma said. "We trust CO₂ is very effective for customers' costs."

Panasonic has a wide-ranging interest in energy efficiency. As reported on www.r744.com, Panasonic yielded more than 20% in power-consumption reductions (compared with the average nationwide figure in Japan) in 2015 after adding glass doors to its showcases. The study was conducted as part of the Japanese Ministry of Environment's energy saving initiatives.

Homma said Panasonic would seek to leverage its scale to help ensure that its CO₂ offering is price competitive in the US.

SUITED TO SMALL FORMATS

Unlike the various CO₂ refrigeration systems already in use in some large commercial installations in North America, the transcritical CO₂ condensing unit technology Panasonic currently deploys in Asia is designed for small-format retail locations, such as convenience stores. Panasonic currently offers CO₂ units with 2, 10, 15 and 20 horsepower (HP). A large retail space might need up to 20 such units.

Panasonic is scheduled to begin production of a 30HP CO₂ unit, along with other variations of its small-store solutions, this year.

Homma confirmed that Panasonic's plans call for Hussmann to market two types of commercial CO₂ refrigeration technologies in North America – CO₂ transcritical for larger installations and CO₂ condensing units for smaller retail and foodservice locations.

Hussmann, in partnership with Quebec-based Systemes LMP, has already been marketing CO₂ transcritical refrigeration technologies – primarily to large-format retailers and other commercial customers – since 2014. Last year Aldi opened a store in New York that operates the first Hussmann/LMP transcritical system in the US. Hussmann executives told www.r744.com that the Panasonic acquisition would have no impact on the Hussmann-LMP partnership.

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→ The growth of small-format food retailing calls for “a new investment” in refrigeration technology for smaller types of stores, Homma said.

He said the company understood that the refrigeration systems used in the US are different from the low-HP CO₂ condensing systems Panasonic has deployed in Asia, but he added that the company was confident its experience with technology and engineering would help it transition to doing business in the US.

Panasonic’s success with commercial refrigeration systems in multiple climate conditions throughout Japan, as well as its experience in small-format stores in Indonesia, have given it confidence that its systems will prove effective in the warm regions across the Southern US. Some have questioned CO₂’s effectiveness in such climates.

“We don’t feel there are any limitations by climate for CO₂ technologies,” said Homma. “We have already introduced our system in Indonesia, where it is very warm and humid, and our system works really well. We trust our CO₂ refrigerant system is workable for US customers nationwide.”

This includes Australia, where Woolworths is investigating the viability of Panasonic’s CO₂ transcritical compressors for its business-as-usual waterloop systems.

OTHER TECHNOLOGIES

In addition, Panasonic could leverage Hussmann’s network to market other Panasonic technologies, such as HVAC systems and cloud-based technology for controlling and monitoring store energy and refrigeration systems remotely.

“I trust we will have opportunities to promote our technologies to US, Canadian and Mexican customers, because Hussmann already has very good customer contacts, and a very good sales network, installation network and service network,” Homma said.

“The last three or four years for us has been an experimental stage to prove that CO₂ should be a mainstream, next-generation refrigerant technology, and now we have confidence that CO₂ has the potential to be the most popular technology in this industry.”

He said Panasonic planned to continue to allow Hussmann to operate autonomously as a wholly owned subsidiary with the support of the Japanese parent, much like the successful, California-based aviation business Panasonic has been operating in the US for the past 30 years. Panasonic will also retain the Hussmann name for its newest US division.

“We have some experience in how to operate business outside of Japan, and how to respect autonomy,” said Homma.

The US \$1.545 billion acquisition of Hussmann, which was announced late last year and closed 1 April, is part of a significant shift in business strategy for Panasonic, which generated revenues of \$70 billion (JPY 7.7 trillion) in 2015. Long known for its consumer electronics and telecommunications products, the company has instead recently been redirecting its engineering resources toward more business-to-business technology solutions.

Homma said part of Panasonic’s shift in strategy towards B-to-B includes a focus on the foodservice and food retailing industries. Panasonic had been looking for two years for a company to acquire in the industry to expand its reach, he said.

Hussmann’s status as an end-to-end provider of products and services made it an ideal fit, Homma explained.

“We understand such a one-stop solution is very beneficial to this business, and Hussmann has this position,” he said. “They also have very wide and deep customer relationships, not only in the US, but also Mexico, Canada and the Pacific regions [Australia and New Zealand].” Homma noted that there is no regional overlap between the two companies. [@MH & MC](#)



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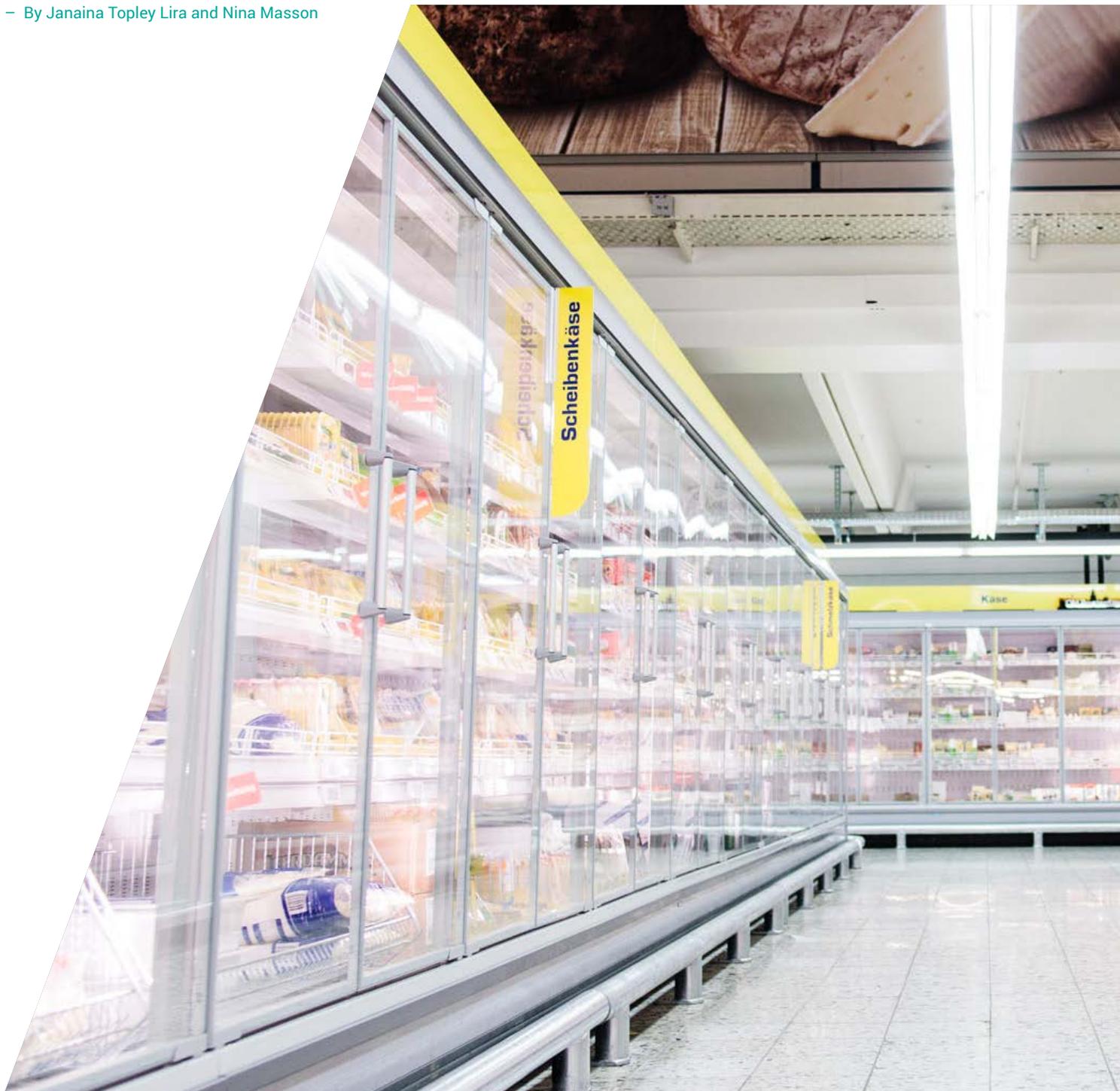
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METRO AG'S IRREVERSIBLE STAND ON NATURAL REFRIGERANTS

