

WINTER 2016

ACCELERATE

ADVANCING HVAC&R NATURALLY

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

WHERE TO NEXT?

How Industry Collaboration Can
Shape The Future For NatRefs

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Leaders With HFC Phase-Down

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CO₂ Transcritical Sets
Foodstuffs Apart

p.64

First ATMosphere
Event Lays Foundation



ATMO
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Special
ATMosphere Australia
Conference Issue

LEADING ENERGY EFFICIENT COLD STORAGE

Ammonia Low Charge

Distribution Facility, Perth, Western Australia



PAY-BACK 2 YEARS ¹⁾

\$13,500 PER MONTH ELECTRICITY COSTS ²⁾

Project Details

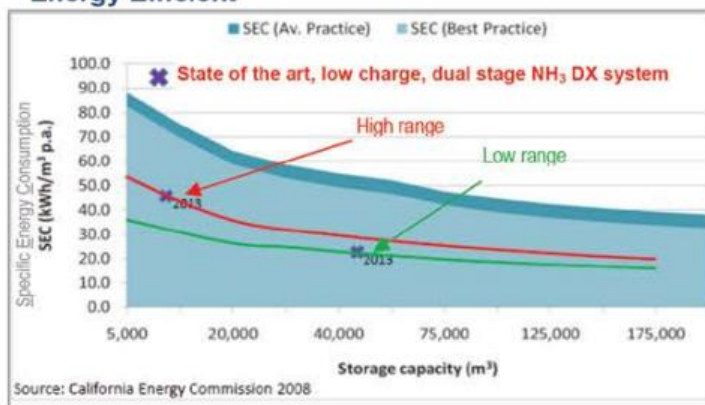
- Solar Installation
- Low charge ammonia
- Sustainable and efficient
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- Total Refrigeration Load 496kW
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- reduced regulatory burden
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Energy Efficient



1) Based on differential investment between new, state of the art low charge ammonia refrigeration system and industry standard, HFC based, single stage, air cooled plant with electric defrost divided by reduction in annual energy costs.

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



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ADVANCING HVAC&R NATURALLY MAGAZINE

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AUSTRALIAN & NZ EDITION ISSUE #2, WINTER 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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Australia's HVAC&R sector is marked by several industry associations, all of whom represent different factions, groups and commercial interests. Yet despite their differences, where fragmentation exists but unity is sought, areas of common ground are nonetheless easy to find.

In the cover story of *Accelerate Australia & NZ* ([see full story on p. 34](#)), we talk to Australia's leading associations about their efforts to tackle the natural refrigerant training gap, licensing and regulation, and to produce a new generation of future-proofed technicians to replace an ageing one.

In the US, the Environmental Protection Agency has been effective in regulating refrigerant leaks and delisting high-GWP refrigerants in many applications (just like in Europe), while Japan's subsidy scheme has been hugely supportive of natural refrigerant technology.

While Australia's new HFC phase-down of 85% by 2036 is a step in the right direction ([p. 68](#)), at this stage, the review board has elected not to take industry advice and adopt a nationally consistent skills-based licensing scheme.

Can Australia learn from New Zealand's voluntary licensing scheme – an industry-led initiative in response to training and safety concerns, which has engaged the new market and incorporated natural refrigerants?

And what does the unity and collaboration created by the integration of two of New Zealand's leading industry bodies – the Institute of Refrigeration Heating & Air Conditioning Engineers New Zealand (IRHACE) and the Climate Control Companies Association (CCCA) – say about the state of affairs in Australia?

The number of global manufacturers presenting themselves to the market and strong messaging from leading local end users towards adopting platforms for natural refrigerant technology at ATMOSphere Australia, will surely have lit the touch paper for the rest of the industry.

New Zealand retailer Foodstuffs has proven a peerless leader in Australasia when it comes to CO₂ transcritical technology ([p. 44](#)).

The company's North Island Refrigeration Specialist Sean Davel describes how the company has harnessed supplier competition to complete 18 commercial transcritical installations; more than Australia, China and South America combined.

In the eastern suburbs of Melbourne, Box Hill TAFE's state-of-the-art Climate Control Centre of Excellence (RCCC) is helping arm the next generation of technicians with natural refrigerant knowhow, with senior lecturer Len Raines central to those plans ([p. 50](#)).

The training dimension is indeed in need of an overhaul to incorporate natural refrigerants into more tertiary packages nationwide. Bitzer Australia is one OEM intent on aiding that transition. *Accelerate Australia & NZ* sat down with the company's managing director, Peter Gibson, to talk about their R&D facility in Sydney and building relationships and trust with the market ([p. 64](#)).

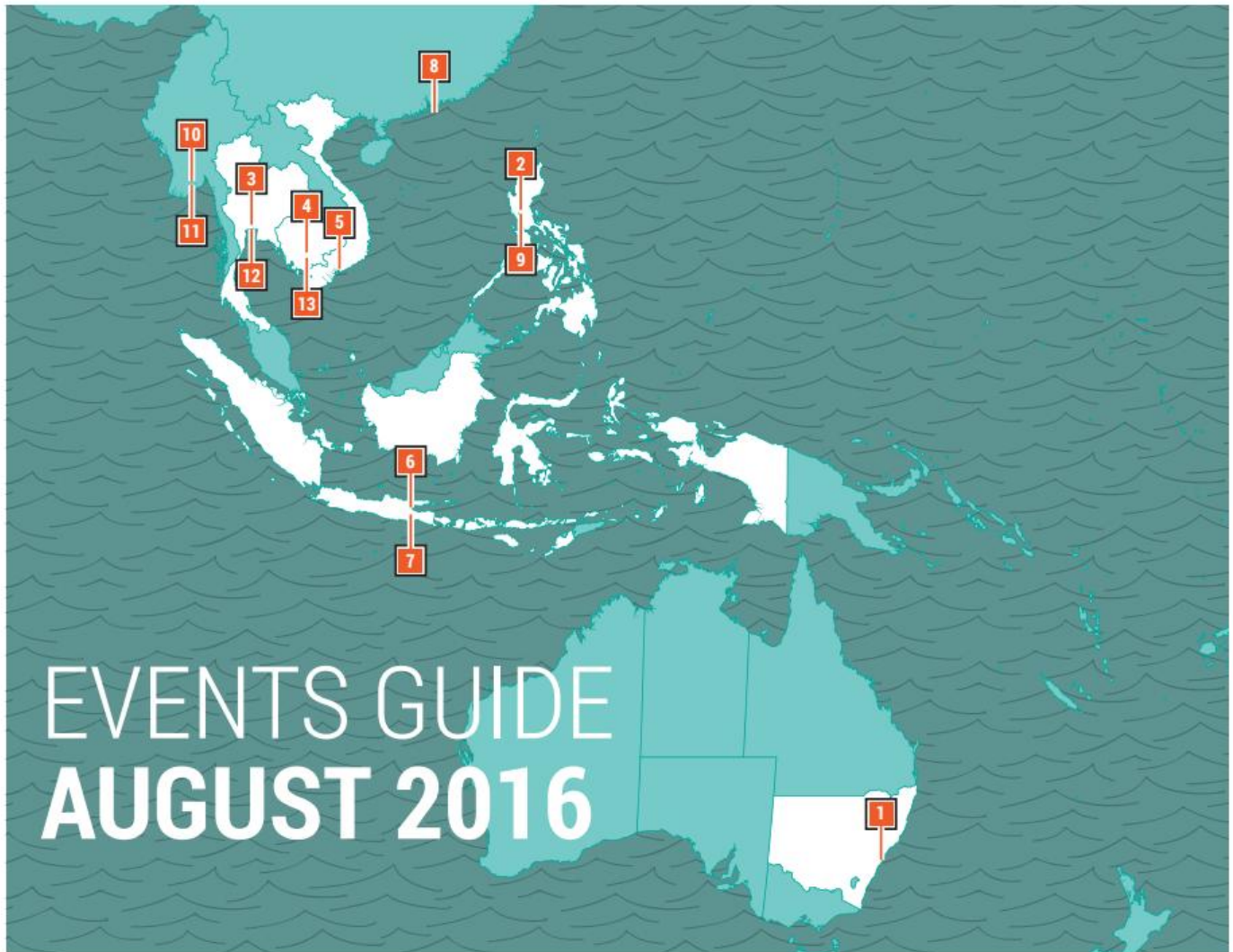
The stakes have been raised, but only a truly united industry can raise standards.



EVENTS GUIDE

JULY 2016

- | | |
|--|---|
| <p>1 July 2-3, Auckland, New Zealand
Ecobuild Expo
http://www.organicexpo.co.nz/ecobuild/</p> <p>2 July 6-8, Bangkok, Thailand
Asia Cold Chain Show (ACCS)
http://www.asiacoldchainshow.com/
twitter: #ColdChain @AsiaColdChain</p> <p>3 July 6-8, Bangkok, Thailand
ASIA WAREHOUSING SHOW 2016
http://asiawarehousingshow.com/
twitter: #AsiaWarehousing @AsiaWarehousing</p> <p>4 July 10-14, Singapore, Singapore
World Cities Summit
http://www.worldcityssummit.com.sg/
twitter: @WCS_16</p> <p>5 July 10-14, Singapore, Singapore
CleanEnviro Summit Singapore
http://www.cleanenviros Summit.sg/
twitter: #CESS2016 @CESSsingapore</p> <p>6 July 12-14, Melbourne, Australia
CeMAT Australia
http://www.cemat.com.au/
twitter: #CeMATAus @CeMATAus</p> | <p>7 July 12-14, Yangon, Myanmar (Burma)
Myanmar International Food Tech Industry Exhibition
http://10times.com/myanmar-food-tech</p> <p>8 July 20-22, Surabaya, Indonesia
Indo Renergy 2016 Expo & Forum
http://www.indorenergy.com/
twitter: #expoindonesia @IndoRenergy</p> <p>9 July 20-23, Ho Chi Minh City, Vietnam
ENERTEC EXPO 2016
http://vietnam-ete.com/enertec-expo.html</p> <p>10 July 21-22, Singapore, Singapore
12th Data Center Summit
http://www.questevent.com/DCS/2015sg/</p> <p>11 July 27-28, Sydney, Australia
Australian Clean Energy Summit 2016
http://www.cleanenergysummit.com.au/
twitter: #ACES2016 @cleannrgsummit</p> <p>12 July 24-28, Adelaide, Australia
Australian Wine Industry Technical Conference (AWITC)
http://www.awitc.com.au/
twitter: #AWITCSocial #16AWITC @The_AWITC</p> |
|--|---|



1

August 2, Sydney, Australia
**HVAC&R Leadership Awards Industry Breakfast
 and Innovation Forum**
<http://www.climatecontrolnews.com.au/live>

2

August 3-6, Manila, Philippines
WOFEX 2016
<http://www.wofex.com/>

3

August 4-7, Bangkok, Thailand
ASEAN Retail
<http://www.aseanretailshow.com/>
 twitter: @BITEC

4

August 8-9, Phnom Penh, Cambodia
Aqua Fisheries Cambodia Expo 2016
<http://www.veas.com.vn/index/articles/mod/27/cid/356/lang/en/id/757>

5

August 10-13, Ho Chi Minh City, Vietnam
Vietfood & Beverage
<http://hcm.foodexvietnam.com/en>

6

August 11-14, Surabaya, Indonesia
East Food Indonesia 2016
<http://eastfoodindonesia.com/>
 twitter: #EASTFOOD2016 @KristaExhibit

7

August 11-14, Surabaya, Indonesia
Eastpack Indonesia Expo
<http://eastpackindonesia.com/>

8

August 11-15, Hong Kong
Food Expo Hong Kong
<http://www.hktdc.com/fair/hkfoodexpo-en/HKTDC-Food-Expo.html>

9

August 18-19, Manila, Philippines
Transport and Logistics Philippines
<http://www.globallinkmp.com/transportandlogistics/>

10

August 18-20, Yangon, Myanmar
Myanmar FoodBev
<http://www.myanmarfoodbev.com/>

11

August 18-20, Yangon, Myanmar
Myanmar Retail Expo
<http://www.myanmarretailexpo.com/>

12

August 25-27, Bangkok, Thailand
RetailEX ASEAN 2016
<http://retailexasean.com/>

13

August 26-29, Phnom Penh, Cambodia
Cambo Foodtech
<http://10times.com/cambo-foodtech-expo>



1

September 1-2, Brisbane, Australia
Queensland Supply Chain and Logistics Conference
<http://qldsc.com/>

2

September 6-7, Manila, Philippines
Retail World Philippines 2016
<http://www.terrapinn.com/conference/retail-world-philippines/index.stm>

3

September 6-8, Wanchai, Hong Kong
Seafood Expo Asia
<http://www.seafoodexpo.com/asia/>
 twitter: #seasia16 @SeafoodExpoAsia

4

September 6-8, Kuala Lumpur, Malaysia
International Conference on Green Computing, Technology and Innovation (ICGCTI2016)
<http://sdiwc.net/conferences/icgcti2016/>

5

September 7, Hong Kong
Cool Logistics Asia 2016
<http://coollogisticsresources.com/asia/>
 twitter: @coollogistics

6

September 7-8, Brisbane, Australia
The Future of HVAC 2016 Conference
http://www.airah.org.au/iMIS15_Prod/AIRAH/Events2/AIRAH_Conferences/AIRAH/Navigation/Events2/

7

September 7-9, Hong Kong
ASIA Fruit Logistica
<http://www.asiafruitlogistica.com/>
 twitter: @ASIA_FRUIT

8

September 7-9, Singapore, Singapore
Mostra Convegno Expocomfort Asia
<http://www.mcxpocomfort-asia.com/>

9

September 7-9, Singapore, Singapore
BEX Asia
<http://www.bex-asia.com/>

10

September 7-9, Singapore, Singapore
International Green Building Conference 2016 (IGBC)
<https://www.bca.gov.sg/events/sgbw/en.html>
 twitter: #SIALASEAN2016 @SIALASEAN

11

September 7-11, Auckland, New Zealand
Auckland Home Show
<http://www.aucklandhomeshow.co.nz/>

12

September 08-10, Phnom Penh, Cambodia
CIVAR'16
<http://www.expocambodia.com/civar16/index.html>

13

September 09-11, Brisbane, Australia
Brisbane Home Show
<http://www.brisbanehomeshow.com.au/>

14

September 12-15, Melbourne, Australia
Fine Food Australia
<http://finefoodaustralia.com.au/>
 twitter: @FineFoodExpo

15

September 19-20, Kuala Lumpur, Malaysia
BIGIT Technology Show
<http://bigittechnology.com/malaysia2016/>
 twitter: #BIGITMY2016 @BIGITTechnology

16

September 28-30, Jakarta, Indonesia
Refrigeration & HVAC Indonesia 2016
<http://www.refrigeration-hvacindonesia.com/>

17

September 28-30, Jakarta, Indonesia
International Indonesia Seafood & Meat Expo 2016 (IISM)
<http://www.iism-expo.com/>

Part of our Natural Refrigerant Range of Products.

