

SPRING 2016

ACCELERATE

ADVANCING HVAC&R

EUROPE

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on display at
ACR Show
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for nat refs at
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UK's Carter brings
nat refs to US
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ANDRÉ FOURIE
Head of Water Security
& Environmental Value,
SABMiller plc
—
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Editor's note by
Andrew Williams



SEIZING THE CHANCE TO CHART A SUSTAINABLE DEVELOPMENT PATH



As the ink dries on the global climate agreement struck at COP21 in Paris last December, the natural refrigerants industry is optimistic that the coming months will bring new business opportunities.

Like other sectors, the HVAC&R industry is marked by long investment cycles. As we wait for governments across the world to transform the overarching goals of the Paris Agreement into deliverable objectives at home, now is the time for business to seize the opportunity to help put the world on a more sustainable development path.

Failure to act now risks missing a once-in-a-generation opportunity to ensure that natural refrigerants are at the heart of the refrigeration systems of the future.

Companies like SABMiller plc. understand this. In our cover story, the brewing giant demonstrates impressive awareness of the responsibility that global multinationals share to help put the world on a more sustainable development path. The firm is committed to using natural refrigerants in 100% of its fridges by 2020. Head of Water Security & Environmental Value André Fourie outlines how adopting natural refrigerants makes financial and commercial sense for companies like SABMiller, as well as benefiting the climate ([see full story on p. 30](#)).

Delivering positive change sometimes means staying ahead of the political curve. Until now, some industry players had reported that the EU's F-Gas Regulation was yet to dramatically influence their market. But as the decisive year of 2018 looms closer, the search for alternatives is now clearly intensifying.

Companies like Carter are at the forefront of this drive. The UK-based firm is looking to expand its global presence by bringing impressive new natural refrigerant systems to the US supermarket sector ([p. 56](#)). Exciting innovations were also on hand at the ACR Show in Birmingham, where the appeal of natural refrigerants as a solution to climate and legislative pressures buffeting the HVAC&R sector was obvious ([p. 16](#)).

Meanwhile, Switzerland's largest retailer Migros is showing impressive climate leadership with the world's first use of state-of-the-art CO₂ refrigeration systems combining parallel compression with ejectors ([p. 40](#)).

Accelerate Europe is the place to showcase the best that the natural refrigerant industry can offer, and to demonstrate to the world that our sector is part of the climate solution. I'm excited to be joining shecco Europe at such a fascinating time for our sector. I look forward to meeting more of our readers in the coming months, as we continue to report on cutting-edge developments from manufacturers and users of natural refrigerant technologies. Together, we can change the world! **AW**

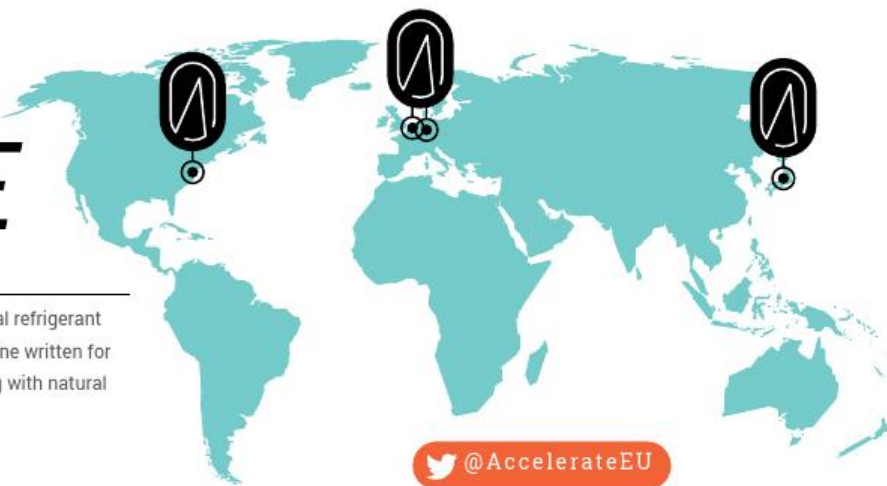
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ACCELERATE

ADVANCING HVAC&R NATURALLY

Brought to you by shecco, the worldwide experts in natural refrigerant news, *Accelerate Europe* 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://accelerateEU.com>



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Blazing a trail for natural refrigerants

Brewing giant SABMiller is recognising natural refrigerants as a key component of its sustainability strategy – and demonstrating how nat refs are a winning recipe for corporate success as well as the environment.

André Fourie

Head of Water Security & Environmental Value
SABMiller plc.

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LEADING CO₂ TECHNOLOGY FOR COMMERCIAL AND INDUSTRIAL REFRIGERATION

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ACCELERATE R744 UNITS FOR WARM CLIMATE APPLICATIONS!

Being part of ATMOsphere Asia 2016 in Tokyo was a very inspiring experience. Among the latest achievements presented by leading Japanese manufacturers was the effective development and market introduction of small-size R744 commercial refrigeration units. Pilot systems shipped to other South Asian countries will demonstrate that these units are viable alternatives, even close to the equator.