The German retail giant is committed to making natural refrigerants an integral part of its trailblazing sustainability strategy

– By Janaina Topley Lira and Nina Masson



“ I believe that in ten or eleven years time the roll-out of natural refrigerants across all our stores will be almost finished.”



One of the largest international retailing companies, Germany-based METRO AG (also known as METRO Group) has made a name for itself as an environmental leader.

The Dow Jones Sustainability Index, the most well known sustainability ranking, rated METRO AG the best performing company in the Food & Staples Retailing Industry in 2015. On top of that, METRO was included in the FTSE4Good Global and FTSE4Good Europe Index.

Cementing the Düsseldorf-based Group's reputation is its pioneering F-Gas Exit Program. A cornerstone of the company's emissions reduction strategy, it will see METRO phase out f-gases by 2025, replacing them with natural refrigerants in all store locations worldwide, where technically feasible.

The man whose job it is to oversee this change is Olaf Schulze, director, facility energy and resource management. Trained as a lawyer, Schulze is a fast talker and a quick thinker. After joining METRO AG in 2005, he initially found success working on the retailer's energy reduction strategy. In less than two years he managed an impressive 10% decrease in energy consumption.

Now an expert on the subject, he has authored several scientific papers on energy management, and has even published his very first book "CSR und Energiewirtschaft" (Energy and Corporate Social Responsibility).

In 2013, Schulze embraced a new challenge. Following the decision by the METRO AG Sustainability Board to transition away from f-gases, Schulze has been working hard to ensure the company adopts natural refrigerants as part of its efforts to green its image. Under his leadership the company has already introduced natural refrigerants at 14 distribution centers in addition to installing CO₂ transcritical systems in 42 stores throughout Europe.

Schulze believes CO₂ refrigeration represents a huge opportunity for METRO to move away from a technology of the early nineties and implement a technology that will help the company to "future-proof" its business in the 21st Century.

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→ REVOLUTIONARY F-GAS EXIT PROGRAM

METRO was founded in 1964 by Otto Beisheim in Mülheim an der Ruhr, Germany. Its revolutionary cash-and-carry concept was an instant hit. Customers flocked to the first self-service, bulk-buying store and it wasn't long before several more opened.

Today, the Group operates around 2,200 stores in 31 countries, including 800 METRO stores and 300 hypermarkets. Its sales divisions include METRO/MAKRO Cash & Carry stores, a leader in self-service wholesale; Real hypermarkets; Galeria Kaufhof, Europe's top department store chain; and Media Markt and Saturn, its consumer electronics stores.

With sales in 2013/2014 of around \$68 billion, Metro AG is the fourth biggest retail group in the world. A global player, METRO's size and influence come with certain responsibilities. One of these, according to Schulze, is the obligation to be a technology front-runner. "We have to use our strengths, such as our internationality and our first-mover mentality, to pilot and test new technologies."

It is precisely this ambition that led the company to pilot its first CO₂ refrigeration installation in a store in Hamburg, Germany, in 2008. With refrigeration responsible for more than 20% of the company's greenhouse gas emissions, METRO AG was eager to find a way to reduce this negative environmental impact.

Two years later, METRO publicly committed to the Consumer Goods Forum's pledge to begin phasing out climate-warming HFCs in 2015. To that end, the company published plans to use only natural refrigerants in new refrigeration equipment installations. This commitment was made not only by the METRO AG board in Germany, but also by the local boards of the 27 METRO countries.

The decision to introduce natural refrigerants across all of the Group's stores worldwide was not an easy one. But in July 2013, after considerable debate and discussion, the Sustainability Board agreed to introduce the F-Gas Exit Program. Its priority: to replace existing refrigeration equipment with natural refrigerant technology.

REASSESSING OLD EQUIPMENT

An important part of the Program is "business as usual." This means taking the opportunity to introduce state-of-the-art refrigeration technology when current equipment is near the end of its life, which can be anywhere between 18 and 25 years after its initial start-up.



To illustrate this point, Schulze uses an automotive analogy. "My old car is ten years old and when I have to replace it, I am not going to buy a new vehicle built using old technology. I am going to buy a new car, built to new standards. The same is true of refrigeration equipment. We have to buy new equipment built to modern standards, not new equipment built to old standards." For METRO AG, state-of-the-art, or modern, means using natural refrigerants.

Deciding where to begin exchanging refrigeration systems, however, was a difficult task. It required an analysis of METRO's entire installed base of refrigeration systems, taking into account refrigerant type, age of the system, leakage rate, depreciation status, and whether the equipment was located in an EU or non-EU country.

"We undertook extensive internal research, looking at all our equipment, and in the end we came up with a five-level ranking system," Schulze explained. "We calculated a system's depreciation time as being on average 15 years. Then we decided that for each negative aspect of a system we would award one point. Very old equipment, older than 20 years for example, received an extra point. For refrigerant type, the use of R404A was awarded five points. The use of R134a on the other hand, was awarded only one point, primarily because under the EU's revised F-Gas Regulation, R134a will still be allowed after 2020."

Based on the results of this analysis, the Group plans to replace f-gas equipment with natural refrigerant solutions in 58 stores in 2016, 62 stores in 2017, and 37 stores in 2018. By 2025, Schulze estimates that METRO will have stopped using f-gases in around 90%, or 680, of its stores.

"We are on track to open, on average, 50 natural refrigerant stores every year," said Schulze. "I believe that in ten or eleven years' time the roll-out of natural refrigerants across all our stores will be almost finished," Schulze said.

continued on p.58 →

Who says we can't cool the world with CO₂? We say: YES we can!

The application of evaporative condensers and gas coolers to CO₂ refrigeration worldwide has the following major benefits: Firstly, the so-called CO₂ application equators at about 40 degrees North and South Latitude will be moved to the real equator at zero degrees latitude. Secondly, it signals the end of the numerous efforts to recover energy from high pressure, hot transcritical CO₂ fluids by the use of, mostly ineffective, expanders and ejectors.

CO₂ evaporative condensers and gas coolers applied to integrated supermarket CO₂ refrigerating systems for all AC, MT and LT refrigeration in Australia reduces electrical energy consumption - ranging from 21% in Darwin to about 47% in Hobart – and also reduces direct and indirect emissions compared to air cooled HFC refrigerating systems.