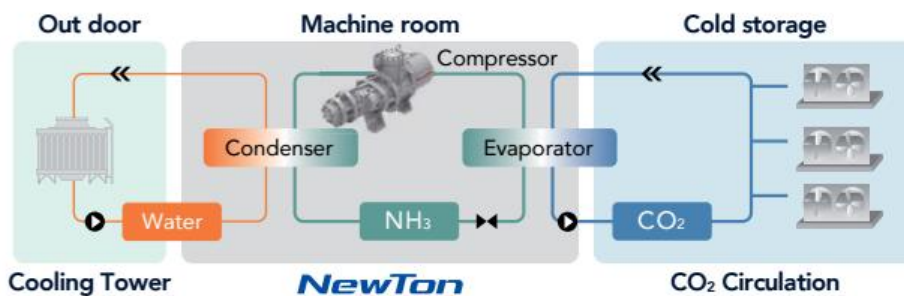
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SHORT TAKES

— By James Ranson & Andrew Williams

ADVANSOR CELEBRATES, CONTINUES MOVE SOUTH

To mark its 10th anniversary in 2016, Danish company Advansor is showing how CO₂ transcritical technology can be rolled out across the world in all climates.

A central pillar of Managing Director Kim G. Christensen's vision was the decision to focus only on CO₂ when the company was founded in 2006. "The whole organisation is only thinking about one thing – and that's doing the best transcritical rack," he explained.

A leading manufacturer of refrigeration technology for supermarkets, food processing, air conditioning and industrial refrigeration, Advansor has sold over 2,100 transcritical units globally.

In more recent times the company has taken the technology to the south of Europe, has installed four units in Brazil, and is looking squarely at Australia and New Zealand to introduce its technology.

While innovations like ejectors, parallel compression, sub-coolers and de-superheaters will inevitably complete some part of the puzzle in regions where system performance is challenged by higher ambient temperatures, Christensen warned that overcomplicating systems with such technology could be detrimental to their long-term success.

"When we sell these ejectors, for example, we have to make sure that the Spanish refrigeration technician, who may not speak English and doesn't necessarily know much about these ejectors, is able to service that system on a Saturday night," he said.

"We can do systems in Spain and Portugal now – even without ejectors – which are competitive with HFC systems. We shouldn't be afraid of selling transcritical CO₂ systems in these countries, because we're already there with that technology."

✪ JR & AW



PRIME BUS ROLLING

The Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH) has approved funding to establish a secretariat for PRIME, an industry-wide initiative to transition Australia's HVAC&R industry to a 'low emissions future'.

The secretariat will outline what needs to be achieved over the coming months before AIRAH approaches industry for funding to begin a series of projects.

With 2,500 members, AIRAH has identified nine priority projects that require funding and will now work to secure support for PRIME from the 170,000 people working in the HVAC&R sector.

"We focus on the whole industry, we don't just focus on the trade or engineer sector, we don't just focus on HVAC or refrigeration, we're engaging with the whole industry including the supply chain, so we sit at a lot of tables," Phil Wilkinson, AIRAH executive manager for government relations, told the ATMOSphere Australia conference in May.

PRIME aims to mobilise the industry via five main pathways:

Professionalism, Regulation, Information, Measurement and Emissions Abatement.

This includes improved industry collaboration and investment in focus areas like training and education to upskill the HVAC&R workforce in flammable refrigerants, licensing and registration, and maintenance for energy efficiency.

PRIME will also include a strong focus on natural refrigerants pushing for standardised licensing, Total Equivalent Warming Impact (TEWI) awareness raising and research into new technology, as well as information dissemination via companies like shecco.

The 2016 edition is the second iteration of the PRIME initiative, which stalled in 2014 due to a lack of funding. ✪ JR



ARNEG FITS ITALY'S LARGEST HYPERMARKET WITH CO₂

In April 2016, the largest hypermarket in Italy opened its doors in Milan with a brand new CO₂ transcritical refrigeration system fitted with ejector technology.

Italian supermarket giant Iper trusted Italian firm Arneg with the turnkey refrigeration solution for its brand new 10,000m² hypermarket, featuring components from LU-VE, Dorin and Danfoss, who helped with the system design, testing of packs and commissioning.

The system enhances efficiency in temperatures of up to 38°C, further demonstrating that CO₂ refrigeration is advancing across southern Europe as an efficient and viable solution.

Using similar installations with heat recovery, intelligent control and ejector technology as a guide, early estimates point to energy savings of up to 50% compared to conventional installations.

"Electricity for refrigeration makes up 50% of the total energy consumption of the hypermarket, and our customer Iper has an

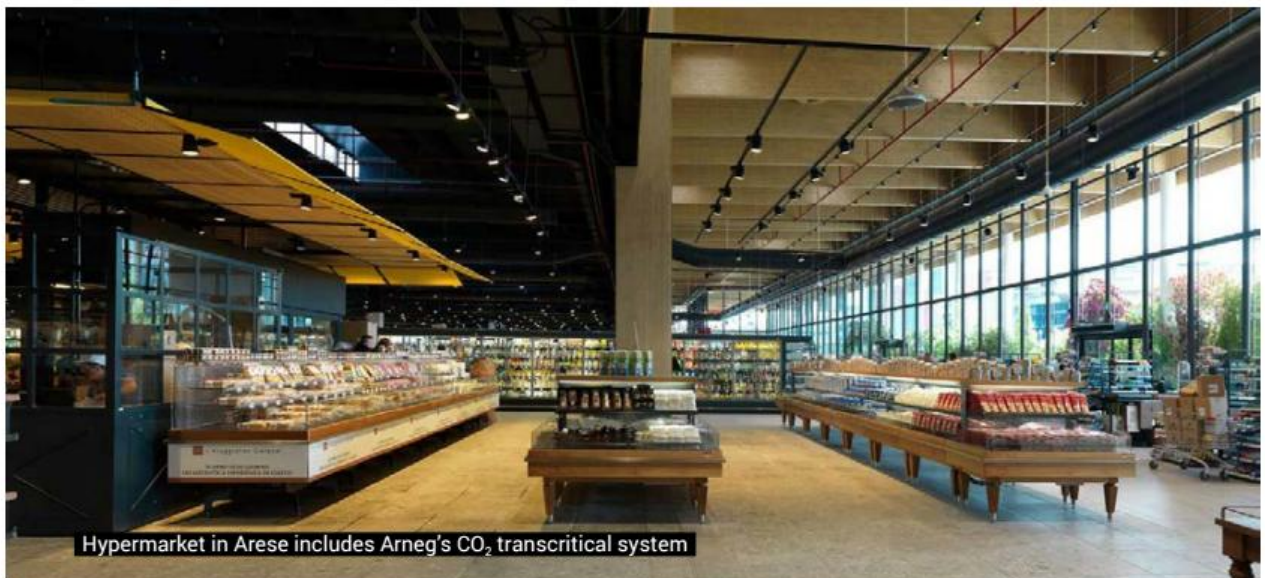
ambition to cut down this consumption year by year as part of their sustainability programme," said Arneg's Technical Support Manager Enrico Zambotto.

"In order to fulfill these goals, we proposed a transcritical CO₂ solution. It is a large installation with several hundred cabinets and cold rooms," Zambotto added.

The Iper hypermarket is part of the new Arese shopping centre, which is the largest shopping centre in Italy and one of the largest in Europe.

The Iper hypermarket is one of the first stores to implement new ejector technology from Arneg into a transcritical refrigeration system. Convinced by the results of numerous tests in recent years, Arneg chose the new ejector technology to enhance the hypermarket's energy efficiency.

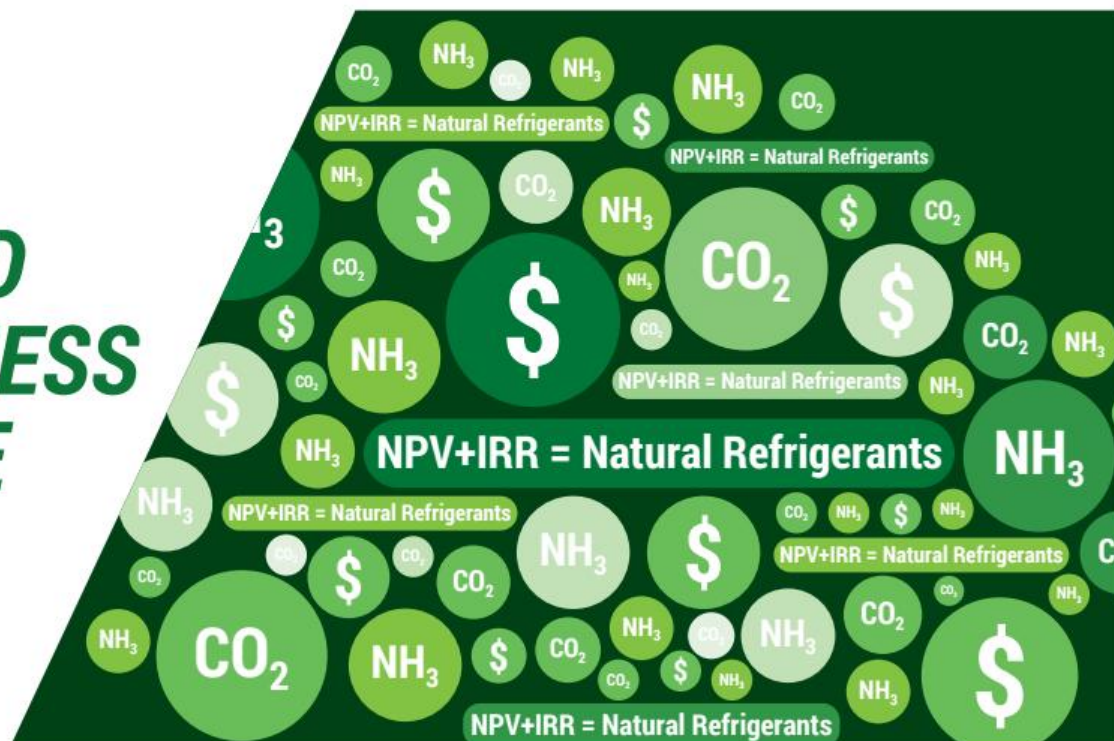
Arneg is active in New Zealand and Australia, where temperatures can exceed 40°C. **© JR & AW**



Hypermarket in Arese includes Arneg's CO₂ transcritical system

SOUND BUSINESS SENSE

– By Julian Hudson



In June, the Australian Government committed to implementing cost-effective measures to reduce HFC emissions by 85% by 2036, at last putting Australia on a level footing with other global leaders serious about tackling HFC emissions. On the face of it this is a positive move forward and a clear indication to industry - and in particular end users - of the choices that should be made when choosing new systems or upgrading existing refrigeration plants and equipment.

However, although the HFC phase-down presents the industry with some much needed clarity, if Australia is to transition to natural refrigerants without outright bans on HFCs as in Europe's legislation, then we have to be more professional in the way we conduct business. This will require industry, and in particular contractors, to take more responsibility and become savvier in their knowledge of the type of solutions available to end users, and more importantly, the business case for these solutions.

I firmly believe that the phase-out of HFCs will have the biggest impact on the heavy commercial/light industrial sector, where systems using 50 kg to over 1000 kg of synthetic refrigerant per system are widespread. Adding to this belief is the fact that such systems are not easily retrofitted when using large quantities of A2L hydrofluoroolefins (HFO) refrigerants.

This will undoubtedly provide significant opportunities for natural refrigerant solutions like CO_2 , hydrocarbons and ammonia.

Industrial contractors often don't deal in the heavy commercial/light industrial sector. However, the regulatory changes will affect business and present savvy contractors with a good opportunity to move into this sector with ammonia (NH_3). That said, you can't simply take large-scale NH_3 systems and scale them down, regardless of the energy efficiency, as their higher initial capital cost does not represent a good Internal Rate of Return (IRR) and there are related OH&S issues.

What this means is that NH_3 systems must be scaled down and 'commercialised' by combining CO_2 and ammonia in a cascade solution. These systems offer excellent efficiencies and substantially reduced installation costs, thus providing end users with a very attractive IRR, while in turn lowering the ammonia charge by restricting the system to the plantroom area. This reduces the number of OH&S compliance issues that must be adhered to.

Typically, end users of refrigeration, and in particular small to medium enterprises, care little about what refrigerant flows through their system and the environmental impact, but care acutely about their margins. It is therefore imperative when offering alternative natural refrigerant solutions to end users that rather than making unsubstantiated claims about system efficiencies and payback, that a full business case analysis is presented for each option, outlining the Net Present Value (NPV) and the IRR.

We will now see another wave of synthetic refrigerants phased out in Australia. End users must look longer term, satisfied in the knowledge that even though a natural refrigerant solution may cost more in initial capital expenditure, a bank loan at 5% interest will be easily compensated by a natural refrigerant solution with an IRR of around 20%. It's a no brainer.

By adopting the approaches highlighted and bringing contractors into the discussion it will be possible for our industry to move forward to a more settled, sustainable future. The benefits of transitioning to natural refrigerants make sound business sense. **JH**

Julian Hudson is Director/Principal at JCH Refrigeration Consulting and has over 30 years' experience in the refrigeration industry specialising in CO_2 , ammonia and thermal energy storage plant design and specification.

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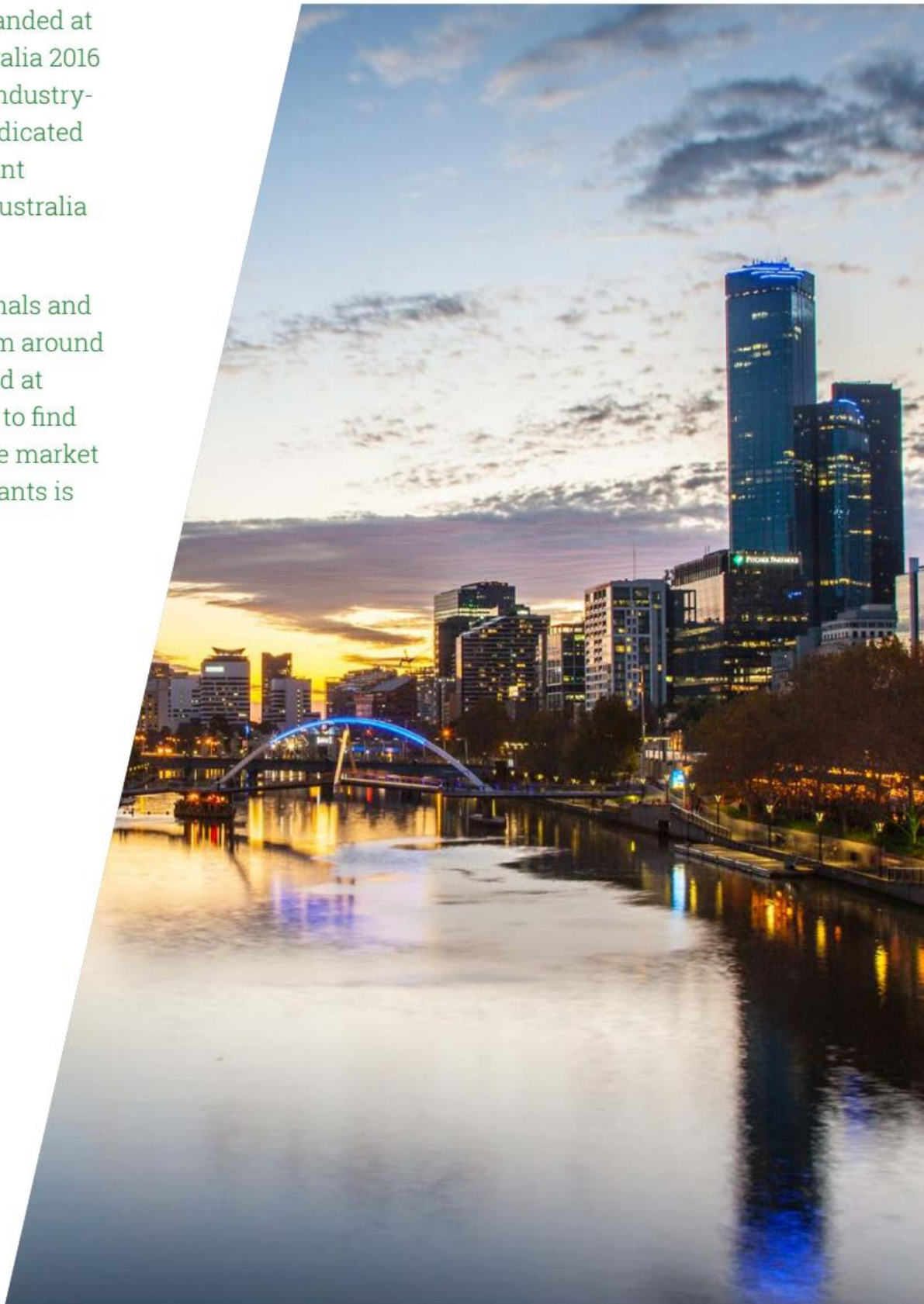
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ATMOsphere AUSTRALIA 2016

The shecco team landed at ATMOsphere Australia 2016 on 16 May for the industry-first conference dedicated to natural refrigerant developments in Australia and New Zealand.