The audience discovered that R744 refrigeration technology is a success story not limited to Japan. As was the case for large European commercial refrigeration systems 10 years ago, scepticism used to dominate the area. Nowadays R744 is the preferred option for far-sighted end users, a trend that can be seen in Asia. Hundreds of small Japanese convenience stores are now equipped with R744 technology. Various field measurements performed by different players showed that the energy savings compared to previous HFC installations reach up to 45%!

This is good news for southern Europe. The phase-in of natural refrigerants into the supermarket sector in the warmer regions of Europe can accelerate! End users are fed up with the successive churning out of synthetic refrigerants by the chemical industry in the last few decades. Natural refrigerants solve this problem – now let's make an effort to further increase the energy efficiency of the solutions they are looking for, like integrated refrigeration packs.

In new and completely remodelled supermarkets, the latest R744 refrigeration rack solutions will take care of all the energy flows from the store or building in an efficient way. Besides cooling the store equipment, the entire energy supply to the HVAC and hot water systems will be managed in a cost-efficient manner – reducing the total cost of ownership for end users. Several pilot supermarkets are performing excellently across Europe, equipped with parallel compression booster systems enhanced with the latest ejector technology.

As reported by several experts, the work recovery efficiency of R744 ejectors is generally in the range of 20-30% at elevated ambient temperatures. Ejectors also simultaneously pump additional liquid through the evaporators, improving system performance significantly. This increases the suction pressure of the compressor twice, due to the elevated evaporation temperature (flooded evaporation) and the pre-compression of the evaporator outlet fluid.

ARMIN HAFNER

Professor,
Refrigeration Technology
Department of Energy
and Process
Engineering

Norwegian University of
Science and Technology



Component manufacturers will soon be ready to deliver serial production parts to the market: this is a major step forward for the large-scale introduction of centralised commercial refrigeration systems in southern Europe. This ejector technology can be applied in other applications too, such as industrial or commercial cold storage refrigeration systems, transport refrigeration systems, industrial heat pump applications, or chillers.

However, training to support local vendors and installers is critically important. To support this vital need, the EU has provided funding for a H2020 project called SuperSmart, which aims to improve the energy efficiency of supermarkets by improving staff expertise and facilitating knowledge transfer.

SuperSmart tackles barriers both short-term (awareness and knowledge) and long-term (organisational, political and social), even though the impact on the supermarket sector may not be immediate. The purpose of the SuperSmart hub is to establish a knowledge transfer and promotional platform devoted to the supermarket sector in order to educate, train and bring together stakeholders from various backgrounds in such a way that facilitates the uptake of energy-efficient heating and cooling solutions.

We look forward to welcoming you to the SuperSmart hub. ● AH



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one year

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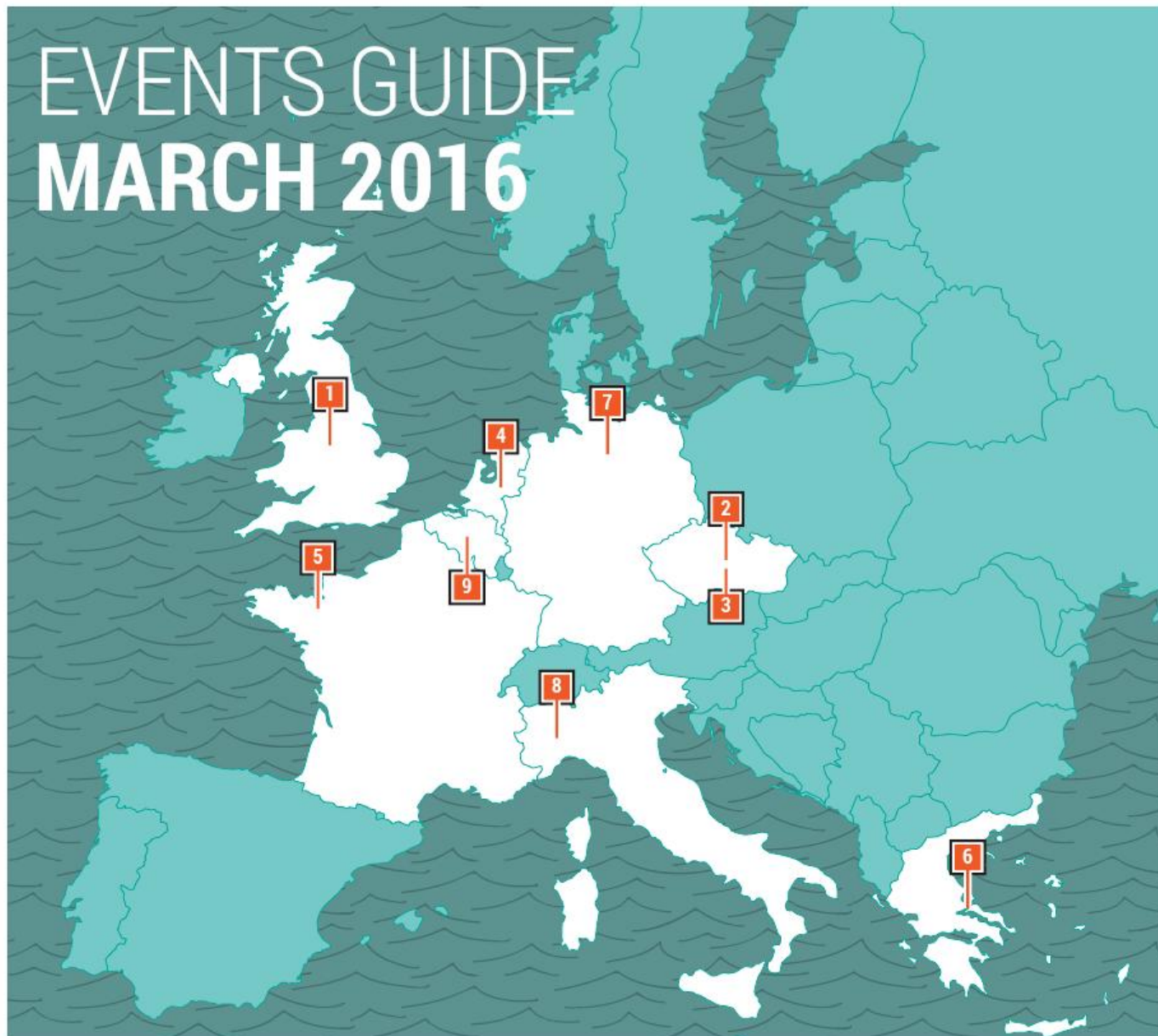
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smartstore.danfoss.com