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4. A269 316 SS condensing coil option.
5. Design operating pressure 100bar.
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7. Energy efficient, low pressure, wide angle square pattern, non-clogging solid cone sprays.

CO₂ Evaporative Condenser Patents Pending.

These condensers are also suitable for ammonia and all other refrigerants, and as final stage CO₂ gas coolers.

Effect of the ambient wet bulb temperature on the CO₂ condensing temperature and on the gas cooler and condenser exit temperatures and calculated energy savings with AC/MT/LT using 35%, 25% and 15% of energy respectively.

Parameter			Australian City			
No.	Description	Unit	Darwin	Perth	Melbourne	Hobart
1	Ambient Dry Bulb	°C	34	38	35	30
2	Ambient Wet Bulb	°C	28	24	22	20
3	Saturated Condensing Temperature	°C	-	30	28	26
4	CO ₂ Discharge Pressure	bar	75	72.1	69.1	67.6
5	AC CO ₂ Evaporating Temperature for Chilled Water	°C	+5	+5	+5	+5
6	MT CO ₂ Evaporating Temperature	°C	-5	-5	-5	-5
7	LT CO ₂ Evaporating Temperature	°C	-25	-25	-25	-25
8	Gas Cooler/Condenser CO ₂ Exit Temperature	°C	+31	27	25	23
9	Liquid Subcooling	K	-	3	3	3
10	Virtual Gas Cooler Exit Temperature to MT	°C	+5	+5	+5	+5
11	Liquid Temperature from MT to LT Refrigeration	°C	-5	-5	-5	-5
12	AC/MT/LT COP with CO ₂ Evap. Condensing/Gas Cooling		3.8/4.1/2.4	4.8/4.7/2.6	5/5/2.7	6.1/5.4/2.9
13	AC/MT/LT COP for Air Cooled R404A		3.5/2.7/1.7	3.5/2.7/1.7	3.5/2.7/1.7	4.1/3.1/1.9
14	AC/MT/LT CO ₂ COP Improvement	%	8/34/29	27/42/35	33/46/37	33/42/34
15	Estimated reduction annual electrical energy use	%	21	36	44	47

Evaporative condensers for subcritical CO₂ condensing and gas cooling of transcritical CO₂ fluid allow the efficient application of CO₂ refrigeration all over the world, just like in Darwin, Australia where the Ambient Wet Bulb Design Temperature is 28°C, which is not exceeded in 98% of the world.

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→ One of three pillars of the F-Gas Exit Program, the shift to natural refrigerants goes hand in hand with leakage prevention through proper maintenance, and maintenance of detailed records for each refrigeration system, known as the refrigeration system logbook (LOCS). “Although we have a way to go to achieve our long-term target of a 5%-6% leakage rate, we are succeeding in our efforts to reduce the number of leaks,” said Schulze.

CHALLENGES TO OVERCOME

For any international company, one of the key challenges in switching to a new technology is having qualified technical support on the ground. METRO stores are spread far and wide across the globe; thus the switch to natural refrigerants has required significant investment in technician training and education.

“One of the lessons we have learned is that you cannot expect to find the same level of technical knowledge as you find in Central Europe all around the world,” said Schulze. “This has been our experience in India, for example, which is one of the countries in which we are expanding rapidly. We currently have 16 stores in India and in order to transition to natural refrigerants we have had to ensure we have fully trained technicians who can provide support, maintenance and repair.

Another challenge is the negative impact high ambient temperatures, like Australia’s, have on the efficiency of CO₂ refrigeration technology. For METRO to successfully switch to naturals, this newly adopted technology has to operate efficiently in all of the countries in which the Group operates. Fortunately, the very latest CO₂ refrigeration advances, which include parallel compressions and ejectors, have made this possible.

“To roll out natural refrigerants worldwide, the technology had to work in our stores in Spain, Portugal, Turkey and India,” says Schulze. “And I am happy to say that the latest CO₂ innovations have enabled us to open our very first CO₂ transcritical store in Madrid, Spain, and that in the 2016 fiscal year we will open our first transcritical store in Portugal.” The Madrid store employs a parallel compressor system to compensate for high ambient temperatures.

© JTL & NM

SHARING IS CARING

A key advantage METRO has enjoyed as its move towards natural refrigerants is its ability to exchange best practices between countries. “To accelerate the roll-out, we must learn from each other,” said Schulze.

Knowledge sharing is central to METRO’s plans to open its first CO₂ transcritical store in China in 2016. This follows the opening of the company’s first CO₂ cascade system in the country in 2014, collaborative effort between local companies Fute and General Fushi. One thing is certain, METRO Group’s expansion into China will rely on the use of CO₂ refrigeration.

While discussions with international partners on how to transition to natural refrigerants have been largely fruitful, Schulze says the company has encountered opposition. “We sometimes encounter technical resistance from local governments.” China is a case in point. METRO is not allowed to install AHT’s propane refrigeration solutions, a technology allowed in many other countries. Seeking to overcome this issue, METRO is working closely with local associations and trade unions to drive regulatory change.

Could the decision to use natural refrigerants, and in particular CO₂ transcritical refrigeration, change? Not according to Schulze. “As a result of our efforts, I am confident that this decision is irreversible. All of the refrigeration systems planned in 2013 and built in 2015, and those that we will build in 2016 and so on, will use natural refrigerants. Every year we further entrench the use of natural working fluids, including CO₂, in METRO Group operations.”

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DANFOSS LEADING TECHNOLOGY CHARGE DOWN UNDER

Danfoss is at the heart of a supplier push to build momentum in Australia and New Zealand for the acquisition of CO₂ technology.

– By James Ranson & Klara Skačánová

Iood Retail Business Development Manager Inderpal (Indy) Saund knows better than most what challenges lie ahead – not least high ambient temperatures and less than adequate government support in Australia – but is more excited about the company's CO₂ transcritical projects in the works for 2016.

Figures show there are at least eight CO₂ transcritical installations in Australia and 16 in New Zealand, where ambient temperatures are typically lower. Australia has a number of CO₂ systems (both subcritical and transcritical) installed in a number of retailers. This has given a good basis of information on how CO₂ systems run in warmer climates.

Danfoss' Australian journey with the refrigerant commenced in 2006 in Sydney, working with Bitzer on a cold store installation that utilised CO₂ on one side and hydrofluorocarbon R404A on the other. "This was essentially the testing ground for CO₂ in Australia," Indy said. "We saw around 20% energy savings despite higher capital costs but it was the basis to start investigating CO₂ further in Australia and New Zealand."

From there, Danfoss moved into the supermarket sector with Coles (Wesfarmers), who Indy describes as "the leaders at the time". Danfoss worked with compressor manufacturer Bitzer to install subcritical CO₂ systems in Australia, using Melbourne-based contractor Frigrite, as well as in New Zealand.

"New Zealand has a similar climate to Europe. I'm talking Northern Europe like the UK, so it makes it very suitable for transcritical solutions. And they were already used to using subcritical systems, so it was quite easy to make that transition."

"For a long time people were saying that transcritical systems weren't OK for these parts of the world, because the 'CO₂ equator' rules it out. But all those theories have been whitewashed, because it's been proven in warm climates that we can get similar results and run the transcritical systems."