Over 190 professionals and 102 companies from around the globe converged at Rydges Melbourne to find out exactly how the market for natural refrigerants is shaping up.





ATMO
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AUSTRALIA
business case
natural refrigerants
16 May, 2016 — Melbourne





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solutions for australia

natural refrigerants

ATMOsphere AUSTRALIA 2016

30

PRESENTATIONS



102



ORGANISATIONS

191



DELEGATES



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END USER

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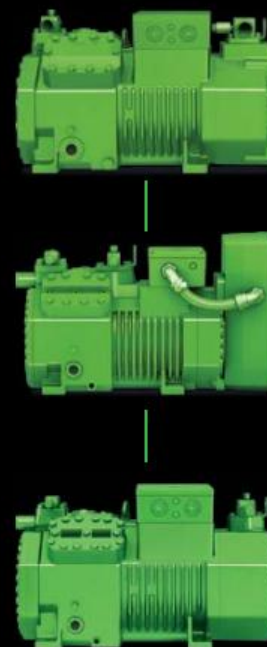
INDUSTRIAL CASE STUDIES

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CHALLENGING REFRIGERANT CHOICE EASY CAPITAL SOLUTION

PHASE-DOWN



BITZER BACKS UP PRODUCT DEVELOPMENT WITH AN ARRAY OF TECHNICAL DOCUMENTATION



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In 2013 the HCFC phase down started in Asia. In 2015 the HFC phase down started in Europe. The EPA proposal to ban HFC's in certain applications from 2016 in the USA is set. Therefore alternatives for R22 / R404A in new systems are needed. Different solutions are available depending on the application. No single solution for all countries and applications is available. Therefore BITZER offers an extended product range for compressors, systems and heat exchangers for many varying refrigerants. BITZER is constantly developing new, innovative component and system solutions. BITZER maintains development with the following key points; Energy efficiency of new solutions, Technical and commercial feasibility.

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THE HEART OF FRESHNESS



BOUNDLESS POSSIBILITIES FOR NATURAL REFRIGERANTS

Participants in the first ever ATMOsphere Australia expressed hope and confidence in the potential and opportunities for natural refrigerant technologies in the region.

– By James Ranson

“What we’re excited to see is the number of international players entering the market, not just Heatcraft and Bitzer but also Advansor and SCM Frigo.” – Stuart Saville, Coles.

Vith close to 200 delegates walking through the doors at Rydges Melbourne on 16 May – many of whom arrived well before the jangling of the first bell – it was clear that the industry is prepared, and more importantly willing, to mobilise as one.

The ATMOSphere team was absolutely delighted to welcome such a high number of key industry figures and stakeholders to its first event in the southern hemisphere, with the final figure far exceeding initial expectations.

ATMOSphere Australia broke away from the series’ proven record in Europe, Japan and the US, setting the stage for some robust discussion on the unique industry and market opportunities for natural refrigerants in Australia.

Attendees listened in to over 30 international presentations – from Australia and New Zealand, Belgium, Denmark, Italy, Japan, South Africa, the UK and the US – on a diverse range of topics including policy measures, market trends, technology, safety standards and training.

CHARTING A PATH FOR AUSTRALIA

The key presentation in the policy session came from Patrick McLnerney of the Australian Department of Environment. Industry had been eagerly awaiting the outcome of the Federal Government’s Ozone Protection and Synthetic Greenhouse Gas Management programme (OPSGGM).

In August 2015 the Australian government outlined a proposal for an emissions reduction target of 26-28% (compared to 2005 levels) by 2030 and an 85% phase-down of HFCs by 2036. The OPSGGM received 57 submissions with strong support for the national phase-down on HFC imports, the option ultimately selected in the outcome review released on 27 June. All legislative measures will enter into force by January 2018 ([see full story p. 68](#)).

Consensus from a live poll at ATMOSphere Australia indicated industry favoured “bans on the use of HFCs (above a certain GWP) in new equipment for specified sectors” (47%) – a measure adopted in California – over the 85% HFC phase-down (36%).

The OPSGGM outcome document does “[enable] provisions for future bans on the import of new equipment containing high global warming potential HFCs... [as well as] domestic and automotive air conditioners containing high global warming potential HFCs...”

continued on p.24 →

Which measure would be the most effective in driving the uptake of natural refrigerants in Australia?

107

Bans on use of HFCs (above a certain GWP) in new equipment for specified sectors

47%

Phase down of HFCs by 85% by 2036

36%

Bans on use of specific high GWP HFCs

14%

Maintenance & leak testing requirements

3%



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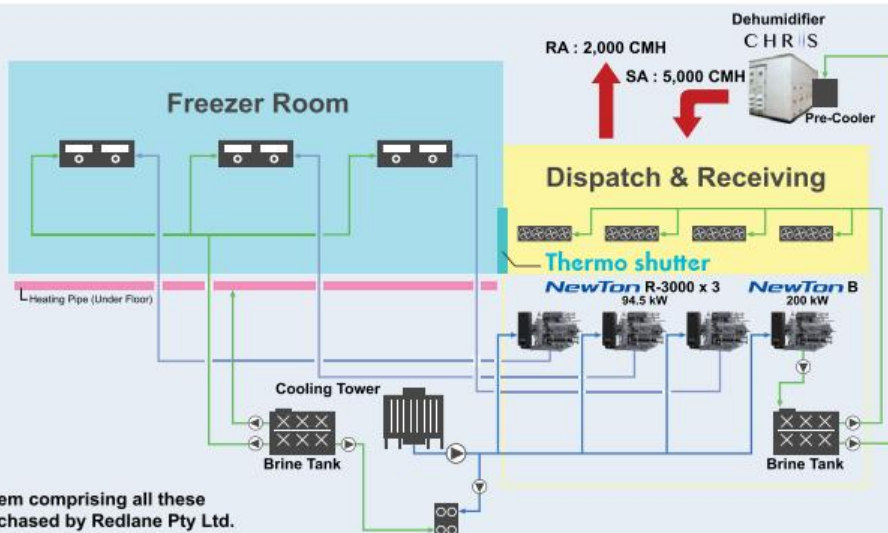
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Scantec Managing Director Stefan Jensen challenged the Australian government and Environment Minister Greg Hunt to implement a ban on all HFCs in new systems with a charge exceeding 5kg by 2025; legislation that Denmark proposed in the nineties and implemented within a decade (2007). But other participants expressed concern over his proposal, arguing that there are an inadequate number of trained technicians in Australia.

shecco's Deputy Manager for Market Development Klára Skačánová cited the California Air Resources Board's (CARB) aggressive stance of phasing out HFCs with GWPs higher than 150 in specified equipment and applications as a world-leading example for Australia to follow. California's strategy includes financial incentives for end users through a US \$20 million (AUD \$27 million) fund proposed under Governor Jerry Brown's budget.

So what does this all amount to? "Basically times are getting tougher for high-GWP HFCs, and that's going to create huge opportunities for natural refrigerants," said shecco Managing Director Marc Chasserot. "There's a tendency to think that Australia is not selling itself enough, but in fact there are many fine examples in the room. Australia can lead the world in natural refrigerants," he said.

A MATURING MARKET

The market trends session revealed quite clearly the plethora of opportunities available for tried-and-tested systems from Asian, European and US manufacturers looking to enter the market. Warm climate variants of transcritical systems with ejectors, CO₂ heat pumps and cascade NH₃/CO₂ solutions were among the solutions that had domestic delegates listening intently.

Bitzer, Advansor, Heatcraft, Mayekawa and Mitsubishi Heavy Industries are just some of the global manufacturers already making moves in the region.



Klaas Visser, KAV Consulting, asks the probing questions



Ian Tuena, C.A Group Services

Peter Bao, a team leader and project engineer at Denmark-based Advansor, is very familiar with Bitzer's CO₂ compressors having used hundreds of them in Advansor's 750 transcritical installations worldwide.

Advansor recently delivered four transcritical booster systems with parallel compression to Brazil and is eager to deliver a similar solution to the Australian market. Bao displayed a projected energy consumption chart for Melbourne, with its CO₂ booster including parallel compression revealing a 10% drop compared to a synthetic-based R404A system.

Robert DelVentura, Vice-President Global Innovations at Heatcraft Worldwide Refrigeration, echoed moves from Advansor. "In Australia we're looking for installations with ejectors and parallel compression and we're hoping to have some projects confirmed in the third quarter of 2016," DelVentura said.

Heatcraft's Australian division has a strong customer base in the region, and launched its first transcritical rack for warm ambients the following day at the Air conditioning, Refrigeration and Building Services exhibition (ARBS) 2016 in Melbourne.

Similar market shifts are occurring in South Africa, where Commercial Refrigeration Services (CRS) has installed 52 of its CO₂ transcritical units despite the country's only relevant regulation pertaining to the phase-out of HCFC R22 as of 2015.

Similar to Australia, demand for the company's CO₂ transcritical booster systems (designed for high ambient temperatures), heat pumps and chillers resulted from competition between end users. "[It was] driven by [South African food retailer] Woolworths, and Makro followed [...] from a contractor's point of view they try to keep up with what is happening; they are aware of future limits on f-gases," argued CRS' Head of Engineering Wynand Groenewald. The booster systems CRS has fitted with parallel compression are 10-15% more efficient than a regular booster system. With an ejector that can be raised a further 7%, with a payback period of between 2-4 years.

In 2016 CRS opened the first CO₂ training academy in Africa (Johannesburg, South Africa) to help train contractors and end users so that they do not have to travel to Europe to get hands-on experience with CO₂.

continued on p.26

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Patrick McNerney, Australian Department of Environment; and Klára Skačánová, shecco

→ Platinum sponsor Bitzer Australia delivered a strong opening message to the room, with Engineering Manager Ian Suffield declaring: "Think future and invest in long-term solutions. It would be a great shame if [end users] spent millions of dollars on a system that might be superseded overnight."

Bitzer offers the full array of ammonia and CO₂ compressor solutions with its semi-hermetic reciprocating compressors using hydrocarbon refrigerants able to be applied to chillers, water-loop systems and air conditioning applications. Bitzer's are the only ASERCOM-certified hydrocarbon compressors currently on the market.

END USERS SETTING STAGE

End users were delighted to finally have the platform to openly discuss natural refrigerant solutions and barriers across all aspects of the industry. Key commercial players like Coles and Woolworths, and Countdown and Foodstuffs in New Zealand, will continue to set the agenda and be an example to follow. There was consensus that there is no time to wait for government to implement regulation or provide subsidies.

"We're not in a position to be able to wait," said Coles' National Engineering Refrigeration Manager Stuart Saville. "We've got new stores that need building and old stores that need retrofitting."

"We have no f-gas legislation in Australia at this stage but make no mistake, we will be feeling the effects of EU f-gas legislation in the future. What we're excited to see is the number of international players entering the market, not just Heatcraft but also companies like Advansor, Bitzer and SCM Frigo."

As in Europe, CO₂ will undoubtedly have a significant impact on the food retail sector. In fact it already has, with over 300 CO₂ cascade systems in operation in Australia and New Zealand. All major retailers are installing or investigating transcritical CO₂ as the future-proof solution for food retail,

while hydrocarbon showcases and water-loop systems are also making a significant imprint.

New Zealand is leading the way when it comes to CO₂ transcritical, with the Foodstuffs Group completing 19 installations (14 on the North Island, and five on the South Island) and Countdown, a subsidiary of Woolworths Limited, opening its first transcritical store at Cable Car Lane in Wellington in March 2016.

Countdown's Greg Lewis, who will oversee the company's transition having committed to another four transcritical stores, described it as a "very exciting time for the industry". Swedish manufacturer Green & Cool supplied the rack at Cable Car Lane and has been awarded three of the upcoming tenders. For the remaining tender, Lewis listed Bitzer, Advansor, Heatcraft, SCM Frigo and Green & Cool as potential suitors.

After delivering hundreds of cascade CO₂ systems to major retailers since 2004, Bitzer supplied Coles' first CO₂ transcritical rack at Coburg North in 2015, fitted with parallel compression, flash gas bypass and heat reclaim and supplying 100% of the store's refrigeration and air conditioning needs with CO₂.

As reported in the cover story of the first edition of *Accelerate Australia & NZ* ("The Power of Two"), the store has so far achieved a 15% energy usage reduction compared to its standard CO₂/R134a plant design. "We're pretty proud of the achievement because it was our first attempt and we've achieved these savings across the Australian summer, so with the final months of the 12-month period we're expecting closer to 20% energy savings in total," Saville said.

Woolworths' Head of Engineering Michael Englebright confirmed the company would deliver its first CO₂ transcritical booster system with parallel compression in 2016, throwing down the gauntlet to suppliers. "Once we see how the system reacts then the sky's the limit," Englebright says.

continued on p.28 →

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→ HYDROCARBON SPACE

Carter UK has supplied over 20,000 of its self-contained display cases with hydrocarbon refrigerants running on a water loop for heat rejection since 2009. In 2015, Carter partnered with Melbourne Refrigeration Services and completed its first Australian installation at Coles' Liquorland store in Coburg North.

The three plug-in showcases contain 850g R1270 (propylene) charge and use 90% less refrigerant than a standard DX system. Coles and Carter have so far experienced an 8% reduction in energy consumption and are looking to partner again.

Carter's Technical Director Ian Garvey said he didn't believe it was common knowledge in the region that AS/NZS 1677 permits a charge much higher than 150g (up to 1.5kg) when the required design processes are adhered to (i.e. removing the ignition source).

A NATURAL TO FIT ALL

The swathe of natural refrigerant solutions presented to industrial end users in the case studies session is clearly not yet fully understood by the potential customer base.

From hydrocarbon chillers, low-charge ammonia, DX ammonia, CO₂ transcritical and CO₂/NH₃ systems to water-based solutions – all are being tested and offer carbon-neutral, highly efficient investments for customers.

Hydrocarbon chillers in particular can fill a gap in Australia in small to medium-sized industrial applications, where natural refrigerant offerings are lacking.

"We're sort of being pushed in Australia to accept that [hydrocarbons] are only acceptable in systems with under 150g charge," said Ian Tuena, managing director of C.A Group Services. "But systems like chillers used in open air environments can have much larger charges. And I think small to medium air conditioning, heat pumps and medium temperature refrigeration present real areas of growth for hydrocarbons."