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EVENTS GUIDE

MARCH 2016



1

1 March, Kenilworth, UK
6th British Frozen Food Federation's Business Conference and Exhibition
<http://bfff.co.uk/category/business-conference/>

2

1-4 March, Prague, Czech Republic
AQUA-THERM Praha 2016
<http://www.aquatherm-praha.com/en/>

3

1-4 March, Prague, Czech Republic
12th International Specialized Exhibition Climate World 2016
<http://www.climatexpo.ru/eng/>

4

6-8 March, Amsterdam, Netherlands
19th European Cold Chain Conference
<http://www.gcca.org/19th-european-cold-chain-conference/>

5

8-10 March, Rennes, France
CFIA (Carrefour des fournisseurs de l'industrie agroalimentaire)
<http://www.cfiaexpo.com/en>
 twitter : #saloncfiarennes @CFIAexpo

6

9-10 March, Athens, Greece
Qualicheck Workshop: Summer comfort technologies in buildings
<http://www.eceee.org/events/calendar/2016/Workshop-9-10-March-2016-buildings>

7

11-16 March, Hamburg, Germany
INTERNORGA
<http://www.internorga.com/en/>

8

15-18 March, Milan, Italy
MCE 2016: Mostra Covegno Expocomfort
<http://www.mcexpocomfort.it/en/>
 twitter : #MCE @mcexpocomfort

9

22-23 March, Wavre-Nazareth-Aldhem, Belgium
refritec ON TOUR 2016
<http://www.refritec-on-tour.be/>

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INNOVATION

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EVENTS GUIDE

APRIL 2016



1

5-8 April, Älvsjö, Sweden

Nordbygg

<http://www.nordbygg.se/>

twitter : #nordbygg

2

7-8 April, Kristiansand, Norway

Norsk Kjøleteknisk Møte

<http://nkf-norge.no/>

3

18-20 April, Birmingham, UK

ncs- National Convenience Show

<http://www.nationalconvenienceshow.co.uk>

twitter: #NCSevent @ NCSevent

4

18-20 April, Birmingham, UK

Foodex

<http://www.foodanddrinkexpo.co.uk/>

twitter : #FDE2016 @FoodDrinkExpo

5

19-21 April, Barcelona, Spain

ATMOsphere Europe 2016

<http://www.atmo.org/>

twitter : #ATMOEurope, #CO2, #ammonia, #hydrocarbons
@ATMOEvents

6

19-21 April, Messe Frankfurt/Main, Germany

En+Eff 2016

<http://www.eneff-messe.de/en/>

7

26-28 April, Brussels, Belgium

Seafood Processing Brussels

<http://www.seafoodexpo.com/global/>

twitter: #swss16 @euroseafood

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R 744

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PRODUCTS



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Hall 24 - Stand M29 N22

- HEAT EXCHANGERS
- CONDENSING UNITS
- PACKAGED SYSTEMS
- PACK SYSTEMS
- INTEGRATED SYSTEMS

RIVACOLD
MASTERING COLD

EVENTS GUIDE

MAY 2016



1

4-7 May, Milan, Italy

Venditalia

<http://www.venditalia.com/en/home>

twitter : @venditalia

2

11-14 May, Krasnoyarsk, Russia

ClimatAquaTEx

http://www.krasfair.ru/en/events/climat_en/

3

17-18 May, Birmingham, UK

edie Live

<http://exhibition.edie.net/>

twitter : #SusLive #edielive @edielive

4

22-25 May, Aalborg, Denmark

12th REHVA World Congress CLIMA 2016

<http://www.clima2016.org/welcome.aspx>

5

18-20 May, Paris, France

Heat Pump Forum 2016

<http://forum.ehpa.org/>

twitter : #ehpa @helloheatpumps



ZANOTTI is an Italian excellence in producing systems for food refrigeration for over 50 years. A leader in the field, we base our professionalism on the constant search for technological innovations to apply to our products. As for green solutions for food refrigeration, for many years Zanotti has offered units for small and medium-capacity cells that operate on gas with a very low environmental impact such as Propane R290 or Propylene R1270. Lately, the range of natural gases products has expanded to become the most comprehensive range available on the market. Zanotti has already been working with Ecodesign protocols for 4 to 5 years now to make sure the equipment will be fully recyclable at the end of its life span. Innovation, energy saving, quality and competence are the key words for the activities that Zanotti has carried out to date and the promises for the future.