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Danfoss Food Retail
Business Development Manager Indy Saund

→ The difficulties for CO₂ lie in the fact that above the 'critical point' (31 °C) – known as supercritical mode – the gas does not condense in the condenser (which instead serves as a gas cooler) and does not become liquid until after the pressure is reduced. The key to overcoming this challenge is the constantly evolving ejector and parallel compression technology currently penetrating the market in warmer regions, including Southern Europe.

Indy knows what is possible in Australia and New Zealand, having worked far further afield. He has assisted on pilot projects for UK supermarket giant TESCO in the humidity and high ambient temperatures of Bangkok, and played a key role in the design and construction of the first CO₂ subcritical rack in China.

EJECTORS, PARALLEL COMPRESSION KEY TO UNLOCKING AUSTRALIA

Parallel compression was installed in Coles' Coburg North store for the first time in 2015 and is so far achieving positive results ([see cover story p.20](#)).

Indy says Danfoss is in discussions with a major retailer in Melbourne, Australia to install the first transcritical system with an ejector and hopes to confirm it later this year.

"The question of ejectors has been discussed, but we're trying to find an end user in Australia to take it on. The problem is that the results we have right now from trials that we've done in Europe all show maximum ambient temperatures of, say, 35°C, but in Australia it can get up to 45°C and in Central Australia as high as 45-50°C."

"That's the crunch," Indy says. "The end user is saying: 'that's fine but what happens when it gets up to 45°C in Melbourne?' – and this is in central Melbourne – 'what do I do then? Will this ejector system give me the same results? You're saying that it will on paper but I want to see hard facts'. Taking into account all these factors to be the first one is a risk, and that's what we're trying to deal with now."

“ For a long time people were saying that transcritical systems weren't OK for these parts of the world because the 'CO₂ equator' rules it out. But all those theories have been whitewashed because it's been proven in warm climates that we can get similar results and run the transcritical systems.”

New Zealand has proven a fine testing ground for Danfoss and Indy, who is excited about further transcritical installations in 2016. "This has been a big milestone for us, doing these transcritical systems and seeing how they perform, and it's clear from the feedback that there is a stronger push to adopt transcritical systems in New Zealand where the climate is cooler."

GOVERNMENT SUBSIDIES AND SUPPORT LACKING

A number of factors in Australia have combined to stagnate the adoption of next-generation technology like natural refrigerants in recent years, according to Indy. A lack of investment in "official training, at government and association level," combined with inadequate incentive schemes and the repeal of a federal tax on carbon in 2014, have all hindered progress.

The carbon tax was in place for just under two years until it was scrapped in the Australian senate on 17 July 2014, dangling the unenviable tag of the 'world's first developed nation to repeal carbon laws that put a price on greenhouse gas emissions' around Australia's neck.

The tax was designed to encourage Australia's largest emitters, namely the nation's huge mining and fossil fuel industry (including industrial HVAC&R), to increase energy efficiency and invest in sustainable energy. Approximately 185 companies paid the tax in 2013 and the move to scrap it arguably disincentivised businesses from adopting greener technology.

Indy said incentive programmes and an Emissions Trading Scheme (ETS) like the one in place in New Zealand would help independent retailers in particular to purchase natural refrigerant equipment in Australia. "What we desperately need is an ETS, which has been successful in basically sparking things off again in New Zealand, where we've seen the trend

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TRAINING GAP

Indy described training as the “main issue in the greater Pacific region”. Back in 2008 Danfoss collaborated on a training facility with TAFE NSW, which offers vocational education courses. It was fitted with an NH₃/CO₂ system and a transcritical CO₂ system for refrigeration students to get hands on work experience.

Sadly, the facility is now left “underutilised” according to Indy due to a lack of government support for CO₂ technology and very little incentive for refrigerant students to work with natural fluids and transition away from HFCs, which still dominate the industry.

“The carbon tax made a lot of noise before it was scrapped. While it was in place the numbers at the TAFE College in Sydney were great and people then forgot that and just went back to traditional R404A or R134a.”

“While there are a handful of people that are working on these [natural refrigerant] systems, there is still a lack of official training, at government and association level. That’s where Danfoss is trying to make the greatest impact: we’re trying to team up with local associations and get the government involved by saying, ‘hey, we’ve got training material, we’ve got examples of where we can help train your guys – let’s try and come up with something’. If we want to see this accelerate in great numbers we need to educate the market.”



Ammonia system training



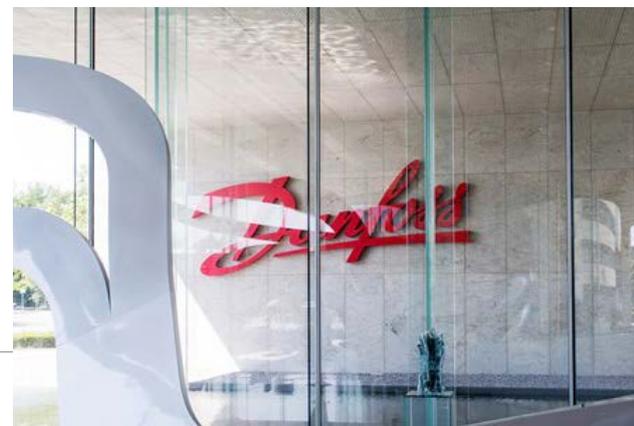
towards CO₂ because of it. In Australia the government are talking about it but until they do it there will be no real attraction.”

The Australian government put out option papers in August 2015 seeking comment on a Direct Action approach, including a \$2.5 billion Emissions Reduction Fund and a commitment to phase down hydrofluorocarbons (HFCs) by 85% by 2036.

Unlike Europe, Australia is a relatively closed economy. Boasting a landmass almost the size of the US yet inhabited by a relatively small population (around 23 million), big companies like Coles and Woolworths (in food retail) dominate their respective industries. In the absence of government support, Indy believes the onus is on the major end users to drive sustainable change in the industry.

“Although the government will play an important factor in this, it’s going to be the end users who are going to be the greater players. In Australia, what controls that market is the big supermarket players, the biggest users of refrigeration. They are really driving where the industry goes. If they are interested in CO₂, that’s where the market will go. It will also force the smaller players to go in the same direction.”

“So, yes the [options] paper is needed from a governmental point of view. Is it really where it should be? That’s questionable, but I would still say without that commitment from end users we’ve got no direction. If they’re paying a tax to the government then they really have a say in where the market goes.” @JR &KS





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SYDNEY SPOTLIGHTS NATURALS

Australia is on the verge of an HVAC&R revolution, but it will take collaboration from the whole industry to make the transition to natural refrigerants happen.

– By James Ranson



 We're at a cliff edge with carbon emissions – HFCs take us way over," warned Tim Edwards in his opening address at the Energy Efficiency Seminar in Sydney held 5 April at the Australian Technology Park.

The message from the Australian Refrigeration Association (ARA) president is a sobering one, but just as clear are the enormous opportunities available to Australian industry to adopt natural refrigerant technology.

The ARA's High Performance Energy series set about ways to educate the industry as direct participants to understand the high energy cost and global warming impact of HVAC&R, which in Australia accounts for about 14% of the country's carbon emissions.

Edwards believes the nation's air conditioning and refrigeration bill can be drastically reduced and save the Australian economy in the order of \$10 billion per annum via a market-wide transition

to natural refrigerants and integrated HVAC&R energy-efficiency technology.