In New Zealand, EcoChill, which has many customers in the produce industry, retrofitted a 4,200m² kiwi fruit cold store running on R22 with an advanced propane (R290) glycol system design.

The installation has led to 36% energy savings (using R22 system as a baseline) while cooling more fruit per day. It also requires 16% less maintenance but includes a 12% premium on capital costs, an investment that will be returned to the customer within 19 months.

The conventional system uses 200-220kg of refrigerant while the hydrocarbon chiller uses just 40kg split across two circuits, significantly reducing the cost and safety burden. "I think the opportunities are there in the Australian market as well for a quality product no matter who's making it," said EcoChill Managing Director Matthew Darby. "Having the right knowledge around the safety and engineering aspects is important."

continued on p.30 →

Which technology is the future for industrial refrigeration?

101

Ammonia / CO₂

53 %

CO₂ transcritical

27 %

Low charge ammonia

13 %

Hydrocarbons

7 %

Other

0 %



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LARGE HFC SYSTEMS, LARGE BURDEN

In Australia the use of HFC systems using between 200-1,000kg of refrigerant for around 50-500kW capacities are prevalent.

In a study of HFC and natural refrigerant systems, including several cascade variants, Julian Hudson of Glacem Cooling Solutions found the HFC variants to have the lowest initial capital cost but also the lowest energy efficiencies, leading to high indirect emissions from Australia's fossil fuel-based energy grid.

In this application range, Hudson argued that CO₂/ammonia cascade systems offered the best all-round option, with less than 1% difference in energy efficiency compared to traditional ammonia systems and a very attractive internal rate of return.

Scantec Managing Director Stefan Jensen believes a lack of awareness among end users regarding the natural refrigerant options available is not helping. "I don't know that I don't know" is common," Jensen said. "We need to get [end users] away from that towards: 'I don't know'. Everything is going the way of energy efficiency. Regulators won't have the luxury of knowing what goes around in the pipes. The government will decide that you can't use a certain amount of kWh/per installation. This is a top-down approach and the way we need to go if we want to achieve a carbon-neutral economy by 2050."

Scantec's low-charge ammonia systems can reduce end users' energy consumption by up to 70% compared to standard single-stage HFC-based, air-cooled systems. One such facility reduced its energy usage from \$42,000/month to \$13,500 with a low-charge ammonia system. This amounted to annual energy cost savings of \$400,000, helping pay back the premium capital cost of \$1.9 million within five years.  JR

A TOAST TO NATURAL REFRIGERANTS

Bitzer Australia Managing Director Peter Gibson was quick to toast ATMOSphere's first successful voyage to the southern hemisphere and his company's continued leadership in Australia.

"Congratulations on organising such a wonderful event," Gibson said. "To generate such a panel of expert speakers, and an audience of such scale at the beginning of the ARBS exhibition, is a remarkable achievement. Let this event be the beginning of many to follow and let the story of natural refrigerants grow from strength to strength."

Since developing its first CO₂ cascade system in 2004, a system now installed as standard in all new or upgraded supermarkets, Bitzer has committed to training over 400 technicians studying at TAFE (Technical and Further Education) in CO₂ technology at its St. Mary's Training Centre.

Industry firsts including an ammonia/CO₂ cascade system at Coles' Ropes Crossing store; COSTCO's first CO₂ system; and Coles' first CO₂ transcritical store in Coburg North labelled 'South East Melbourne Magic' by AIRAH in 2015 are all significant milestones.

"The vision of our former CEO Mr. Peter Schäufler, who passed away suddenly last year, remains ingrained in Bitzer's culture. Mr. Schäufler firmly believed that standing still is the enemy of innovation."



Peter Gibson, MD, Bitzer Australia



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HOW MANY DETOURS TILL THE FINAL DESTINATION?

United industry can steer the future for natural refrigerants

Industry collaboration in Australia will be crucial to raising training standards, implementing a nationwide licensing scheme and providing a legitimate platform for natural refrigerants.

— By James Ranson

The sheer number of HVAC&R industry bodies in Australia makes for an interesting dynamic not seen elsewhere in the world. These associations represent the researchers, trainers, contractors, engineers, facility managers, equipment suppliers and installers, among others, based all over the country.

At ATMosphere Australia in May it was made clear that natural refrigerants are coming. Yet industry fragmentation and duplication of effort have thus far done natural refrigerants few favours.

However, despite sometimes conflicting allegiances, Australia's industry bodies share much in common: the need to raise training standards and awareness of the safe use of all refrigerants to produce a new generation of future-proof technicians; the push from some quarters for a nationwide 'trade-based' licensing scheme; the development of codes and standards to support natural refrigerants; and the collective requirement to move to a low-emissions future under the framework of new legislation in Australia to phase out HFCs by 85% by 2036 ([see story pg. 68](#)).



FINDING COMMON GROUND

While divisions can allow confusion to reign, they can also present new opportunities for collaboration — as AIRAH Executive Manager Phil Wilkinson argued at ATMosphere Australia.

"All of the associations are at a lot of different tables so there's a lot of replication of effort," he said. "What we want to do to create better collaboration and remove a lot of that duplication of effort is to have a consistent message and work on the right areas first and ensure we're listened to with credibility," Wilkinson said.



“ We must establish a national industry board, structured to ensure whole-of-industry representation and get serious government support for, and consumer education about, the benefits of the inevitable growth of natural refrigerant use across the industry in Australia.”

To that end AIRAH outlined the reincarnation of its PRIME initiative, described as ‘a vehicle developed by a coalition of stakeholders to engage the whole industry to move to a ‘low-emissions’ future’. In the days proceeding ATMosphere, AIRAH received funding to help establish a secretariat for PRIME.

In New Zealand, the CCCA represents employers within the HVAC&R industry in New Zealand, while its sister entity the IRHACE represents individuals and employees.

CCCA chair Matthew Darby has helped establish a voluntary nationwide licensing scheme in New Zealand, incorporating

natural refrigerants, to respond to training and safety concerns. He believes it is also incumbent on industry bodies in Australia to unite and drive the transition to natural refrigerants.

“It’s career-limiting to make enemies,” Darby said. “You don’t have to like everybody but as long as you’ve got a common cause it’s easy to unite people. In an industry that is suffering for numbers and struggling to upskill and attract young people to enter the trade; right now to me is where we need to be as cohesive and collaborative as possible.”

continued on p36 →

→ The Australian Refrigeration Council's (ARC) 'environmental licence' has administered some 80,000 licences to the RAC industry on behalf of the Australian government. However, the licence only regulates Ozone Depleting Substances (ODS) and Synthetic Greenhouse Gases (SGG) like HFCs, not natural refrigerants. CEO Glenn Evans said the ARC's membership base includes the key industry associations across Australia, and that the ARC undertakes compliance audits and sanctions licence holders.

However, some in the industry, including Australian Refrigeration Mechanics Association (ARMA) President Kim Limburg, Australian Refrigeration Association (ARA) President Tim Edwards, Refrigeration and Air Conditioning Contractors Association Australia (RACCA) President Kevin O'Shea, and AIRAH, have called on the government to implement a national trade-based or occupational licence that incorporates natural refrigerants.

Accelerate Australia & NZ sat down with some of Australia's other key decision-makers and industry leaders to discuss how to overcome some of the barriers for natural refrigerants including training, safety, regulation and licensing.

Accelerate Australia & NZ: Can you outline the common principles you share with other industry associations and the key areas of collaboration, as well as the barriers to overcome in order to move towards a low-carbon HVAC&R future?

Kim Limburg (ARMA): The Australian and NZ industry associations both understand the benefits to the industry and consumers of national trade-based licensing. We need to learn from Australia's mistake of introducing an environmental licence; which has significantly increased emissions and failed to raise awareness of natural refrigerants.

We must establish a national industry board, structured to ensure whole-of-industry representation, and get serious government support for – and consumer education about – the benefits of the inevitable growth of natural refrigerant use across the industry in Australia.



Kim Limburg, ARMA
Advocate for national
trade-based licensing scheme,
natural refrigerants



Tim Edwards, ARA
The ARA is establishing an Australian
chapter of the IIR; promotes natural
refrigerant training, codes and standards

The government's acceptance of ARC as a representative industry group and regulator has resulted in the over-representation of groups with commercial interests in high-GWP refrigerants, while groups that support natural and low-GWP refrigerants have predominantly been ignored. This has led to a lack of government consultation with trade-qualified tradespeople, a lack of support for innovation and failure to address grassroots industry issues such as the impact on trade-qualified technicians, and the community, of ARC's endorsement of short-cut Certificate II and III courses.

Tim Edwards (ARA): Most of the industry associations agree on the need for nationally consistent, skills-based licensing in the HVAC&R industry; as opposed to refrigerant-based licensing. This matters and is being addressed as a priority under the auspices of PRIME.

The implications are far-reaching insofar as the work being done to reestablish PRIME, supported by most of the industry, may well call for more ambitious HFC phase-down objectives, new legislation at the federal and state level to support skills-based licensing, greater emphasis on energy efficiency, and a major educational and communications program to drive change in the national interest.

One could argue that ARC is an industry association, albeit its funding is largely from the Department of the Environment. It is certainly far from clear that the ARC supports the use of natural refrigerants despite its constitution calling for guiding the industry to better performance. Nationally consistent, skills-based licensing will fundamentally change the role of the ARC.

continued on p38 →



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→ Further, it is not clear to the ARA that Refrigerants Australia, Refrigerants Reclaim Australia, AREMA or the Air Conditioning and Mechanical Contractor's Association (ACMA) support the use of natural refrigerants.

Phil Wilkinson (AIRAH): We all want the best for the industry and our members and want the industry to be visible, highly skilled and professional, safe, cost-effective and environmentally conscious.

A few key areas of collaboration needed include: the industry's push for a national licensing scheme to cover all refrigerants; ongoing training and professional development on refrigerants as regulations and technology evolve; and working towards a more visible industry – to attract better talent, funding, research and training.

Kevin O'Shea (RACCA): At RACCA Australia we have no agenda for the type of refrigerant a member uses but it is up to our association to make sure members are aware of different practices required in using these refrigerants. With this in mind, RACCA developed (with the input of other associations and experts) training manuals on natural refrigerants for the industry to use.

Matt Darby (CCCA): It became apparent to me whilst visiting Australia recently and talking with representatives of a number of the respective associations there that they too are working hard to find new ways to make the industry interesting and appealing to the next generation.

With principles based on developing the skills and professionalism of both our employers and employees to operate with both safety and the environment in mind, it's becoming evident that the transition to a low-carbon future for HVAC&R is already underway.



Kevin O'Shea, RACCA
Represents HVAC&R contractors and wants better competency-based training

HUGE TRAINING TASK

Without adequate training there can be no future for the HVAC&R industry in Australia. Edwards estimates that approximately 100,000 technicians will need to be trained in natural refrigerant and low-GWP technology to elevate the skill level of trained apprentices to ensure there is a future for the industry.

"Safety is not a distinguishing factor," Edwards said at ATMosphere Australia. "All refrigerants are dangerous if not delivered by a trained technician. We will see standards develop and we will certainly see an increased presence of codes and standards supporting natural refrigerants. Safety is about one thing, which is training engineers and electricians, but that's a huge training task that we have."

AAUNZ: What is your association's position on the inadequate level of quality training – particularly in natural refrigerant technology – and what are you putting in place to help prepare the next generation of HVAC&R technicians for the transition?

Kevin O'Shea: What RACCA sees as a drawback at the moment for the growth of ammonia, CO₂ and hydrocarbon systems is making sure all technicians are competent in the use of these refrigerants. Talking to TAFE teachers across the country, they tell me that the standard of apprentices is very poor. The industry needs to get together and start to attract a better standard of apprentice; we need to make our industry sexier to the younger age group. If you think about what we expect from our technicians, especially when it comes to diagnostic skills, for them to be very good at their job, that person needs to be very smart. Any employer will tell you that highly competent technicians are very rare.

RACCA believes in licensing for all of our industry and would like to see a national occupational licence, not just the current environmental licence under the ARC.

Phil Wilkinson: AIRAH has worked over the years to put training in place for ammonia and flammable refrigerants, and supported our TAFE sector to develop and implement training programs for all new refrigerants. A big part of this issue is that there is not a culture of re-training in Australia for those already qualified. There is no requirement to upskill. We, and the whole industry, would like to see this change. New training on natural refrigerants has been developed and is included in apprentice training packages and we would like to build on that.

Kim Limburg: ARMA's position is that the current Arctick licence scheme (ARC) only issues licences based on the qualifications received, and unfortunately these qualifications are issued by training organisations that deem these peripheral trades competent. For example, electricians or plumbers are able to complete as little as an eight-hour course to receive a refrigerant handling licence to carry out RAC works. There is no power to police this high influx of peripheral tradespeople illegally carrying out service and repairs, including works they are not technically competent to undertake.

ARMA is working in partnership under the PRIME model to establish state and federal legislation to create this national technical based licence. We are an active participant in training groups, to advise at the grassroots level what is required to create a mutual recognition for the HVAC&R and peripheral trades, to keep HVAC&R a specialised industry and ensure a higher-level qualification is issued to technicians.

We are working towards a training package that is competency-based, properly structured, and records on-the-job results and development. As a strong advocate of the inclusion of natural refrigerants, and strident capstone testing in the final term of an apprenticeship, ARMA will work to include this in the training package.



Glenn Evans, ARC
ARC has administered 80,000 licences covering ODS and GHG refrigerants



Matthew Darby, CCCA
The CCCA represents NZ's HVAC&R employers and actively supports natural refrigerants

Glenn Evans (ARC): Training is critical to ensure a skilled workforce. The quality of training is a key element, which underpins qualifications and skills. In recent times the ARC has added skills and resources in the training quality space to better address this issue and is starting to promote training courses for alternative refrigerants.

The ARC has formed a working group on training quality, which will look at a range of issues and challenges and how to address them. ARC has also been actively involved in censuring courses, which do not achieve suitable standards in partnership with the skills industry regulator Australian Skills Quality Authority.

Tim Edwards: The training and certification situation is in total disarray. Because the industry skills council has been removed it is far from clear how training is going to be structured or even delivered, or what the training requirements are specifically.

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New Zealand ETS taking hold

In 2008 the New Zealand government chose an Emissions Trading Scheme over a flat tax as the cornerstone of its environmental policy. Until recently it had proved to be “a reasonably slow moving mechanism,” according to Climate Control Companies Association chair Matthew Darby.

However, the price of New Zealand’s carbon credits (NZU) has climbed drastically in the past two years and continues to climb (from around NZ \$5 in mid-2014 to close to \$17 in mid-2016).

Under the scheme, if a wholesaler imports 1kg of HFC R404A they would have to purchase NZUs on top of the price of the refrigerant at around \$17 per unit, with the price varying based on the GWP of the refrigerant.

A recent review of the scheme by the New Zealand government will mean the removal of the ‘two-for-one-deal’ on the price of each credit (from the end of 2018), which effectively halves the trading price of NZUs.

“Given the rapid increase we have seen recently in the trading price of the carbon credits, the pressure on contractors and employers to find cost-effective and fast solutions for end users who have ignored all of the messages until now, is growing rapidly,” Darby said.

“The calculations being made on the return on investment of new HFC plants right now looks very poor. So from that point of view the ETS is having the desired effect and has created the drive for change to natural refrigerants.”