ZANOTTI is working for our future



ACR SHOW 2016: IMPENDING F-GAS RESTRICTIONS TRIGGERING NATURAL REFRIGERANTS BOOM

Until now, many industry players have reported that the EU's F-Gas Regulation has had only a subdued impact on the market. But as the decisive year of 2018 looms closer – with its deadline for reducing use of high-GWP HFCs by 44% – the search for alternatives is intensifying. *Accelerate Europe* was on hand at the ACR Show – the UK's only event for the HVAC&R industry – to find out the impact this increased impetus is having on companies large and small.

– By Robert Davidson

The ACR Show, held at the Birmingham NEC in the heart of England on 16-18 February, brought together manufacturers, component and refrigerant suppliers, and other players from across Europe to display the latest and best air conditioning and refrigeration technologies.

At the Institute of Refrigeration (IOR) conference – held alongside the ACR Show and focusing on EU F-Gas and Eco-design legislation – it was clear that the shadow of legislation would loom large over the event. Intricate charts detailing the various drop-offs in HFC consumption ordered by the European Commission were a ubiquitous sight – all the way to a 79% reduction by 2030.

This EU legislation is beginning to drive the industry in two directions. First, it has forced companies using high-GWP HFCs to reconsider which refrigerants to focus on, with clear suspicions as to the future role of HFOs on display. Second, it acts as a reward for early adopters of CO₂ and hydrocarbons technology who are in a comfortable position to weather the brewing regulatory storm.



IMPACT OF REGULATION AFFECTING ENTIRE INDUSTRY

From the original refrigerant supplier all the way to the end user, the presence and appeal of natural refrigerants was obvious at the ACR Show. Operators of training courses on using natural refrigerants in particular are seeing at first hand the impact that the legislation is having.

The Grimsby Institute of Refrigeration and Polar Pumps notes how training operators are now catching up with demand and see this as a period of transition in successfully training a growing number of companies on how to use refrigerants that are not subject to the phase-down. Peter White, director of Doncaster-based Polar Pumps Ltd., spoke about the ammonia training courses it has been operating since 1994:

"50% of those we train are for ammonia and this seems to be growing. The industry is changing as refrigerants have gone from CFCs, HCFCs, HFCs and now on to HFOs. People want a bit of security; ammonia has been here forever and it will stay here forever."



Stars of the show: Natural refrigerants on display at Birmingham NEC

While ammonia accounts for a large number of the trainees walking through White's door, he explained that Polar Pumps do not currently offer hydrocarbons training but would look into doing so if demand were to increase – expressing a similar sentiment for CO₂ training too.

Jason Clark, the Grimsby Institute of Refrigeration's senior training consultant, detailed both their ammonia and hydrocarbons training courses. He explained that training operators are led by the industry in terms of the courses they offer:

"The industry leads and we follow along. There's no point us putting out training if there's no industry out there wanting it... And as the industry introduces all of these natural refrigerants, the training sector will catch up and it will mingle in. I do think it is just a matter of time."

As a long-time standard in industrial refrigeration, the Grimsby Institute goes one step further in ensuring quality ammonia training. The Institute is equipped with a full-sized ammonia plant on its premises to ensure the next generation of trainers are fully prepared for these systems.

ECO-DESIGN HELPS COMMUNICATE THE ENERGY EFFICIENCY OF HYDROCARBONS

Paul Anderson, Gram's commercial director, spoke about the implications of new EU Eco-Design regulations coming into effect on 1 July 2016:

"As of 1 July 2016, every commercial refrigerator or freezer that is manufactured for sale within Europe will by law have to have the energy label on it, like a domestic refrigerator. Then every year, the standard increases and companies have to better themselves, so it is requiring a manufacturer to invest its correct and pertinent resources into bettering the product."

As one of Europe's leading manufacturers of energy efficient refrigeration products, Anderson noted that the legislation was music to Gram's ears, as they have been pushing the boundaries for years in terms of efficiency. The Superior Model refrigerator – recipient of seven industry rewards for efficiency in 2015 – that Gram had on display is testament to this continual innovation:

"We don't go out to win awards, but it's nice to be recognised for sustainability, environment, energy efficiency. The Superior Model is actually 35% more energy efficient than the previous leading model, which also utilised hydrocarbons."

With innovation on this scale, Anderson noted how the Eco-Design regulations will allow consumers to choose models based on clearly displayed energy efficiency standards alongside other criteria:

"Eco-Design will add clarity to the industry. When we go to buy home appliances, we look at the price, we look at the aesthetics but we also look at the A-F rating and this informs our choice."