Opportunities and challenges including new technology, training and safety misconceptions were presented specifically to mobilise contractors and specifiers to start working with cutting-edge modern technology.

Some of Australia's leading suppliers including Scantec, Pioneer International and engas Australasia introduced their proven natural refrigerant technology while Ignacio Gavilan, the Consumer Good Forum's director of sustainability, added an international perspective.

NATURAL REFRIGERANT TECHNOLOGY READY AND WAITING

CA Group Services Managing Director Ian Tuena described supermarkets as the biggest mobilisers in the Australian industry. "The single biggest challenge that needs to be communicated to



Australia should be a leader, there is high growth for those companies that engage and take this opportunity. Export and development opportunities exist to assist the developing world and avoid about one billion dollars in exports via avoiding HFCs.”

government is training, and funding for this. Consultants need to start thinking outside the box,” he said.

Klaas Visser of KAV Consulting and Ian Wilson from Strathbrook Industrial Services presented a strong case for the expansion of CO₂ technology.

Always one to think outside the box, Visser presented a CO₂ transcritical system he has been developing, with the first which will be installed in Kuala Lumpur in 2016. The atypical use of an evaporative condenser, Visser argued, would enable the technology to operate constantly in subcritical mode in 90% of Australian locations and 100% of Europe’s.

In his presentation Selwyn Wallace, Managing Director, engas Australasia (a supplier of hydrocarbon refrigerants) with 35 years of experience, showed how hydrocarbons can be applied safely, as with any other refrigerant, and are highly efficient in a number of applications.

Over 22 million split system air conditioning units running on R22 will all need replacing and Pioneer International’s George Haydock sees hydrocarbons as the answer. “Old air conditioners use up to 60% of the electricity in houses (using f-gases),” he said. “The critical temperature of

hydrocarbons is 30% higher than f-gases like R410A and they are up to two times more effective at heat transfer.”

Scantec’s Stefan Jensen will have installed 10 of the company’s low-charge ammonia systems by the end of 2016. The systems have a price premium of around 1.5 times that of HFC systems but the return on investment is just 2-3 years in light of their outstanding energy efficiency.

SAFETY, STANDARDS AND TRAINING

Earlier, Edwards cautioned against overstating the perceived danger of natural refrigerants. “The truth is all refrigerants are dangerous and need to be handled by trained and qualified engineers and technicians,” he said.

He also welcomed the review of Australia’s proposal to phase down hydrofluorocarbon (HFC) refrigerants by 85% by 2036 via the Ozone Protection and Synthetic Greenhouse Gases Management Act, which is underway and in Edwards’ view absolutely essential.

Australia’s technical colleges (TAFE) have seen funding cut at federal level in recent years, further draining technical expertise and the level of education in future technologies like natural refrigerants, Edwards said.

“Australia should be a leader, there is high growth for those companies that engage and take this opportunity. Export and development opportunities exist to assist the developing world and avoid about one billion dollars in exports via avoiding HFCs.” @JR

CGF EXPANDING IN AUSTRALASIA

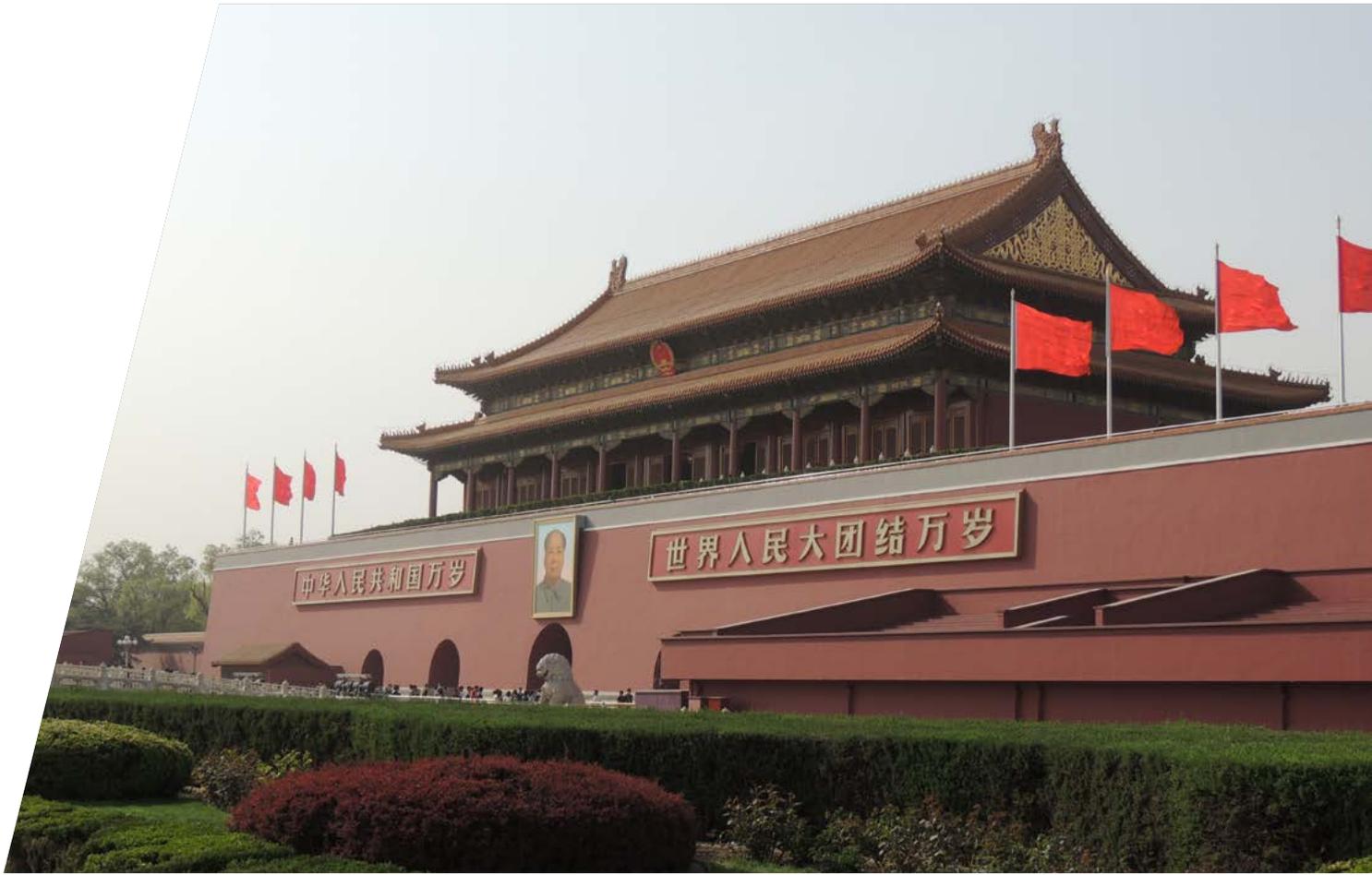
With over 400 members globally, the Consumer Goods Forum’s aim is to bring together the world’s leading retailers and manufacturers in pursuit of business practices for efficiency and positive change.

Its first resolution on refrigeration, covering the period from 2010 to 2015, included commitments from the Coca-Cola Company, TESCO, SABMiller and Woolworths, among others, to phase out HFC refrigerants and replace them with natural refrigerants by 2015.