Australia flirted with the idea of an ETS under consecutive governments in 2007 and 2008 but the legislation was voted down in Parliament on two occasions, while a carbon tax introduced in 2012 was repealed in 2013.



➔ **Matt Darby:** It’s up to us as professionals to help upskill and train our industry. The CCCA continues to work very hard on building the capabilities of industry through its training company, Refrigerant Licensing New Zealand, and to provide ongoing training for Kiwi technicians that is relevant and practical.

The biggest concern we are trying to manage right now is the growing risk around flammable refrigerants, as more equipment crosses our borders pre-charged with R32 and New Zealand has no restriction on the importation and distribution of hydrocarbons.

HFC PHASE-DOWN A STEP IN THE RIGHT DIRECTION

Announced in late June, Australia’s HFC phase-down will provide certainty to industry and a clear caveat to transition to natural refrigerants. The government has included provisions for future bans on new equipment containing high-GWP HFCs, including domestic and automotive air conditioners.

Greater engagement between local, state and federal government, and everyone representing the industry, will be needed to pave a clear path forward.

AAUNZ: Which policy option under (or outside) the OPSGGMA do you believe would be the most significant driver for the industry to switch to natural refrigerant technology and why?

Kim Limburg: Global trends are the most significant driver for the industry and following COP21 in Paris, Australia will need to commit to significant improvements in energy productivity and emissions reduction, reduce the use of high-GWP HFCs, and include provisions for natural refrigerants and low-GWP refrigerants in the OPSGGMA. This will drive new technology and provide a path for current and future HVAC&R tradespeople to be upskilled with appropriate technology.

Tim Edwards: We have provided the Department of the Environment with clear guidance in this regard. The first answer is that the legislation that pertains to the HVAC&R industry should embrace all refrigerants. The Montreal Protocol amendments will call for this and will call for energy efficiency. This enables the OPSGGM to incorporate these considerations such that it is not handcuffed by dealing only with ozone-depleting, synthetic refrigerants.

In addition we need federal legislation that calls for a progressive phase-out of the use of high-GWP refrigerants. This legislation needs to specify the charge size limitations in the use of various refrigerants such that the use of high-GWP refrigerants limited to low-charge volumes determined by GWP and maintenance. Leak checking etc. is a requirement. The EU legislation provides a good model.

Glenn Evans: In Australia we have not witnessed the urgency to move to natural refrigerants that is prevalent elsewhere in the world. Australia has regulated CFCs, HCFCs and HFCs for over 10 years. It is unlawful to emit, so we do not have the detrimental environmental footprint of other nations.

REFRIGERANTS AUSTRALIA WORKING GROUP

Speaking at ATMOSphere Australia in May, the executive director of Refrigerants Australia, Greg Picker, outlined plans to aid the transition to natural refrigerants with a working group to investigate the associated policy and technical barriers.

Refrigerants Australia describes itself as “refrigerant agnostic” and represents, among others, refrigerant suppliers, wholesalers and contractors, while the Air Conditioning and Refrigeration Equipment Manufacturers Association of Australia (AREMA), which Picker also represents, works on behalf of the equipment manufacturers and importers.

“What we’re [Refrigerants Australia] trying to do is to resolve the key issues so that natural refrigerants can have the full range of opportunities they deserve to have,” he said. “There are a few barriers in the way of the greater adoption of natural refrigerants in Australia: technician training, concerns around tradespeople using equipment not as designed.”



Greg Picker,
Refrigerants Australia
and AREMA, which
represents refrigerant
suppliers, equipment
manufacturers
and importers

AAUNZ: Natural refrigerants will no doubt play an integral role in Australia and New Zealand in the coming years – what is your association doing concretely to raise awareness and share knowledge about natural refrigerants, and to this end, what are your priority areas over the next year to help achieve this?

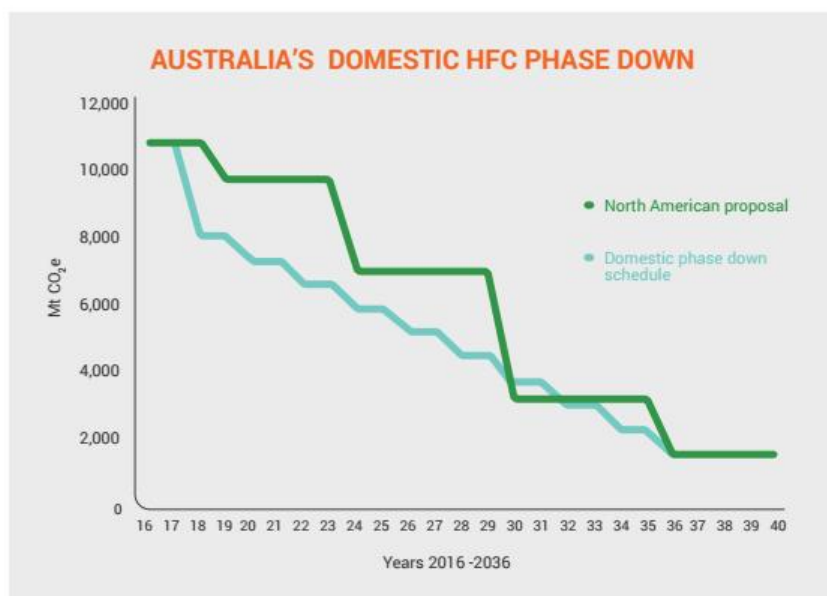
Phil Wilkinson: For the past 15 years AIRAH has been delivering training on ammonia plants for safe operation and emergency response and published an ammonia code of practice. AIRAH has worked closely with industry and government to develop a safety guide for flammable refrigerants, and has produced factsheets and case studies on all refrigerants including natural refrigerants.

More recently, AIRAH has supported the development of PRIME, which will be a major focus for AIRAH in the coming years. All of the industry-sourced solutions have been allocated into one of PRIME’s five pathways to transition: professionalism, regulation, information, measurement, and emission abatement.

Kim Limburg: We are committed to communicating and raising awareness of the benefits of natural refrigerants with grassroots members through ARMA’s online forum, newsletters and national network as well as strengthening relationships with industry associations across Australia and New Zealand.

Over the next year, we will continue to lobby all levels of government to recognise the RAC trade as a specialised and professional industry, and improve actions and messaging around Australia’s phase-down of HFC refrigerants.

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→ **Glenn Evans:** Natural refrigerants like all refrigerants have their own advantages and challenges. As technology using natural refrigerants continues to emerge it is critical for technicians to receive appropriate training to install and service. If not it will impede the uptake of new technologies.

Tim Edwards: The ARA is run specifically for the purpose of representing and promoting the use of natural refrigerants. We communicate broadly. We participate in a wide range of policy initiatives and industry collaboration.

Our priorities going forward are to: establish far greater natural refrigerant awareness and training/education programs; help shape the OPSGGM such that it serves to reduce HVAC&R emissions in part by enabling and encouraging the use of natural refrigerants while not being constrained to the licensing of synthetic refrigerant use; all levels of government to promote natural refrigerants and direct their procurement authorities to buy natural refrigerant-based technology; improve the industry standards to enable rather than impede the use of natural refrigerants; and establish a chapter of the International Institute of Ammonia Refrigeration (IIAR) in Australia and promote their standards and codes of practices across all natural refrigerants.

Kevin O'Shea: RACCA has been heavily involved in developing natural refrigerant training manuals and assisting TAFE colleges to upskill technicians, particularly in regional centres. Our manuals cover commercial and industrial systems and heat pumps using R744 as well safety awareness, installation commission service and repair and the legal requirements for both CO₂ and hydrocarbon refrigerants.

RACCA's 'taking natural refrigerants to regional New South Wales' project was established under the Council of Australian Governments while the targeting skills needs in regions program was supported by both the federal and New South Wales government.



Our work in partnership with TAFE New South Wales has helped develop accredited training programs for CO₂ and hydrocarbons, delivering teachers and students at regional campuses with natural refrigerant safety awareness, information sessions and systems training. We have also obtained natural refrigerant equipment for regional campuses through industry donations to build on that infrastructure.

MD: The CCCA developed flammables safety awareness training in association with the New Zealand Ministry of the Environment a few years ago. This training is now being developed for online delivery for the entire industry, via the Refrigerant Licence Trust Board (RLTB). So the focus is to develop knowledge of practitioners in the industry on flammables over the next year. There will most likely be more practical and in-depth training developed over time although it is important to note that while we are working hard on the training and upskilling around the use of natural refrigerants, we are always mindful of the growing skills gap in working in a safe and compliant manner with any compressed gas and work hard to address this issue too.

WHO WILL SHAPE THE FUTURE?

Australia's HFC legislation has been a long time coming but the country now has a unique opportunity to put the necessary frameworks in place, and take advantage of the significant commercial opportunities available, by becoming a natural refrigerant leader for neighbouring regions in the Asia-Pacific.

But in a sector where government support has not been readily forthcoming in the past, only a truly united industry can foster innovation and ensure the necessary changes are made. **JR**



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COMPETITION DRIVING INNOVATION IN NEW ZEALAND



Sean Davel is committed to CO₂

Foodstuffs' proactive approach towards sustainability and supplier competition has seen it surge ahead as Australasia's preeminent user of CO₂ transcritical technology.

– By James Ranson

In today's business world, the drive for sustainability, collaborative teamwork and market forces rank among the most prominent drivers of innovation. But for New Zealand's largest food retailer, Foodstuffs (NZ) Ltd., the preliminary factor behind two landmark transcritical installations was healthy internal competition.

Back then, with the North Island operations of New Zealand's largest food retailer split into two cooperatives at the time – Foodstuffs Auckland and Foodstuffs Wellington – the race was on in earnest to install New Zealand's first CO₂ transcritical system.

At the time, the systems were being installed at two supermarkets: New World Newlands in Wellington, and New World Devonport in Auckland.

So who was victorious? "Well, that depends which supplier you ask!" recounted Refrigeration Specialist for Foodstuffs North Island Sean Davel, "and if you ask who started theirs first and who completed it first," he joked. "From Foodstuffs' perspective we are just proud to be the first."

Regardless, with the new systems showing 15% energy savings compared to their business-as-usual stores, Davel was quickly convinced. "We thought: why are we wasting time and money dealing with other technologies? Since that first transcritical system was turned on in 2012, we've reaped energy savings across 14 stores."

"My message to industry is just to get on and do it," he said.

Today, Foodstuffs is one of the biggest users of transcritical refrigeration systems in a country that is a regional leader too, with more CO₂ transcritical supermarkets in operation in New Zealand than Australia, China and South America combined.

OWNER-OPERATOR MODEL

The Foodstuffs supermarket group operates under three main food retail banners: New World (supermarket), PAK'nSAVE (food retail warehouse) and Four Square (smaller format 'neighbourhood' stores). The group also owns and operates a variety of liquor stores, convenience stores and fuel sites.

Founded in Auckland in 1922, the group remains completely New Zealand-owned and operated, with over 700 stores and seven distribution centres nationwide.

Foodstuffs' model is unique in that it is made up of two regional cooperatives in the North and South Islands, while each store typically operates under an 'owner-operator' model. Foodstuffs Auckland and Foodstuffs' Wellington operated independently until they merged to form Foodstuffs North Island Ltd. in 2013.

"If you imagine tipping a store upside down and shaking it," says Davel, "and everything that falls out is the property of the owner and everything that stays attached belongs to Foodstuffs. By having 'money in the game' so to speak, our owners are highly motivated to make each business a success."

Davel heads a team in Auckland coordinating operations. Having worked in the supermarket refrigeration trade since 1985, and with CO₂ for 10 years, it is easy to get a sense of the direction he desires.

"We thought 'why are we wasting time dealing with other types of technologies?' Since that first transcritical system was turned on in 2012 we've reaped energy savings across 14 stores. My message to industry is just to get on and do it."

It is Davel's job to convince store owners to take a long-term, sustainable approach when purchasing equipment for their stores.

"Whenever a store is undergoing a major refurbishment we try to convince the owners not only to replace their plant but to do it with CO₂," he said. "We want them to make the right decision because if they choose to go with a synthetic refrigerant, there are genuine concerns that it will only be viable for about half the life of the system."

"I've found [CO₂] to be a very easy refrigerant to work with. I know there are a lot of concerns about the high pressures of the system, but from my point of view there's no difference between that and a synthetic refrigerant."

"A lot of it is about training our technicians. There are complexities that come with a CO₂ transcritical system but the chance of some of those more complex components failing is very low. It's a lot easier to diagnose problems with CO₂ systems because they are electronically controlled."

ENCOURAGING INNOVATION THROUGH THE SUPPLY CHAIN

At the heart of Foodstuffs' daring strategy is the onus it puts on suppliers and contractors to deliver solutions that are tailored to the system's design and energy performance specifications. Further, it invites competition among suppliers to deliver the best possible price.

Having worked on many of Foodstuffs North Island's refrigeration projects, contractor Ian Skipworth, from Auckland-based Refrigeration Consulting Limited, said the retailer has two clear non-negotiables: a CO₂ transcritical system and compressors of Foodstuffs' choice.

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New World Devonport, Auckland

→ "It's a performance-based specification so we describe to the [suppliers] what we want to achieve, but it's up to the tenderers and the contractors to come up with the design," Skipworth said. "That encourages innovation and price competitiveness."

"So far we've tendered the projects to a lot of suppliers so they could have a crack at it. It's a pretty robust tendering process and we do have owner-operators that have their preferred suppliers, but we still send those out to tender just to demonstrate to the owner-operator that we can get better pricing by doing that."

Of the 14 North Island supermarkets now with transcritical systems, four rack suppliers have been used – Green & Cool, ARNEG, Engie Services (formerly Cowley Services) and Bitzer Australia – plus two refrigeration cabinet manufacturers, McAlpine Hussmann and ARNEG.

Italian supplier SCM Frigo has been commissioned for one of four transcritical installations currently underway, with a further six in the design phase and scheduled for completion in 2018.

TAKING THE LEAP

Compared to its 'business as usual' CO₂/R134a stores, Foodstuffs has been able to reduce the overall carbon footprint of its new CO₂-only stores by 45%. What's more, Davel said that since the first two installations at Devonport and Newlands, the cost premium that comes with CO₂ transcritical has basically dissolved.

"When we first started, we were tendering in parallel between synthetics and CO₂ and there was about a 5% difference in cost. Now we don't ask for costing [on synthetics]; we just go with CO₂ transcritical."

The North Island still has around 11 Foodstuffs stores with CO₂/R134a subcritical systems, Davel said, but the idea was always to leap ahead to transcritical. "There were contingencies

in place, at New World Newlands, so that if we had to revert back to a subcritical system, we could."

New World Newlands was a new store build, which allowed the group more flexibility in the decision-making process without an owner-operator on board. Conversely, the Devonport store required a refurbishment, meaning the owner-operator was fully engaged with the project and was one of the driving forces, in collaboration with service provider, for the use of a CO₂ refrigeration system.

Both the Newlands and Devonport stores use waste heat to heat the store and the water. The team is now looking at integrating air conditioning and a heat pump with the CO₂ transcritical systems of the six stores in the design phase, in order to move away from synthetic refrigerants. The final decision will depend on the budget of each store.

Owing to New Zealand's mild climate, Foodstuffs is yet to use parallel compression in any of its transcritical booster systems. It has not considered ejectors either. The group is, however, investigating the use of hydrocarbon waterloop systems.

Its centralised cold stores typically use ammonia, with one in the Wellington region using a mixture of ammonia, glycol on the mid-temperature side, and organic salt on the low-temperature side.