Anderson notes that while R290 is now Gram's standard for refrigerators, they also have models using R600. Anderson also specified that some customers still ask for R134a refrigerated equipment, but that this trend is very much on the slide, not just in the UK but globally.

"There are countries in Europe that will not take to hydrocarbons as of yet, but that is changing. I've seen that in Dubai and the Middle East, where energy efficiency wasn't considered five years ago but now people are asking for

continued on p.18

energy-rated products... Everyone is looking to better and enhance the planet – and we have got to be a part of that.”

This clear message for the light commercial refrigeration sector also resonated in the IOR Conference, where Foster Refrigeration noted how they have shifted towards natural refrigerants and most obviously hydrocarbons.

COMMERCIAL REFRIGERATION CONTINUES TO LEAN TOWARDS NATURAL REFRIGERANTS

A case study presented by Arctic Circle during the IOR Conference showed the willingness of supermarkets to take on natural refrigerants as an alternative to HFCs – an alternative that is becoming increasingly mainstream. A store highlighted by Arctic Circle was just one of the 5,500 CO₂ transcritical stores that are currently open in Europe.

The use of CO₂ transcritical systems in commercial refrigeration has obvious benefits and proves a rock-solid case for those who are currently in a transition period. This sense that natural refrigerants are increasingly used in commercial refrigeration was shared by other prominent companies, such as SWEP. Stefano Bellada, SWEP's Segment Manager for Air-Conditioning and Refrigeration, noted that not just CO₂ but also hydrocarbons are growing in commercial refrigeration applications:

“The market is growing for new advanced systems across the world, such as for our waterloop systems which utilise hydrocarbons.”

Ruben Duarte, US-based Fieldpiece Instruments' international sales manager, also notes how their business of manufacturing leak detectors for refrigeration applications is growing to incorporate CO₂ leak detectors:

“There's more demand for a CO₂ detector in Europe, Canada and Japan than in North America. So we created a product for international markets but we expect the United States to grow right behind everyone else.”

The reasons behind this demand is a mix of ecological awareness and the industry shifting towards natural refrigerants and other companies not wanting to lose sight of the pack:

“The world is becoming more environmentally conscious and everyone knows HVAC&R is a sector that is responsible for a large amount of greenhouse gases. So you have those who want to do the right thing and you have businesses that want to accommodate this growing demand. Due to this combination, we expect the CO₂ market to grow exponentially in the next ten years.”



Paul Anderson, Gram

IOR CONFERENCE: A UK CONFERENCE SHOWS GLOBAL IMPLICATIONS OF F-GAS REGULATIONS

While the show was based in the UK, there was a clearly wider grasp of the significance of regulations and their potential impact elsewhere in driving forward phase-downs in HFC consumption worldwide. A presentation by Ray Gluckman, director of Gluckman Consulting, at the IOR Conference looked at these global implications:

“It is likely we will see the HFC phase-down become a global consensus in 2016 among all 197 countries in the world.”

Asked whether the lack of coherence of a global phase-down could potentially undo all the work the UK and the rest of the EU has been doing to reach their targets, Gluckman was intelligent and clear in his response:

“It would actually make it easier if it's a global phase-down because of production and consumption targets. Production is only in a discrete number of factories, most of which are in China. So provided these can be controlled, then you're not putting the gas into the market. The problem with Europe going alone with its F-Gas Regulation is because the EU cannot control the production of HFCs outside of Europe. When f-gas prices go sky-high, the temptation to smuggle might increase.”

With the world so delicately balanced, it seems that the innovation on display at the ACR Show is poised to play a key role in facilitating this necessary global transition. Others may scratch their heads and ignore the oncoming regulatory storm – but the sentiment in Birmingham was that it would be extremely ill-advised to do so. **RD**



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A full range of refrigeration valves for CO₂ and hydrocarbons



The EU's 20-20-20 Goals:

- + Reduction of Greenhouse Gas levels by 20%
- + Increase share of renewables to 20%
- + Reduce energy consumption by 20%

Refrigera™ 4-way Reversing Valve the key component in Heat Pumps

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The **4-way Reversing Valve** provides heating and cooling efficiency by reversing the flow direction of refrigerant. The cycle inversion needs no solenoid pilot valve and no slider movement, **reducing the risk of mechanical seizures** due to environmental conditions, the presence of dirt or particles. In comparison to the solenoid pilot valves, where the pressure differential regulates the movement of a slider, which changes the direction of the refrigerant, the **ball-valve design guarantees minimum pressure drop and a very low risk of leakage**, therefore preventing the fault from completing the opening/closing cycle and ensuring a quick changeover, even without any pressure differential. The ball is suspended by 4 Teflon seats and is **able to work at maximum temperature** or even in case of **total absence of pressure** in the system. The valves are suitable for all P.E. Directive Group 1 or 2 refrigerants and operate under the full pressure of the heat pump system.

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GOING BANANAS FOR NATURAL REFRIGERANTS AT FRUIT LOGISTICA



Strawberries in January? Why not?! Mangoes in Scandinavia? Don't mind if I do! We take it so much for granted that we can buy fresh produce all year round, anywhere in the world, that we can't imagine having to patiently wait to enjoy our favourite fruit. Seasonal food remains a foreign concept for many, as we follow our whims and cravings. Yet most of us never think about where that perfectly shaped peach came from, how it was transported, or how it was stored before landing in our shopping basket.