Gavilan was in Australia to speak with potential members including retail giants Coles and ALDI. The duo’s inclusion as members would complete the food retail quartet in Australia with current members Woolworths and Metcash already on board.

With the potential to prevent global warming by up to 0.1°C by 2050 and 0.5°C by 2100, Gavilan highlighted HVAC&R as one of the sectors with the highest potential to reduce emissions in a cost-effective manner. He urged delegates in Sydney to start “piloting solutions with natural refrigerants, share best practice on these pilots and to contribute to industry leaders and bodies like shecco and the ARA.”





NATURAL REFRIGERANTS KEY TO CHINA'S SUSTAINABLE GROWTH

The phase-out of HCFCs and a 2015 revision of the Environmental Protection Law are creating new opportunities for natural refrigerants in room air-conditioning, heat pump, commercial and industrial refrigeration applications in China.

– By Andrew Williams

China produces the vast majority (92%) of HCFCs in developing countries. No doubt, then, that the industrial powerhouse's move to completely eliminate their production and consumption by 2030, under the auspices of the Montreal Protocol, will have a major global impact.

At China Refrigeration, held in Beijing 7-9 April, the importance of embracing natural refrigerant technology in the cold chain, welcoming proven overseas manufacturers onto the market, and subsidising new technology to accelerate the transition, were all highlighted as critical components to set the wheels in motion.

The Chinese government recognises the role that natural refrigerants can play in putting the country on a sustainable footing. "In China, natural refrigerants can contribute to reducing greenhouse gas emissions and lead to bluer skies," Xiao Xuezhi, Deputy Director-General of China's Foreign Economic Cooperation Office (FECO), told the Ozone2Climate Industry Roundtable.

In 2015, FECO issued a list of recommended substitutes for HCFCs. It is currently finalising proposals for Stage II of the HCFC Phase-out Management Plan and the revision of national standards for natural refrigerants – altogether representing a significant shift in China's approach.

SOLUTIONS FOR CHINA

For Rüdiger Rudischhauser, Vice-President Sales International at Snowkey (part of Chinese manufacturer Fujian Snowman Co. Ltd.), “food processing is the megatrend” not just in China but also globally.

Rudischhauser believes natural refrigerants are essential to deliver more sustainable food processes in applications like food preservation, cold storage and blast freezing for a global population that is expected to hit nine billion people by 2050.

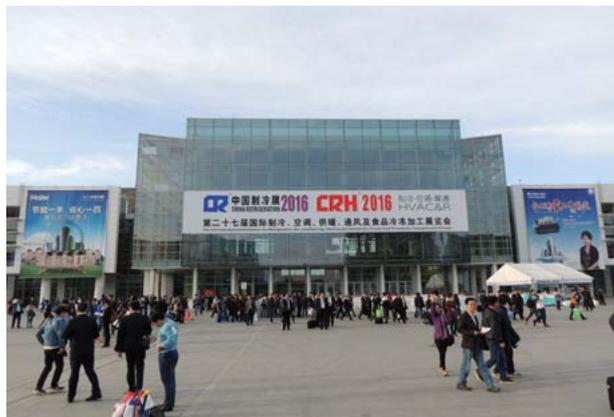
Snowkey plans to install a CO₂ transcritical system in a major supermarket in China very soon. “I’m very positive about bringing CO₂ transcritical to China, because the ambient temperatures in the northern part of China are very favourable,” Rudischhauser said. “Our R&D centre is here. This is our home market and our home turf.”

This is leading manufacturers like Snowkey to bring complete technology packages to China. “We see the future not just in compressors, but in complete packages and solutions - on the industrial and commercial side - which clearly shows that in China we have already made that step of forward integration from being a compressor manufacturer to a system provider,” he explained.

EUROPEAN KNOW-HOW

Major European manufacturers like German compressor manufacturer Bitzer also see opportunities in bringing their natural refrigerant technologies to the Chinese market. Bitzer has supplied a subcritical CO₂ cascade system to a METRO China supermarket in the city of Weifang, and some heat pumps.

“Globally, Bitzer is very strong in promoting CO₂ applications,” said Bill Feng, General Manager – Sales and Marketing, Great China Region at Bitzer. “We have [the] METRO store with CO₂ for refrigeration [and are] also starting on some heat pump applications in industrial segments, for instance in railway stations in the north.”



USHERING IN HYDROCARBONS

Transitioning end-of-cycle HCFC equipment to hydrocarbons is also necessary in a country still heavily reliant on R22 for domestic air conditioning and other light commercial applications, such as household freezers and beverage vending machines.

As part of its ‘HCFC Phase-out Management Action Plan’, the Chinese Ministry of Environmental Protection published a list of nine air conditioner makers eligible to receive the so-called Incremental Operating Cost (IOC) subsidy in 2015.

The subsidy is designed to help companies cover the cost of transforming air conditioner production lines to R290 (propane) and the increased cost of producing R290 units in the first few years of production.

Gree’s demonstration project to provide 243 R290 air conditioning units to Shenzhen University is central to the transition.

Meanwhile German compressor manufacturer SECOP, which primarily supplies systems for household, light commercial and DC-powered refrigeration, plans to focus solely on hydrocarbons. “That’s what we’re good at,” said Pieter Boink of SECOP. “We have different dynamics in different markets. One thing we’re really good at in China is looking at total cost. It’s very easy to choose natural refrigerants, because propane gives you very high efficiency – bringing costs down – and it’s green.”

Asked how he sees the market for hydrocarbon air conditioning developing in China, Bonny Dai, Senior Regional Marketing Manager (China) at Danfoss Commercial Compressors, said the company considers R290 as an exceptional refrigerant from a thermodynamic standpoint. “Danfoss has furthermore made investments also in compressor labs in order to deal with A3 and A2/A2L flammability and to investigate compressor solutions for both the residential and light commercial air conditioning and refrigeration applications,” he said.

Jan Dusek, Business Development Manager, shecco Japan, said that there were already over 750,000 retail display cases, vending machines and bottle coolers using CO₂ or hydrocarbons in China. “The use of natural refrigerants in light commercial refrigeration is a strong trend in most major economies,” said Dusek, adding: “China is the fastest growing world market for commercial refrigeration.” @ AW

SABMILLER'S TOAST TO NATURAL REFRIGERANTS

Brewing giant SABMiller is employing propane refrigeration in new beer coolers throughout its sprawling global enterprise

– By Andrew Williams

 As the world's second-largest brewer by revenue, London-based SABMiller uses a lot of resources. But the company is aware of its responsibility to marshal those resources in the most sustainable way.

"We measure the carbon impact of the company across the value chain," said André Fourie, the company's head of water security and environmental value. "We look at agriculture - the barley, the malt and the hops that we buy. We look at the malting process, we look at the manufacturing process, we look at the refrigeration and packaging of our products, we look at the distribution process, and we look at end-of-life," Fourie said from his base in Woking, Surrey, near London.

Founded as South African Breweries in 1885, SABMiller is now a FTSE (Financial Times Stock Exchange) 100 company with operations across six continents, employing some 70,000 people in more than 80 countries.

Among SABMiller's portfolio are premium international brands such as Milwaukee, Wis.-based Miller Genuine Draft, Peroni, Nastro Azzurro, Foster's and Grolsch alongside local names such as Pilsner Urquell, Castle, Tyskie and Lech. The company is also a major bottler of Coca-Cola.