While Foodstuffs ensured all due diligence was carried out, the decision from Davel and the team to take the leap and trust its suppliers and CO₂ technology has been vindicated several times over. **■ JR**

KIWIS DO IT BEST

While New Zealand industry is carefully examining the same shrinking technician base as Australia, companies like Foodstuffs haven't let such barriers get in the way of innovation.

"I get it that there is a concern around training," said Foodstuffs North Island Ltd's Refrigeration Specialist Sean Davel. "But from a technician's point of view, a lot of the top technicians working in refrigeration have got there because they like innovation, and I think a lot of them have become bored."

"This [CO₂] is something new and exciting and gets the juices flowing," he said. "I struggle a little bit with the [Australian] model and how it's taken them so long to get to use CO₂ transcritical. I think they have been too cautious, but I also understand that the big retailers have to convince a lot of people at the top that making the switch is worthwhile."

Ian Skipworth, from Refrigeration Consulting Limited, said Foodstuffs' owner-operator model makes its more "nimble". "[The company has] been able to change direction very quickly several times in response to new and unexpected budget changes," he said.



New World Newlands in Wellington

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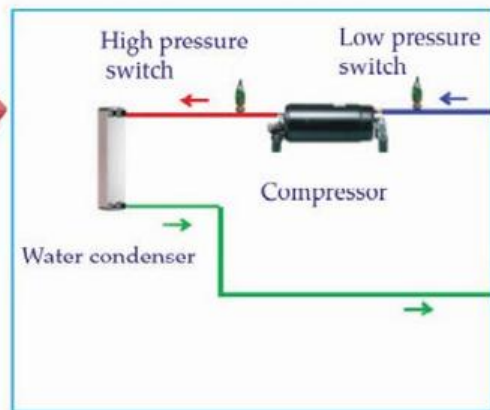
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TOTAL STORES:

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PAK'nSAVE: 53

Four Square: 270

TRANSCRITICAL SUPERMARKETS:

North Island: 14

New World (8)

PAK'nSAVE (6)

South Island: 4

New World (2)

PAK'nSAVE (2)

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Box Hill's senior lecturer Len Raines

The need to raise training standards by arming future professionals with natural refrigerant know-how is central to Box Hill's world-class education centre.

– By James Ranson

The future of Australia's HVAC&R industry, expected to rely strongly on natural refrigerants, will require the next generation of technicians to be equipped with the skills to take up the baton.

At the Technical and Further Education (TAFE) Institute in Box Hill, Melbourne, senior educator Len Raines is well aware of the skills shortage facing the ageing industry and the integral role that training students on future technology will play.

Box Hill's state-of-the-art Refrigeration and Climate Control Centre of Excellence (RCCC) has been in operation for 18 months and includes an integrated technology hub (ITH) with 37 mobile workstations called PODs (Professional Organisational Development). The PODs are supplied by various suppliers and give the school flexibility and the capability to train students in hydrocarbons and CO₂ refrigerants.

The multi-million dollar facility, constructed to fit the Green Building Council of Australia's five-star standard, is the first of its kind in Australia and provides collaborative and innovative learning spaces not just for air conditioning and refrigeration students, but also for the mechanical, plumbing and electrical technology industries.

"When you see the PODs it's pretty amazing. They're really as you would see in a supermarket simulation," Raines said.

BRIDGING THE KNOWLEDGE GAP

Completed in late 2014, the college is a fine example of collaboration between the education sector, government and industry to help address a lack of quality training incorporating future technology at vocational level.

Raines admits, "the knowledge of most of the students coming in on natural refrigerant technology [is] not great". But he insists that courses like the Certificate III in Refrigeration and Air Conditioning and CO₂ and hydrocarbon modules are helping address the knowledge gap.

Key to the centre's commissioning was a connection made through the Air Conditioning and Mechanical Contractors Association (AMCA), who helped fund the project.

"AMCA came to Box Hill's management and expressed their ideas that they wanted a better product coming out of the colleges," Raines explained. "They felt the level wasn't up to the right standard and they made it clear that they wanted to put something back into the training to obtain this level, because prior to this, our workshop would have been 30 years old. It wasn't keeping our students up to speed with what's really out there now."

"Without their backing we wouldn't have had the centre. A lot of money has gone into this from industry, Box Hill TAFE and [the Victorian] government."

“It's getting to the point now where we're getting pretty short of teachers... we have a lot of requests from [industry] to send out their tradespeople to be trained with the best equipment.”

THE BOX HILL MODEL

One of the premier vocational and higher education providers in Victoria, along with RMIT University and colleges in rural hubs Bendigo and Wangaratta, the Box Hill Institute offers:

- » Certificate III in Refrigeration and Air Conditioning (3 years – 1060 hours)
- » Certificate III in Engineering – Mechanical Trade (specialising in refrigeration and air conditioning) (3 years – 980 hours)
- » Certificate III in Appliance Service (3 years – 1060 hours)

The facility boasts over 300 students (and growing) and enables them to get real-world experience with natural refrigerants within the safety of the institute. The state government subsidises all apprentices with students needing an employer to enter the trade.

Each course requires apprentices to complete three full years of training at Box Hill, as well as a fourth while on the job with their employer, to become a fully qualified technician. Depending on the employer, an apprentice's fourth year of study can be curtailed if they are deemed fully competent on the job.

In the third year of the RAC and the engineering courses, students can take electives and OH&S training in CO₂, ammonia and hydrocarbon refrigerants while the Appliance Service certificate offers hydrocarbon competency only.

Raines said providing a course for students on hydrocarbon refrigerants required a slightly different approach. "I feel when I deliver the hydrocarbon course I have to take the fear factor out a little bit, once you do that the students are fine." The hydrocarbon course includes one day of occupational health and safety and one day of workshop practice.



Box Hill Institute's state-of-the-art RAC training facility

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→ Additional courses in natural refrigerants and subjects like business management are on offer to students wanting to obtain a Certificate Level IV. Raines says this typically takes a further 12 months on top of the four-year Certificate III but is viewed favourably by leading end users and manufacturers in the industry.

A further 'master class' on natural refrigerants allows teachers and selected students to take personal development lessons for free. Apprentices and other industry professionals can make use of these as well, with Box Hill offering guidance in specialised subject areas.

"AMCA offers a scholarship for one teacher and a student with a minimum Certificate III, in either discipline, to do these higher level units and in the two-week period the master class will cover CO₂ and hydrocarbons. We've had a lot of teachers and students from other TAFEs visit to see how it's all been set up. I'm sure a few people are pretty envious!"

"It's getting to the point now where we're getting pretty short of teachers. Because of AMCA's big membership, we have a lot of requests from them to send out their tradespeople to be trained with the best equipment."

RESISTANCE TO CHANGE

As a self-confessed 'oldie' Raines said only the industry could decide what legacy it will leave for the next generation of technicians. "It's the oldies like myself that have been in [the industry] a long time that are resistant to change." But in the face of growing demand for natural refrigerants, he knows the industry had to adapt.

More recently, Raines has worked with natural refrigerants CO₂ and ammonia, collaborating on training projects with City Facilities Management and Coles, who have installed a hydrocarbon water loop system in their Coburg North store ([see full story](#)).

Coles have sent their qualified tradespeople to the RCCC to gain hydrocarbon competency. "They don't get a certificate but they are up-skilled. Companies like Coles will be asking these students: 'Have you passed your CO₂ competency or have you passed your hydrocarbon competency?'"

Commissioned recently in May, Heatcraft supplied the equipment for a new CO₂ POD while HyChill fitted the hydrocarbon POD. **JR**



The Heatcraft CO₂ POD

TRADE LEFT IN DARK

One issue hindering progress and better safety practices is the absence of a nationwide licensing scheme for refrigeration and air conditioning tradespeople in Australia. Associations like the Australian Refrigeration Association (ARA) and the Australian Refrigeration Mechanics Association (ARMA) are again supporting that motion.

"One of the problems is that we're not a licensed trade like plumbers and electricians in Australia," said Len Raines, senior educator at the Box Hill Institute.

"The nationwide licensing [for refrigeration and air conditioning tradespeople] was on the table a couple of years ago and went by the wayside, but some associations are trying to put it in front of the government again. Hopefully they look at it again," he said.

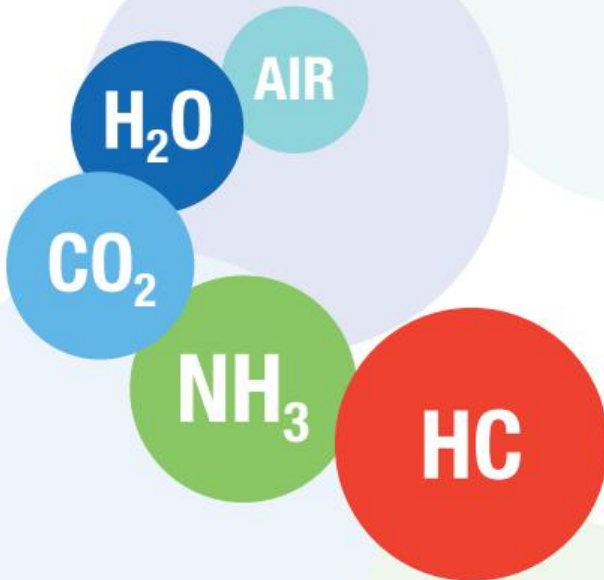
Motions from industry to include natural refrigerants in such a licensing scheme would be a crucial step to ensure greater clarity and safety with the use of all refrigerants. It would help accelerate greater training opportunities for natural refrigerants and equip technicians and experts with the skills to adapt to market realities.



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ARBS 2016: CO₂ THE TALK OF THE TOWN

Competition in the CO₂ refrigeration technology arena is hotting up in Australia and New Zealand, with transcritical solutions coming to the fore at ARBS 2016 in Melbourne.

– By James Ranson

Vith the feel-good factor from the previous day's ATMosphere Australia conference flowing over to ARBS 2016, some 323 exhibitors from around the globe descended on the Melbourne Convention and Exhibition Centre from 17-19 May.

ARBS is Australia's largest international exhibition for the RAC and building services industry with the 2016 edition attracting more decision-makers, contractors, specifiers and technicians to showcase the latest technologies, products and services than ever before.

Bitzer and Beijer Ref (through its SCM Frigo subsidiary) have already transferred their global CO₂ transcritical know-how to the Australian and New Zealand market. Now, Heatcraft Worldwide Refrigeration, through its Australian division, is entering the race.

For the first time, Heatcraft displayed its luminous Kirby eCOBoost CO₂ transcritical rack (100kW-300kW). Modified for Australian conditions after 11 transcritical installations in Europe and the US, Heatcraft has extensive market experience and is looking well beyond the commercial sector with its transcritical and CO₂/ammonia cascade systems.



Robert DelVentura and Brett Hedge with the Heatcraft CO₂ transcritical rack





Heatcraft's 100-300kW eCOBoost CO₂ transcritical rack on display

→ "We have a broader reach in the market than our competitors," said Brett Hedge, the company's commercial manager. "We're hoping to take CO₂ technology well beyond supermarkets and cold storage into smaller format convenience store solutions and food service, where customers are needing to find alternatives to R404A and R134a."

Major food retailers Coles and Woolworths have over 1,530 stores combined nationwide, but have so far completed just one transcritical installation between them. Hedge believes it is just "a matter of where and when" the first Heatcraft rack will be installed in Australia. "We have a number of interested customers that have been asking us for a [transcritical] solution a number of times."

COMPETITION HEATING UP

Along with market leaders Bitzer, SCM Frigo is another interesting proposition. Its CO₂ transcritical system has already been installed in a Countdown supermarket in Wellington, with another retailer, PAKn'SAVE, having commissioned another two in New Zealand.

"They're ready [in Australia]," said SCM Frigo Technical Director Mirko Bernabei. "It's the right time now – the 200 people at ATMOSphere Australia demonstrated that. They need support and help with training. It's important for us also to install a first transcritical rack in Australia...we don't care who with!" he joked.

The Cable Car Lane store is fitted with SCM Frigo's Emerald line CO₂ booster system, which can cater for capacities of 20kW-300kW and includes parallel compression and heat recovery. The company's new Lean line booster system, meanwhile, is dedicated to convenience stores with a 3-100kW capacity.

Bernabei said the Lean line offers end users a point of difference with lower maintenance and a significant price driver.

SCM Frigo is an exclusive manufacturer for global giant Beijer Ref Group, which also acquired New Zealand firms Patton Refrigeration and RealCold in 2015. With that support, SCM Frigo hopes to have 10 transcritical units completed in New Zealand by the end of 2016. Bernabei said that although market traction in Australia had been slower, the potential is "very high".

"It was the same in Europe some years ago when we started selling CO₂ transcritical in 2005," he said. "But when the end users decided to go for it [...] there should be a mutual [evolution] from both industry and end users [...] to work together to create the knowledge. Education is the key point."

continued on p.58 →



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- To assist, SCM Frigo invites its first-time customers for a two-day CO₂ training course at its facility in Padua, Italy. "On the first day they can have a general, theoretical overview about CO₂, safety and operation and on the second day it's hands on – they are operating a test unit we have in the factory."

GEA TARGETS NEW HYDROCARBON TERRITORY

One of the most interesting systems on display at ARBS 2016 was a semi-hermetic propane chiller from GEA Refrigeration. While it is currently in the concept phase, the 10.4kW system would be ideal for convenience stores and small supermarkets.

GEA Refrigeration's Australian sales manager Greg Clements said the system had significant potential to capture new market territory. "The reaction has been very positive, with a high level of interest from the market," Clements said.

The company's 100kW Mark V reciprocating compressor package for NH₃ applications, ideal for low-charge ammonia systems, was also on display. It has been attracting plenty of interest – GEA has received numerous orders for substantial industrial food-processing projects since December 2015.

ARRAY OF CO₂ SOLUTIONS

Mitsubishi Heavy Industries displayed its proven air-to-water CO₂ heat pump, the Q-Ton, which has so far sold over five million units in Japan alone. This suggests that the first installation in Australia – likely to be in Sydney, Brisbane or Melbourne – will only be a matter of time.

Meanwhile, in the same sphere, Mayekewa's sales and marketing manager Peter O'Neill confirmed that the company had so far sold four of its Unimo CO₂ heat pumps to a detention centre in Darwin and was currently installing another at a soy processing plant in Queensland.

With offices in the US, UK, Asia, Canada and Melbourne, Henry Technologies was all about CO₂ at its booth.

Julian Parker, director of engineering, showcased the company's liquid CO₂ charging kit, which considerably reduces the charging time from four hours to 20 minutes, as well as oil separators and high-pressure safety valves specifically designed for CO₂ transcritical systems.

The company supplies components to all the major CO₂ rack and system manufacturers in Australia, and is currently developing an ejector.



Heatcraft's booth at ARBS 2016



GEA's 'concept' hydrocarbon chiller

"When we're talking about the most important issues at ATMosphere Australia, training, for the hands-on guys products where they don't need the extra training are even better," Parker said. "We support TAFE with literature and technical support and have the local expertise. We have the engineers here who know the systems and know refrigeration." **JR**



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THE ROAD TO LOW-CHARGE AMMONIA

The Bornemeiers – a husband-and-wife team that runs Utah-based Western Gateway Storage – are the first company in the US to install Evapco's low-charge packaged ammonia system.

By Michael Garry

David Bornemeier always had a nose for a good investment.