— By Linda Toivio & Andrew Williams

In February, *Accelerate Europe* was in Berlin for Fruit Logistica, Germany's largest tradeshow for the fruit and vegetable sector. 70,000 visitors from over 130 countries flocked to the annual event, keen to discover what some 2,900 exhibitors from the fresh produce industry had to offer.

As well as presenting tasty produce from every corner of the world, Fruit Logistica showcases equipment from across the cold chain, including production units, transport technology, and storage and ripening facilities. Natural refrigerants play a crucial role here by helping to reduce carbon emissions throughout the food chain.

PUTTING NATURAL REFRIGERANTS AT THE HEART OF FOOD RETAIL

Refrigeration is an essential ingredient of the food retail recipe – and natural refrigerants are adding exciting new flavour to the sector.

With CO₂ technology making headway in Scandinavian supermarkets, Sweden's Frigadon is starting to produce CO₂ condensing units for its home market. In Scandinavia, the majority of supermarket cabinets have doors. During the night other power-consuming devices, such as lights, are switched off, leaving just the refrigeration equipment running.

The advantages of CO₂ for food retail in colder or northern climates are incontestable: it runs continuously overnight and can provide heat, hot water and air conditioning as well as refrigeration if needed. Like others in the business, Frigadon is also working hard to improve the efficiency of CO₂ installations in high ambient temperature conditions, said the company's representative at the show, Björn Skattberg.

France's Thermo Réfrigération recognises that the EU F-Gas Regulation will inevitably lead Europe to adopt natural refrigerants. Frédéric Sacher, the company's business manager, predicts that European customers requesting new solutions from suppliers will have a snowball effect – with the choices made in Europe directly influencing other regions.

Warm climates still pose challenges for food retailers. CO₂ is very efficient in colder climates, but less so in high ambient temperatures. Eric MacGregor, managing director of Versatile Refrigeration, stresses that while the industry is currently working hard to ensure that CO₂ systems work as effectively in warmer climates as they do in colder ones, firms such as the Coca-Cola Company are already proving that the technology can be successfully deployed all over the world. **● LT & AW**