With refrigeration representing between 18% and 20% of the company's carbon footprint, natural refrigerants are playing a central role in helping to deliver on the firm's commitment to reduce carbon emissions by 25% across its whole value chain by 2020 (compared to 2010 levels).

SABMiller is committed to purchasing 100% HFC-free store fridges (largely using propane) by 2020 for its bottled beer. The purchase rate of new fridges across the markets in which SABMiller is active is around 10,000 per year. It started the process in Europe, purchasing about 8,000 new propane fridges for its Polish retail network, and then scaling up that strategy. Last year, about 90% of new fridges purchased in Europe were HFC-free.



André Fourie, SABMiller

With that plan underway, Fourie stressed the importance of keeping up the momentum. "Despite some challenges, we are pleased that we're currently on track to meet our commitments."

He expects the market to move quickly. "Once the suppliers have one or two models, all of a sudden their competitors are under pressure to have similar models, they have more confidence, and their maintenance suppliers quickly make the shift to support the industry."

THE WAY THE WORLD IS GOING

Having chosen to phase out HFCs, did SABMiller consider other options such as synthetic refrigerants before opting for 100% natural refrigerants? No, says Fourie. "Our decision was that when you're moving, you may as well move out of HFCs. Why repeat what we had with CFCs? It's quite clear which way the world is going."

Officially, the firm's policy remains "HFC-free" – meaning free of low-GWP synthetic refrigerants (unsaturated HFCs) too. "But as the language developed over time, we saw the value of talking about natural refrigerants," he said. "It's a marketable term. We also think it's the right direction, that we want the world to take."





“ [Natural refrigerants] is a marketable term. We also think it’s the right direction, that we want the world to take.”

Currently, SABMiller’s policy is to adopt propane as the refrigerant of choice for trade fridges that it purchases specifically for beer, because retailers understand its use very well. However, some retailers prefer to use CO₂ cases – particularly when a case also includes soft drinks. “We’re entirely comfortable with CO₂,” said Fourie. “But when we buy [a case] ourselves, we prefer to use propane.”

All SABMiller’s breweries use ammonia for industrial refrigeration purposes. “We used to operate quite distinct ammonia systems in different parts of the breweries. We’re getting better at managing it more centrally and making sure that they are efficient,” Fourie said.

JOINING REFRIGERANTS, NATURALLY!

Recently, SABMiller became the fifth member of Refrigerants, Naturally! – an initiative of international companies taking action against global warming and ozone layer depletion by replacing harmful greenhouse gases in point-of-sale cooling and freezing units with climate-friendly natural refrigerants.

The goal of the group – in which SABMiller, Red Bull, PepsiCo, the Coca-Cola Company and Unilever join forces with supporting partners Greenpeace and UNEP – is to make natural refrigerants the preferred cooling technology in a safe, reliable and cost-effective manner.

Fourie stressed the importance of working together with global partners to tackle the challenges facing our planet. “It’s part of our understanding that in just about all the areas in which we invest in terms of sustainable development, the challenges and the solutions are bigger than us as a company.” **AW**



THE NATURAL FIVE

Mayekawa's green innovation on fast
track to global reach

— By James Ranson & Marc Chasserot



Tadashi Maekawa, President



As the wheel began to turn at the global climate conference in Paris (COP21) in early December 2015, Mayekawa was busy presenting its 'Natural Five' solutions concept – the five natural refrigerants that will inevitably drive the phase-out of harmful HFCs (hydrofluorocarbons) in HVAC&R applications, in turn reducing the most harmful effects of climate change.

Indeed, the company has put environmental preservation, energy efficiency and technical innovation at the heart of its commercial activities for decades. Kisaku Maekawa founded the Tokyo-based company in 1924, beginning by producing industrial reciprocating refrigeration compressors for ice-making and cold storage.

Company President Tadashi Maekawa has proudly continued the legacy his father laid out. "Our endeavor on natural refrigerant technologies started from the conception that solving environmental issues is a global mission that has to be [solved] this century," he says.

"Mayekawa was originally involved in industrial refrigeration, and we chose natural refrigerants not only because they were friendly to the global environment, but also efficient, so our business developed towards the employment of the 'Natural Five,'" he adds.

FIVE-YEAR GLOBAL STRATEGY

Now, some 80 years after Mayekawa produced its first functioning compressor, the company has subsidiaries in 40 countries, expanding into new global markets each year, including the Middle East, Africa and Eastern Europe. In 2014, the company reached a turning point that demonstrated the global reach natural refrigerants have already today. For the first time, international sales outstripped domestic sales with a 60-40% split.

"Our sales overseas exceeded domestic sales [in 2014], and we believe our business will expand more overseas than in Japan in the coming years - the international market is huge compared to that of Japan," Mr. Maekawa states. "And without increasing our overseas sales, we cannot make a significant contribution to the global environment."

"This doesn't mean that the Japanese market is no longer important to us, but at least it already has environmental actions underway. We believe if such actions are conducted on a global scale, the global environment will be far better, even in China or India. That is what we hope to do in the next five years."

Mayekawa wants to share its experiences of the domestic market to a global audience. Mr. Maekawa knows expansion will incur costs but stressed the importance of maintaining open dialogues with local industries and governments, as it has done for decades in Japan.

The company has a strong tradition of working with the Japanese government, utilising the incentive programmes it has offered to expand Mayekawa's business. Building relationships in new global markets will likely prove to be Mayekawa's greatest challenge in the next five years. "This is a very important mission to us. There are a number of key accounts, world-leading end-users, outside Japan. Building relationships with these customers is crucial; in fact it is inevitable if we hope to expand our business abroad," Mr. Maekawa emphasises.

"I have great confidence in the environmental business that we conduct here in Japan. I therefore feel it is the best way to invite potential customers from abroad and show them the technology of Mayekawa in Japan."

CONSTANT INNOVATION

The company's philosophy of constant innovation is certainly true of Mayekawa's flagship low-charge NH₃/CO₂ system, NewTon. The systems are predominantly manufactured in Japan, where Mayekawa has sold over 800 units. Continuous innovation will be crucial for growth in new markets, where natural refrigerant cascade systems are starting to leave their mark in the industrial sector. "The NewTon series is really an important business for us. Although it has gained ground in the Japanese market, we also need to continue [marketing it] overseas, so that this system will be a standard throughout the world," Mr. Maekawa says.

"We also need to introduce more products into overseas markets, and while increasing our sales, we will continue to develop a far more advanced NewTon that achieves higher efficiency using a smaller ammonia charge."

To meet the increased demand, Mayekawa will improve its service networks and collaborate with local companies with the aim of launching a smaller NewTon that uses an NH₃ scroll compressor, for the commercial market, in the first half of 2016. In addition, new production lines for NewTon motors will be constructed at the company's Higashi-Hiroshima plant. "We need to address compressors as well, but we will first enhance the efficiency of the motors. The construction will start [in 2016] and the plant will have a clean room."

“ In industrial refrigeration, Mayekawa originally chose natural refrigerants because they were friendly to the environment, but also efficient”

While Mayekawa traditionally services a wide spectrum of industrial sectors, a move into commercial refrigeration and industrial air conditioning could have positive implications for the company's business. "We are going to construct a building that has NH₃/CO₂ air conditioning systems. Also, we are planning to develop NH₃/CO₂ systems for supermarkets and convenience stores," Mr. Maekawa unveils the company's future plans.