When he was a finance student at the University of Utah, Bornemeier discovered a mint-condition 1967 Mustang in a barn. He bought it for \$500 (AUD \$670), stripped it down, rebuilt it and sold it – for a price that “paid for a good chunk of my college education,” he said.

Years later, in 2011, Bornemeier came upon another investment opportunity – a 61-year-old cold storage facility in Ogden, Utah, called Western Gateway Storage Co., which he described to his wife, Becky, as a “giant refrigerator”. In addition to putting copious amounts of due diligence into the building, the company and the 3PL industry, he also had a gut feeling about this property, the same feeling he had about the Mustang. It was, he said, “gorgeous ... just a little dust on it is all”.

They bought the company, Dave becoming CFO and president; Becky, CEO.



Fluid cooler that supplies water-glycol mixture to Evapcold unit

This year, the Bornemeiers are embarking on the next phase of their journey as investors and entrepreneurs, opening up a brand new cold storage facility this July adjacent to the existing Western Gateway building.

Among its enhancements, the new building will feature the Evapcold low-charge ammonia packaged refrigeration system from Evapco – the first Evapcold system to be installed in the US.

It's also among the first wave of low-charge, rooftop-mounted refrigeration systems that are starting to be used as a safer, simpler, faster-to-install, far-less-regulated, and, in many cases, more efficient alternative to traditional large-charge industrial ammonia systems that require an engine room and network of piping. Other low-charge system suppliers include Azane, NXCOLD, Stellar, Mayekawa, Australian-based Scantec Refrigeration and Cimco.

DUE DILIGENCE

Bornemeier's approach to new investments – whether a cold storage facility or a next-generation refrigeration system – is to apply the due diligence skills he developed in the commercial banking sector as a financial analyst. "David got to see what formulas worked so he could look at a company and see how to make that company better and expand," said Becky Bornemeier.

Western Gateway met their specific criteria: tangible assets, a great reputation, and being in business for many years. It has proven to be "a diamond in the rough," he said.

In April 2016, two Evapcold units arrived at Western Gateway's new building, finding a home on the roof. Each Evapcold unit contains 132kg of ammonia, and can provide 70 TR of cooling (1.85 kg/TR), for a total of 140 TR, though the facility's cooling load is 100 TR.

While Western Gateway's old two-store building uses a traditional ammonia system with thousands of pounds of charge, the new building is one story with just 30,000 square feet, yet it holds the same volume as the other building because its ceilings are twice as high; its target temperature is -9.4°C or below.

To cool the low-charge units' condensers, a fluid cooler is stationed next to each unit, feeding them a water/glycol mixture.

AN ALTERNATIVE TO SYNTHETICS

Western Gateway did not originally plan to buy a low-charge ammonia system. The initial general contractor for the new Western Gateway building led the Bornemeiers toward a less expensive HFC-based refrigeration system.

But, at the beginning of 2015, they found a new general contractor, Sirq Construction, and started asking lots of questions about refrigeration.

Bornemeier takes pride in learning about a new area like refrigeration in order to make the best decision and believes all end users should take that approach. "I'm known to be up until 2-3-4 o'clock in the morning just researching and searching for the latest and greatest," he said.

Bornemeier ultimately rejected the notion that he should invest in an HFC-based system that was much less expensive. "It seemed like with Freon we would be trying to cut corners," he said.

He also studied the regulatory environment and could see that HFC refrigerants were not a good solution for the long term. "We were looking at this building lasting a good long time, not only from a regulatory standpoint but for operations and maintenance as well," he said. "So hands-down, low-charge ammonia was a better decision."

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→ Bornemeier considered using an ammonia/CO₂ system but “felt the design of our building lent itself to a low-charge ammonia package on the roof.” He evaluated other low-charge ammonia vendors, but opted for Evapco because of its longevity as a supplier and OEM of refrigeration systems, including many penthouse units.

He acknowledged that being the first to implement a new technology is something of a risk. But he trusts Evapco’s ability to package “tried, true and tested” components from major suppliers like Danfoss and Bitzer – whom he also vetted – into a new low-charge design.

SAFETY IS KEY

Improved safety was one of the biggest reasons the Bornemeiers went with a low-charge system. “You want to build your system so there are no releases,” said Bornemeier. “With a low-charge, rooftop system any ammonia leak can be handled from the outside, and there’s no chance the evaporator coils that contain ammonia will be hit by any operations in the warehouse.”

The Evapcold unit’s fast installation compared to a conventional ammonia system was also a “huge selling point for us,” said Bornemeier.

In terms of equipment and installation costs, the Evapcold units are “comparable to or less” than a conventional ammonia system, said Bornemeier. That includes the oversizing of the units and the additional structural costs to support the weight of the units on the roof, which were balanced by lower labour and equipment costs for installation, energy savings, and a AUD \$60,000 incentive. **MG**

ENERGY INCENTIVE

Western Gateway was able to obtain a US \$60,000 (AUD \$80,100) energy-efficiency incentive for its two Evapcold low-charge ammonia packaged units from Rocky Mountain Power, helping to cover the cost of the equipment.

The company partnered with energy consultants Cascade Energy to secure the incentive.

The annual savings of the low-charge system was calculated to be 20% less than that of the baseline system, a saving of 280,000 kWh (AUD \$40,500 annually). Of that, 220,000 kWh was attributable directly to the low-charge refrigeration (including 60,000 kWh from the evaporator’s variable frequency drive) and 60,000 kWh from the variable frequency drive of the fluid cooler used to cool the condenser in the low-charge unit.

The baseline system was a single-stage, economised, recirculated liquid ammonia system, with a fixed-speed screw compressor and evaporative condenser.



From left: Kurt Liebendorfer, Evapco; and David Bornemeier, Western Gateway



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BITZER RIPE FOR THE CHALLENGE

Technology, training and trust are behind Bitzer Australia's bid to stay ahead of the game.

- By James Ranson



From left: Shannon Egan, Ian Suffield and Peter Gibson

Australians are competitive beasts, with the nation's long line of sporting feats and willingness to 'have a crack' helping to shape the notion of the Australian spirit.

In business the story is no different. One company, Bitzer Australia, has been a shining light in helping to introduce climate-friendly technology to the HVAC&R sector.

Not for the first time, this preeminent manufacturer of natural refrigerant compressors and complete racks is facing a fresh challenge from other global suppliers eagerly intent on making their own unique impression on the market.

Yet Bitzer has stood the test of time in Australia and continues to lead the way. "Relationships and trust have been the foundation of our success," said Bitzer Australia Managing Director Peter Gibson at ARBS 2016. "The major players Coles and Woolworths trust us and what we do, the product is only part of the solution."

Major players like Frigrite Refrigeration and Austral Refrigeration "have come and gone now but we're still here, we're still doing the same thing," he said.

"The market's composition has changed a lot in the last 10 years, during which time we were supplying and designing our own racks in the development of CO₂ as well as supplying compressors to our customers who were making their own HFC racks," he said.

Bitzer's long-standing association with Coles and Woolworths – the country's two biggest food retailers – helps. Having sold over 60,000 CO₂ compressors and equipped with training facilities around the globe, Gibson says Bitzer has the framework of support and local expertise to stay ahead of the pack.

"Currently in Australia it's Bitzer and Heatcraft producing racks for 3-4 retailers. Now there's a push from overseas suppliers and manufacturers, it's a threat, but we're prepared with the work locally and the technical support we provide."

WHO CAN STAND THE HEAT?

In terms of CO₂ transcritical installations, Bitzer's state-of-the-art system at Coles Coburg North is a symbol of the growing demand for integrated systems, and uniquely in that store, air conditioning loads supplied through the same booster unit.

With temperatures in some parts of Australia exceeding 45°C, technological innovations to improve efficiency like parallel compression, adiabatic cooling and ejectors, will surely play a part in the evolution of CO₂ technology in Australia.

The challenge from the likes of Heatcraft, the Beijer Ref Group through SCM Frigo, and Advansor will lend a new European and US angle to the market, with these companies having already commercialised systems that incorporate some of these features.

However, Australia's harsh conditions cannot be underestimated, according to Gibson.

"I think the advantage the local manufacturers have in our harsh conditions is that we do understand the conditions that we're designing the product for."

With an R&D centre in Sydney and production facilities in both Sydney and Melbourne, Bitzer has the capability to supply customers with around-the-clock support. "The major end users value not just our technical expertise but our local content, because we are here to support the product. Not just at the handshake, but we're also on the ground. We're not 24 hours away."

"We need to look a little bit harder at how the competition is coming into the marketplace," said National Sales Manager Shannon Egan. "Just bringing in technology from overseas and selling it on: that's not selling support."

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Peter Gibson: Building trust is key

→ BUILDING A STRONG PLATFORM

While Bitzer's Schäufler Academy in Germany is undoubtedly the centrepiece of Bitzer's training platform, other facilities in Australia, Brazil and Beijing have helped to establish the company as a strong ally of end users in Australia. Indeed, Bitzer developed CO₂ training programmes at their training facility in Sydney before commercialising their CO₂ products. "That gives us an advantage over the overseas suppliers," Gibson said.

"Bitzer has not just been innovative in having a crack with CO₂ but also being innovative in training and developing the market, so that the technicians could actually safely handle the product and sustain the product."

TAFE Sydney was closely involved with Bitzer's R&D centre until they commissioned a training facility of their own. By 2008-2009, around 600 technicians had been trained and accredited for CO₂ safety and CO₂ commissioning at the Bitzer centre.

"It was important for TAFE to take it on with an accredited programme, but the problem now is that there is probably not as much training going on," Egan said. "There are not as many apprentices going through the system. We have all these centres designed to handle the training, but they're not being utilised 100%".

Gibson said industrial and commercial clients were asking for ammonia and CO₂ transcritical technology, but again insisted that the technology wasn't the problem. "Your average technician in the retail space isn't trained or experienced with using ammonia," he said. "So it comes back to having additional training that can be undertaken to upskill, with further upskilling [required] if they want hydrocarbon [accreditation]". **© JR**



Bitzer's 2-cylinder semi-hermetic reciprocating CO₂ compressor

THE INNOVATION GAME

Bitzer Australia has heralded a number of firsts in Australia with Aldi, membership warehouse retailer Costco, and Coles trusting the company with a variety of pioneering CO₂ initiatives.

Its CO₂ transcritical store at Coles Coburg North, a first for the retailer, took over 18 months to design and model. "It's a world first in terms of including the air conditioning and the efficiency that we've achieved with that system," said Engineering Manager

Ian Suffield, who has six years of retail expertise with Woolworths. "Credit to Coles for having the courage and the engineers who have worked on the project."

Having installed compressors in over 1,600 supermarkets globally, Bitzer has the expertise to cater for the full spectrum of transcritical and subcritical installations with its 8-95kW CO₂ compressor range.

Gibson described Costco's decision to deploy their first CO₂ plant globally in the Sydney suburb of Liverpool as a "big deal". "The decision from Costco HQ was a significant one. They were using Australia to benchmark against their current plant specification and they trusted us to bring this technology to market."

The first CO₂ transcritical store was deployed in Australia back in 2006, however Gibson explains how the market was initially hesitant to take adopt the concept. It would take another few years for CO₂ transcritical to enter the discussion again and gain trust from the Australian market.

Meanwhile, New Zealand has got well "on top of the innovation game" with roughly 19 commercial transcritical installations completed to Australia's five. "Although it's a very small market, they're a very innovative country, New Zealand," Gibson said.

Suffield, meanwhile, stressed that "in New Zealand when you're talking about a 30°C ambient, it's very different to designing for a 45°C ambient in Australia". "When you look at [the number] of days below 20°C [representing] half the days in the year (in New Zealand), it's a much easier decision".



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HFC PHASE-DOWN PROVIDES CERTAINTY

Australia's HFC phase-down will see it join the United States, the European Union and Japan as a "world leader" in reducing synthetic greenhouse gases.

– By James Ranson

The Australian government's long-awaited decision, announced on 27 June, will see a legislative phase-down of HFC imports from January 2018 and effectively reduce HFC emissions by 85% by 2036.

In the absence of national policy regulation legislating for a reduction in the use of harmful HFCs since the repeal of the carbon tax in 2013, the phase-down provides industry with some certainty to adopt sustainable alternatives.

The government's has argued that the phase-down is even more ambitious than the amendment proposal for a global HFC phase-down currently being discussed under the international Montreal Protocol framework. It has a lower baseline, reflecting Australia's current demand, and has more frequent reduction steps.

"Australia will be a world leader in reducing HFC emissions, joining the United States, the European Union and Japan in taking early action to reduce HFC emissions," reads the OPSGGM programme outcome review document.

The outcome review has been well received by industry bodies, including the AIRAH, which says it will provide the Australian HVAC&R sector with a clear path for the future.

"Not only is such a measure pivotal to national and international efforts to reduce CO₂-equivalent emissions in the face of climate change, it provides some certainty to those in

the HVAC&R industry, who can now plan for and invest in new technology that will be required," said AIRAH CEO Tony Gleeson.

This is indeed a step forward for Australia's conservative coalition government. The new measures are expected to reduce HFC emissions by up to 80 Mt CO₂ equivalent in the period to 2030.

The government states that the phase-down has been "developed with industry which supports the phase-down, its environmental benefits and the long-term investment certainty it provides".

Importantly, the amendments will "[enable] provisions for future bans on the import of new equipment containing high global warming potential HFCs [...] and domestic and automotive air conditioners containing high global warming potential HFCs". A ban on specified new equipment using high-GWP HFCs was one of the four options considered in the initial options paper.

"Further, compliance provisions of the legislation will be strengthened to support emission reduction including new offence provisions, increased penalty amounts, provision for suspension of licenses and publishing of compliance actions," it reads.

Australia's former Environment Minister Greg Hunt originally announced the review of the OPSGGM programme in May 2014, with an options paper released after public consultation outlining a 'strong preference' for a hardline stance on phasing down HFCs.

NEXT STEPS

The Australian government will introduce legislative amendments in order to implement new measures as soon as possible. All measures will enter into force and start operating by January 2018.

In the interim, the Department of the Environment will work with businesses and state government regulators to develop information to better inform equipment owners of the benefits of ensuring proper installation of new equipment and regular equipment maintenance, including refrigerant leakage, as well as greater regulatory synergy between state and federal arrangements. **0 JR**

CANADA STRONG-ARMS HFCs

Canada is set to take a tougher stance on HFCs, with proposed regulatory measures to reduce consumption of the climate-damaging substances through a phase down on "bulk" HFC imports as well as product-specific controls.

René Desjardins from Environment Canada outlined the reduction steps at ATMOSphere America in June, which would target companies importing HFCs by cutting CO₂ equivalent from a 2019 baseline to a plateau of 15% by 2036.

Canada currently has domestic measures in place to minimise emissions from existing equipment but these do not address companies importing HFCs. Canada's HFC consumption rose from 16.77 MMTCO₂e in 2011 to 16.96 MMTCO₂e in 2014.

Four sectors will be targeted: refrigeration and air conditioning, mobile air conditioning, foam products, and aerosol products.

Desjardins explained that HFCs contained in pre-charged products or equipment are not considered bulk and would therefore not be included in the phase-down, rather falling under the remit of the product-specific controls.

The product-specific regulations are similar to those under the EU's F-Gas Regulation and California's proposed strategy, however in many applications much higher GWP limits have been set. For example, centralised refrigeration and stand-alone low temperature refrigeration tables a GWP limit of 1,500 by 2020 while mobile refrigeration sets a limit of 2,200 by 2025.