EVERYTHING BECOMES A COOLER



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Condensing Units



Fullmotion



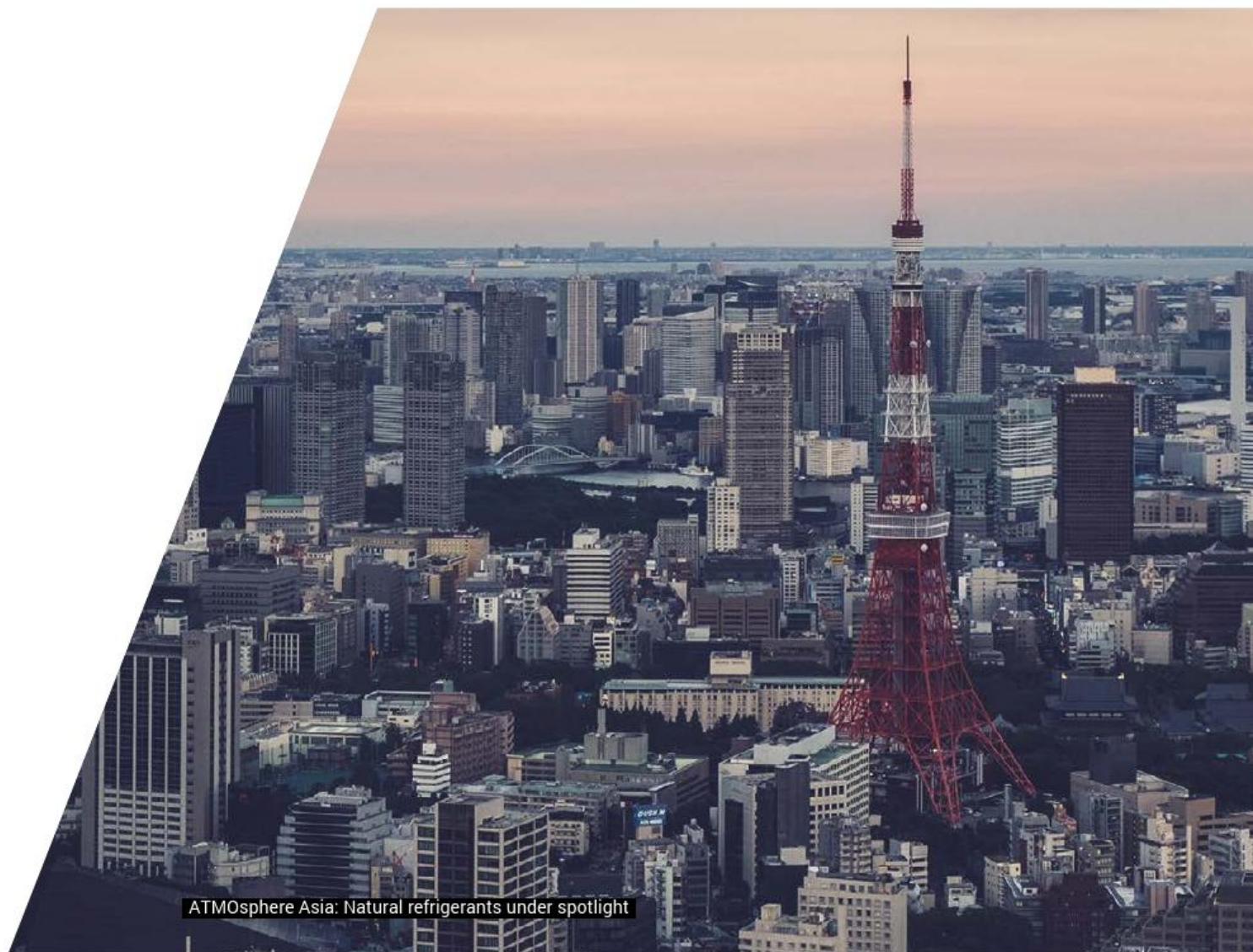
Sliding Units

embraco POWER **IN.**
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ATMOSPHERE ASIA 2016: MULTINATIONALS BUY INTO JAPANESE INNOVATION

There was a distinct international element to the third edition of shecco's hugely successful ATMOSphere Asia event, with leading end users from around the globe descending on Tokyo to tap into Japan's technological expertise.

– By James Ranson and Klára Skačánová





But just as there was a clear sense of an industry looking inward, recently, there has also been a push from a Japanese natural refrigerant market that has matured in sectors where gaps remain in other world markets to become more active overseas.

Japan's expertise and progress in adopting CO₂ technology for small store formats (CVS) – and how such technology could be applied in regions like Europe and North America – was of particular interest to end users from Belgium (Delhaize), Germany (METRO AG), and Canada (Sobeys).

Over 200 participants (30 end users) attended the event on 9-10 February including government officials, and representatives of environmental bodies and academia. The impressive number of attendees – ATMOSPHERE Asia's largest ever – viewed 40 presentations covering the integration of more compact, lower-charge ammonia systems for industrial applications; the growing role CO₂ is playing in the commercial sphere; and the legislative environment currently propelling natural refrigerant technology forward in Japan.

During her opening address, shecco's Deputy Managing Director Nina Masson highlighted the considerable impact that Japan's work with natural refrigerants is having on the rest of the world. "What

we are seeing is companies bringing CO₂ stores to Indonesia and EcoCute CO₂ heat pumps to Europe – not to mention joining forces on next-generation technology in Canada and entering into joint ventures with North American companies," Masson said.

In addition, she highlighted the opportunities that exist for foreign companies offering solutions that are well established in other world regions but which are not yet widely used in Japan. To this end, there was a heated debate about the prospects for hydrocarbon technology in Japan, where companies are hesitant to overcome the barriers to adopting the technology to the level that can be seen in Europe and other parts of Asia.

The most pronounced exception to the low adoption of hydrocarbons in Japan is the beverage vending machine sector, which boasts more than 0.5 million units using hydrocarbons. Overall there are 1.35 million HFC-free vending machines (using CO₂ and hydrocarbons) in Japan. This makes the country a leader, with the highest rate of such products per capita in the world, revealed Masson in her preview of GUIDE Japan, due to be published soon.

POLICY RESTRICTIONS AT ODDS WITH NATURAL REFRIGERANT GROWTH

Three major concerns were raised at the event, all of which have the potential to mitigate the advancement of natural refrigerant technology in Japan. Firstly, the country's High Pressure Gas Safety Act (HPGSA) continues to run contrary to the huge growth of CO₂ solutions and their potential for larger systems.

Platinum sponsor Panasonic announced exciting plans to launch a 30 HP CO₂ condensing unit in 2016 with the hope of targeting larger convenience stores (CVS) and supermarkets. But although the systems are expected to increase competition for CO₂ technology, the restrictions imposed by the HPGSA are limiting the uptake of higher capacity CO₂ booster systems, which are already used in more than 5,500 stores in Europe.

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→ Panasonic's acquisition of major US manufacturer Hussman Corporation will help fast-track production in 2016, which will include developing variations of the company's CVS solutions to "provide new natural refrigerant solutions for every customer," said Panasonic Managing Director Tetsuro Homma.

"We are always communicating this question with government, having successfully launched bigger CO₂ products in other parts of the world," Homma said of the HPGSA limitations.

Secondly, the Ministry of Environment's subsidy scheme, which has provided over JPY 11 billion (€88 million) in the past two fiscal years, and an expected JPY 8.5 billion (€66.3 million) in 2016, remains vital to eliminate the cost disparity between natural refrigerant and synthetic refrigerant-based systems.

Japan's Lawson is one retailer that has dramatically increased its number of stores (now with over 10,000 CVS in Japan) while considerably reducing energy consumption thanks to natural refrigerant technology.

However, the huge increase in the number of Lawson stores and the considerable energy efficiency savings the company has achieved with its CO₂ technology are out of sync with the ongoing benefits provided by a Japanese Environment Ministry subsidy scheme. Should the subsidy scheme be discontinued in Japan, it remains to be seen whether major Japanese retailers like Lawson, AEON, 7-Eleven and FamilyMart will continue to introduce natural refrigerant technology at the same rate, and what implications this will have on natural refrigerant markets in neighbouring regions.