ANNIVERSARY IN 2024 A BIG INCENTIVE

In 2024, Mayekawa will celebrate its 100th anniversary. But rather than use the milestone as an opportunity to reflect, the company is instead using it as a catalyst for further growth. "By 2024 we are aiming to achieve twice as many sales as in 2014. So our goal for 2024 is achieving 200 billion yen in sales. The number of staff will increase as well, and we are looking forward to working with [more] people around the world to advance our eco-friendly business."

Looking forward, Mr. Maekawa insists little would change by way of the company's philosophy. "We will continue to be pioneers but at the same time we hope other companies will [work] with us promoting the Natural Five, so as to make a better global environment for younger generations."

"I want people to perceive Mayekawa as an ecological company making a big effort to support the global environment."

📍 JR & MC

NO TIME TO WAIT AND HFC

In 2016, Australia is expected to usher in several legislative developments pertinent to natural refrigerants. In the meantime, Montreal Protocol discussions on a possible HFC phase-down will take centre stage at the international level.

– By Justina Tamasiunaite and James Ranson

AUSTRALIA TO ESTABLISH HFC PHASE-DOWN IN 2016

In 2015, Australia's Federal Government officially declared its goal to phase down the use of HFCs. Environment Minister Greg Hunt stated that "Australia will fast-track work to reduce domestic HFC emissions by 85% by 2036".

An options paper released in October 2015 outlined four possible ways for Australia to phase down HFCs, and industry views were collected to better evaluate the best path forward.

The final recommendations report for the government to consider is scheduled for publication later this year, with further industry consultations likely to take place after.

Furthermore, the government may consider putting in place an Emissions Trading System (ETS) similar to the one in New Zealand or re-introducing the carbon tax scrapped in 2013. Nevertheless, what any domestic environmental reform would look like remains ambiguous. With the Coalition calling a double-dissolution federal election on 2 July and Labor enjoying

a monumental swing in the polls, any decision, after years of relative inaction on climate change, hangs in the balance.

Modelling conducted by energy market consultants Jacobs investigating Australia's options found that an explicit carbon price delivered in the form of a tax or trading scheme delivered the lowest cost to the Australian economy, with savings of up to \$8.2 billion under a more aggressive 45% target.

In New Zealand, the ETS has seen the price of some conventional HFCs rise three-fold in the past 12 months alone and it's true that in terms of policy and industry actions taken to reduce the use of HFCs, Australia is still lagging far behind other continents, such as Europe and North America. Europe, for example, has long been a leader in taking regulatory action to phase down HFCs, especially with its recent F-Gas Regulation and its amendment proposal to take global action regarding HFCs under the Montreal Protocol.

NEW WORKING GROUP 'PROMOTING' NATURAL REFRIGERANTS

In March this year, Refrigerants Australia, an organisation representing Australian refrigerant suppliers and users, established a new working group for natural refrigerants with the aim of addressing significant policy challenges and technical challenges hindering the introduction and widespread adoption of natural refrigerants in Australia. The working group invites Australian companies interested in improving access to natural refrigerants and clarifying technical barriers and will hold the first of three meetings in June.

In addition, the consultation period for a review of standards vital for Australia's HVACR industry, and the improved livelihood of natural refrigerants, were expected to close on 4 May 2016 after a month's extension.

Australian Refrigeration Association President Tim Edwards has welcomed the proposed new amendments to AS/NZS ISO 817 (Refrigerants Designation and Safety Classification) and parts one to four of AS/NZS 5149 (Refrigeration Systems and Heat Pumps) in that the refrigeration classification proponent will directly impact system design, an element that largely ignores natural refrigerants in the draft standard.

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MONTREAL PROTOCOL NEGOTIATIONS

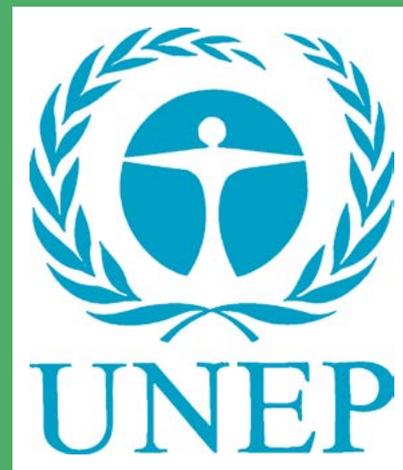
The 37th Open-Ended Working Group meeting (OEWG37) held in Geneva, Switzerland on 4-8 April 2016 kicked off the negotiation process on the future global HFC phase-down.

The most significant progress made during the meeting was the tentative agreement reached on an exemption for high ambient temperature countries, such as those in the Gulf region.

Concerns about a lack of readily available low-GWP alternatives for warm climates were reiterated by Gulf countries, who made it clear that negotiating exemptions would be a clear priority and precondition for further debate.

After lengthy negotiations, the US together with Saudi Arabia presented a proposal for high ambient temperature countries, which would see 34 countries qualify for an initial four-year exemption (with the possibility to renew) from the HFC phase-down in certain types of air conditioning equipment, including multi-split AC for commercial and residential use, split ducted AC, and commercial packaged (self-contained) AC.

Unable to finalise a text, the OEWG37 meeting will resume in order to continue formal negotiations before OEWG38 (18-21 July 2016) with hopes high that an agreement could be hammered out by the end of 2016.





Each Nation and each Industry Sector bears an individual responsibility in the fight against climate change.

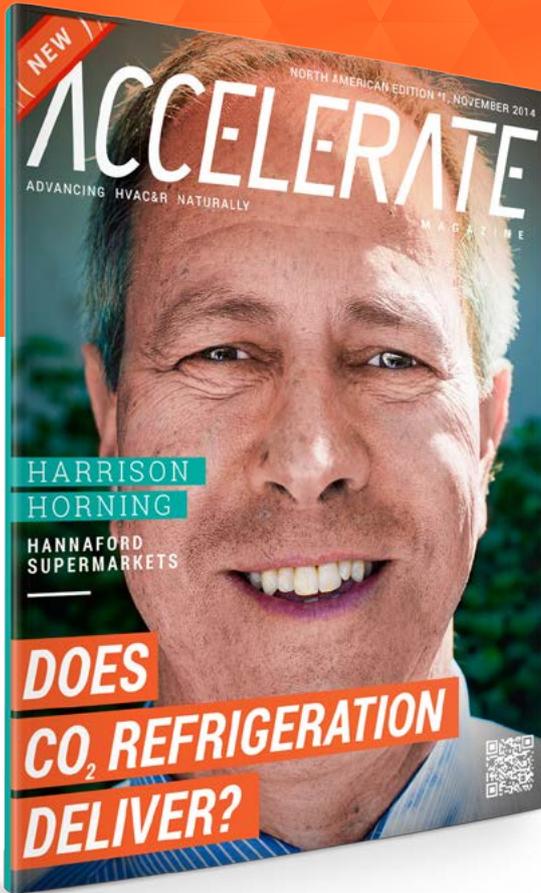
The refrigeration, heating and cooling industry recognises the role it can play to reduce direct and indirect emissions of greenhouse gases.

The Organisations who endorse this statement call upon the National Governments to responsibly shape today the climate opportunities of tomorrow, and acknowledge the potential of Natural Refrigerants.

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