Stakeholders still have the opportunity to comment on the proposal, which will include a 75-day public comment period expected in late 2016-early 2017. **0 JR**





CROSSING THE CO₂ EQUATOR CARREFOUR LEADS THE MARCH SOUTH

For Carrefour, refrigeration plays a key role in delivering on its sustainability objectives and with excellent results in warmer climates than Sydney, the retail giant is putting natural refrigerants at the heart of its strategy to become HFC-free.

– By Andrew Williams

Eadquartered in Boulogne Billancourt near Paris, France, Carrefour S.A. is a multinational retailer with 12,296 stores in 35 countries across five continents and over 380,000 employees worldwide. With annual sales topping €100 billion (AUD \$152 billion), it is one of the largest retail groups in the world.

Carrefour stores are a familiar sight from France to China, ranging from large Hypermarkets to mid-sized Supermarkets and smaller Express convenience stores. Boasting 1,481 Hypermarkets, it ranks among the world's largest hypermarket chains.

With global outreach comes great responsibility. As such the Group is aiming to reduce overall carbon emissions by 40% by 2025 and by 70% by 2050 (compared to 2010 levels).

To reduce refrigerant emissions, the Carrefour Group is phasing out HFCs and replacing them with CO₂ for commercial refrigeration. By the end of 2015, it had installed 260 stores with CO₂ technologies in seven countries.

Paolo Martini, Refrigeration & HVAC Manager for International Support at the Carrefour Group, is the man charged with delivering this transition.



TOWARDS AN HFC-FREE CARREFOUR

"We're moving to eliminate HFCs," Martini says. "This is the goal that we'd like to reach – that's for sure!" Yet the driving force behind his vision for the retail giant runs deeper still – by adopting natural refrigerants, "you can reduce your CO₂ impact and consume less energy," he enthuses.

With HFC phase-out deadlines under the EU's F-Gas Regulation on the horizon, Carrefour's response to the evolving HVAC&R landscape is marked by two distinct approaches. The first centres on reducing direct emissions from refrigeration, HFC leakages, and other refrigerant gas leakages. The second is to replace HFCs with natural refrigerants.

Indeed, natural refrigerants like CO₂, hydrocarbons and ammonia will all have a key role to play in the context of the HFC phase-down taking place in Europe under the F-Gas Regulation, which since 2015 has been restricting the total amount of HFCs that can be sold in Europe. In 2020, a ban on using certain HFCs in new equipment comes into effect, accompanied by bans on servicing and maintaining existing equipment.

The standard Carrefour stores in the future, however, will use natural refrigerants – and particularly transcritical CO₂.

Carrefour first decided to go down the natural refrigerants route in 2009. To begin with, hybrid systems were installed to help familiarise staff members with how CO₂ works as a refrigerant. "It has been a process – to improve our knowledge, installers' knowledge, and the availability of components," Martini explains.

Since those first steps, the decision to switch to CO₂ transcritical in Europe has proven so successful that the Group is planning to roll out the systems in other parts of the world – starting with Brazil.



Carrier's system with CO₂ compressor

CO₂ EQUATOR DISAPPEARING

The efficiency of CO₂ refrigeration systems in warm climates has long been a matter of intense debate and source of concern among experts. Yet Martini is convinced that such fears are long past their sell-by date.

In Spain, Carrefour currently boasts CO₂ transcritical systems in 18 Hypermarkets and one Supermarket. It has installed CO₂ subcritical systems in nine Hypermarkets and 14 Supermarkets.

"The first Hypermarkets using transcritical CO₂ were in the north of Spain, where maximum temperatures tend to be moderate. Energy consumption there for the new systems was low, even compared to subcritical installations," says José Francisco Mollá, technical director of Carrefour Spain.

"This, together with the fact that we didn't encounter any significant problems, encouraged us to continue doing CO₂ installations in places where ambient temperatures are higher," Mollá explains.

He sees continuous innovation in CO₂ technology for commercial and industrial applications, specifically focused on improving the performance of transcritical systems in warm climates, as a major driver of increased uptake of natural refrigerant solutions in Spain.

"It's about checking energy consumption and system reliability. We got good results. We started by making a prototype in Italy, a prototype in France, a prototype in Spain, and so on. Each country made its own pilot system. Then they started to feel comfortable with the technology," Martini recalls.

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Hypermercado Carrefour, L'Ametlla del Vallès



Leading from the front: Paolo Martini

→ From this perspective, the Carrefour Group is particularly proud to demonstrate that CO₂ can be used for commercial refrigeration in supermarkets in climates as warm as Brazil and Spain.

"Pressure from the EU F-Gas Regulation and a Spanish tax penalising the use of fluorinated gases are encouraging the use of alternatives," Mollá adds.

TAKING EUROPEAN KNOW-HOW TO BRAZIL

As recently as April 2016, Carrefour installed two transcritical CO₂ packs in Brazil – its first beyond Europe's shores. "For the moment we've started with Brazil. But we're also thinking about following the same approach in other countries," Martini says.

The Group has two store brands in Brazil – Carrefour and Atacadão. The first CO₂ transcritical installation is in a Carrefour Hypermarket in Cambuci, a district of São Paulo and

the second is in an Atacadão store in Atibaia, a municipality in São Paulo state. Both systems use parallel compression and adiabatic gas coolers.

Will the higher average ambient temperatures in the South American country affect the performance of CO₂ as a refrigerant? "Since 2013, we've been moving the so-called CO₂ equator southwards. We've arrived in Valencia and Malaga, so those are pretty warm average ambient temperatures!"

"The goal is to compare these transcritical CO₂ systems with the standard packs used in Carrefour and Atacadão stores in Brazil until now. The goal is to prove that this technology delivers good service results even in Brazil. Just like we did in Spain," Martini explains. **AW**

SPOTLIGHT ON SPAIN

Average temperatures in the hottest summer months (July: 29°C, August 30°C) in the two Barcelona locations (Gava and L'Ametlla del Vallès) exceed those in Sydney's two hottest summer months (January: 27°C, February: 27°C).

Hypermercado Carrefour, Gavà

- Surface area: 8,300m²
- System: CO₂ transcritical with parallel compression and subcooler from Carrier installed by Cofrico
- Cofrico trained Carrefour staff to maintain system
- Carrier's sub-cooler improves system performance by cooling down discharge of gas cooler when ambient temperature is high

Hypermercado Carrefour, L'Ametlla des Vallés

- Surface area: 3,200m²
- New system: Carrier CO₂OLtec CO₂ transcritical with ejector & parallel compressor
- Installation: Retrofit of 25-year old store.

- Gava & L'Ametlla des Vallés systems: 46% more efficient than previous direct expansion systems using f-gases
- 90% centralised, 10% autonomous cabinets: giving staff freedom to move the units around to adapt to evolving store needs
- Option of adding 30% extra cooling capacity (to add more freezers or display cases in future, or to guarantee power in event of a compressor failure)
- Centralised system uses 3 variable speed Bitzer compressors, for high, medium and low pressure respectively
- Communications: Stickers on display cases inform customers of the use of natural refrigerants

Both stores:



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EUROPEANS EYE TRAINING PROGRAMS

As we found out at ATMOsphere Europe 2016, representatives of European nations, aided by a favorable regulatory climate, are making efforts to create a comprehensive network of training programs for the next generation of natural refrigerant technicians.

– By Klara Skačanová

While European countries have long promoted the adoption of natural refrigerant systems through strong regulation, the need for further development of training programs to support and maintain the installed base represents another critical step in the evolution.

Policy experts who spoke at ATMOsphere Europe in Barcelona in April - organised by shecco, publisher of *Accelerate Australia & NZ* – proposed greater training opportunities for Europe's southern regions, certification, and even mandatory natural refrigerant training initiatives.

Ricardo Almeida from the Portuguese Environmental Agency pointed out the lack of trained technicians in the south. "Adequate training and knowledge among contractors operating in different countries, particularly in the south of Europe, should be guaranteed," he said.

Guillermo Martínez López from the Spanish Office for Climate Change, Ministry of Agriculture, Food and Environment, said that his agency is waiting for approval from the government to move forward with new requirements for training on alternative refrigerants and a certification system for technicians.

Spain followed the lead of northern European countries by introducing a tax on fluorinated refrigerants in 2014. Although the tax level (AUD \$14.4/tCO₂eq) is much lower than in Norway (AUD \$44.4/tCO₂eq), Martínez López pointed out that significant emission reductions are expected for 2015 as a result of adopting HFC alternative technologies in new refrigeration installations and retrofitting with lower GWP substances in existing facilities.

Katja Becken from the German Federal Environment Agency revealed that while Germany is considering making practical training on natural refrigerants mandatory, there is still a “need to enable training facilities”.

As part of Germany's Climate Action Program 2020, several ideas are currently on the table. These include financial support for training facilities and on-the-job practical training on natural refrigerants to help familiarise trainees and professionals with the technology.

In order to accelerate the uptake of alternative technologies, Germany has been providing millions of euros since 2008 as a financial incentive to companies working in the commercial refrigeration sector. “Last year we provided 18 million euros [AUD \$27.5 million] to finance 252 refrigeration systems running on natural refrigerants,” said Becken. “In total we spent 114 million euros [\$174 million] on 1,300 projects from 2008 to 2014.”

Meanwhile, the European Commission is currently working on a report on training for HFC alternatives, which will be published by 2017. While the EU has strict rules regarding training and mandatory certification for f-gases, it doesn't have that for alternative refrigerants. “We don't think that EU-wide regulation for training on alternatives is necessary,” said Arno Kaschl, a policy expert from the European Commission, adding that individual national legislators are best placed to decide the most appropriate way forward.

In terms of policy and industry actions taken to reduce the use of HFCs, northern Europe is more advanced in its move away from high-GWP substances than southern Europe, and natural refrigerant technology has become more the standard rather than the exception. For example, Norway's tax and refund scheme on fluorinated refrigerants has been in place since 2003. At its current level, the tax has provided a supportive regulatory framework for natural refrigerant technologies, especially in larger systems, Torgrim Asphjell from the Norwegian Environment Agency said.

While policy representatives from Spain and Portugal were hesitant on whether natural refrigerant solutions could work in their countries, Asphjell clearly stated Norway's favorable position towards natural refrigerants. “In the long term we want to phase down fluorinated gases and get back to natural refrigerants because we think that this is a sustainable and long-term solution.” **KS**

GREEN & COOL'S NEW CO₂ CONDENSING UNIT

Swedish manufacturer Green & Cool, a major supplier of CO₂ refrigeration systems in Europe, launched a small, stand-alone CO₂ condensing unit at the ATMOSphere Europe conference in Barcelona, targeting small-scale applications like convenience stores and gas stations.

“The unit is basic and inexpensive, but still bears a state-of-the-art eco-performance,” said Johan Hellman, sales engineer for Green & Cool, at the company's ATMOSphere Europe booth. “It's a small condensing unit for applications like small shops or petrol stations, or for bigger shops that need to add extra display cases. It is already CE-marked, so it's ready for the European market.”

The unit – which is manufactured in the south of France – uses a rotary hermetic compressor and a BLDC motor to achieve a capacity of up to 5.8kW. And as a plug-and-play system, it is simple to use. “All you need to do is set which operating pressure you want,” said Hellman.

The control system, manufactured by Italian firm CAREL, features a small microprocessor linking the unit to the cloud, allowing operations to be monitored remotely from a mobile phone and opening the door to its use as part of a wider supermarket system.

Hellman believes the condensing unit will work in ambient temperatures of up to 45°C, making it suitable for use in warmer climates like southern Europe.

NISSUI'S LONG-TERM VISION VINDICATED

Installing the first ever NewTon, Mayekawa's market-leading ammonia/CO₂ system, was no small feat for Japanese logistics company Nissui Logistics, whose reward was an 80,000kWh per year reduction in energy usage.

– By James Ranson & Jan Dusek

In 2008 Nissui provided the first test case for Mayekawa's NewTon in Japan, at its Kawasaki facility. The logistics company has since installed a further two, in Osaka-Kou (port) and Osaka-Maishima, Japan. It now has offices in 40 locations around the globe.

Headquartered in Minato Ward, Tokyo and formerly known as Tokyo Logistics Center, Nissui Logistics provides refrigerated warehousing, storage and freight transportation services – predominantly processed salmon imported from places like Chile. Its 17 distribution centres include one in Osaka-Kou Port, which is jointly operated by Nissui and two other companies.





Michinori Kogawa – the general manager of Nissui’s equipment management department – said Kawasaki’s installation of three NewTons with 14,000 tons of refrigeration capacity at the facility saw the company immediately reduce its energy usage by 80,000kWh a year.

Back in 2008, with the Montreal Protocol firmly in view, Kogawa said the company had an obligation to “fulfill [its] corporate responsibility” and had felt that “the age of natural refrigerants [was] here”.

With the help of Japan’s Ministry of the Environment (MOE), Nissui was able to subsidise the additional cost of the ammonia/CO₂ system, as compared to traditional HFC systems on the market at the time. In turn, Nissui proved a valuable partner for Mayekawa, providing crucial energy efficiency, power consumption and maintenance logging data so that the Japanese manufacturer could continue to develop and hone its NewTon technology.

NISSUI LOGISTICS’ KAWASAKI BASE

Nissui’s Kawasaki warehouse was first commissioned and planned in 2006 and completed in 2008. True to the company’s ‘scrap-and-build’ philosophy for natural refrigerant technology, contractors worked from the ground up.

Initially three refrigeration systems were considered for the Kawasaki logistics centre: ammonia/CO₂, an ammonia direct expansion system, and HFC R404A. Tellingly, Mayekawa’s NewTon was selected due to its “technological innovativeness, energy-saving performance, and overall safety”.

Kogawa had already sampled a smaller ammonia/CO₂ cooling unit at a company he previously worked at, while Nissui – like many at the time – used ammonia direct expansion systems in the 1970s and 80s. However, the old technology experienced ammonia leaks.

Mayekawa’s NewTon at the Kawasaki facility was the first large-scale system installed in a refrigerated warehouse in Japan. When Nissui installed the first model of the NewTon in Kawasaki, they worked hard with Mayekawa to help develop a commercially viable product together. Operational data was supplied for measurement and verification, with both parties making various modifications to enhance the technology and its safety.



NewTon units installed at Osaka-Maishima facility

The installation drew a swathe of interested parties from the industrial refrigeration industry, including government officials from Japan and abroad, and other warehouse operators. That interest, and the MOE’s subsidies, has helped Mayekawa grow the market for the NewTon around the globe. It has now sold over 880 systems.

Nissui followed that with NewTon installations at two other facilities – the joint Osaka-Kou venture and its Osaka-M facility (operation initiated in April 2016). So far, compared to an R404A system, the NewTon set-ups have saved energy (excluding lighting and other equipment) at a rate of 23% in Kawasaki, and 53% in Osaka.

MOE SUBSIDIES ACCELERATING NATURAL REFRIGERANTS GROWTH

MOE subsidies originally encouraged end users to purchase natural refrigerant technology by covering up to one third of the difference in total cost between a system based on fluorinated refrigerants and a natural refrigerant-based one. The subsidy now covers up to 50% of the total cost of the system, which Kogawa identifies as a key shift. The third generation NewTon comes in at roughly 1.2-1.3 times more expensive than HFC systems.

With half of the introduction cost of natural refrigerant systems having been covered since 2014, they are cheaper than HFC units. That saw the number of applications sharply increase, explained Kogawa.

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Kogawa: Industry moving to natural refrigerants

Japan's natural refrigerants subsidy growing in scope



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