Thirdly, Japan's more lenient f-gas laws are failing to give a clear direction to end users and system manufacturers to accelerate the introduction of natural refrigerants at the same rate seen in Europe. The European F-Gas Regulation prescribes that as of 2022, only HFCs with GWP <150 in supermarket refrigeration can be used (except in the primary refrigerant circuit of cascade systems, where f-gases with GWP > 1,500 can be used). In comparison, the Japanese f-gas law outlines a target average GWP value of 1,500 to be reached by equipment manufacturers by 2025.

“What we are seeing is companies bringing CO₂ stores to Indonesia and EcoCute CO₂ heat pumps to Europe – not to mention joining forces on next-generation technology in Canada and entering into joint ventures with North American companies”

– shecco Deputy Managing Director Nina Masson

'LOW-GWP' DEFINITION

In addition, the need to have a clear definition of what 'low GWP' actually means resonated throughout the two-day conference. A number of speakers and participants noted that currently there is a great deal of confusion, especially among technology end users, as to which technology they should adopt in order to have a future-proof solution. The Japanese f-gas law and labelling scheme, which puts HFOs (a new generation of synthetic refrigerants) and natural refrigerants under the same 'non-Freon' banner, adds further to this sense of bewilderment.

shecco's Sidi Menad Si Ahmed pointed out that the low-GWP definition will be a determining factor in the discussions on a future global HFC phase-down under the Montreal Protocol. In addition, Professor Armin Hafner of the Norwegian University of Science and Technology (NTNU) questioned the calculation of GWP values for newly developed refrigerants, and highlighted the need to make a delineation between all synthetic refrigerants and natural refrigerants.

LEADING END USERS SPREADING TECHNOLOGY OVERSEAS

Harbouring ambitions to become the world's largest end user of natural refrigerants, Lawson, which has 1,300 stores using CO₂ in Japan, is leading the move to help end users in neighbouring regions.

Through the Japanese Ministry of Economy, Trade and Industry's (METI) Joint Crediting Mechanism (JCM), Lawson has helped PT Midi Utama Indonesia, via its Alfamidi chain, to fit 13 stores with natural refrigerant solutions. Lawson intends to install natural refrigerant systems in a further 12 stores in 2016.

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The market for **natural refrigerants** is growing and evolving with companies turning their focus towards solutions for **warmer climates** and the rapidly **growing markets in the east and south of Europe**. ATMOsphere Europe 2016 reflects this trend in its move to Barcelona, Spain for the 7th annual conference. The event will highlight the progress that has been made with natural refrigerant technologies thus far, as well as discuss untapped **business opportunities** and next steps in the HVAC&R industry.

Serving as **THE meeting place** for HVAC&R industry stakeholders worldwide, the conference will cover everything you need to know about natural refrigerant based technologies with market trends and regulatory sessions, end user and supplier panels, technology case study presentations, workshops and more. ATMOsphere Europe 2016 also offers the perfect setting to meet and network with **300+ HVAC&R industry experts expected to attend**.

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INTEGRATED SYSTEMS THE FUTURE

On day two of the event, sandwiched between the second policy and end user panel sessions, NTNU's Armin Hafner gave what was one of the most thorough and diverse presentations at ATMOsphere Asia 2016.

In a wide-ranging presentation, Hafner posited integrated systems combining heating refrigeration and air conditioning as the future for all supermarkets around the globe. Combining heat reclaim to bring down costs further, Hafner argued that the reality of integrated natural refrigeration systems was very close on the horizon.

"You can see already that supermarkets are exporting heat (waste heat) to the neighbourhood. People are purchasing their hot water from the waste heat. This makes sense, it's cashed in – otherwise it goes to the birds."

Comparing baseline commercial CO₂ booster systems, Hafner said that additional reductions of 10% in energy usage could be achieved with parallel compression and a further 10-20% with ejectors; another widespread practice in Europe that would be hugely beneficial on the Japanese market if HPGSA limitations were softened.

Hafner described the perfect gliding temperature of CO₂ as an excellent fit for applications using heat rejection, when paired with an ejector (like heat pumps), as well as a solution for Japan's large fishing industry (in place of R22). CO₂ heat pumps for rail transport and hydrocarbons as a new option for transport applications were also mentioned as cutting-edge solutions to transform their respective applications.



→ The Delhaize Group, which itself merged with Dutch retailer Ahold in June 2015 to bolster both companies' US operations, has 130 stores in Indonesia and is investigating the idea of trialling natural refrigerant solutions in Southeast Asia.

The collaborations are positive news for manufacturers like Sanden, which announced at ATMOsphere Asia that prices of its CO₂ compressors had halved in the last five years. It hopes to reach cost parity with HFC models in the next three years.

Sanden sold a total of 1.5 million CO₂ compressors globally between 2011-2015, including a total of 500 installations in the growing CVS market as of the end of 2015. The company expects that figure to reach over 50,000 by 2020.

Aside from Indonesian retailer Alfamidi, the event also welcomed a number of other new end-user faces: COOP Mirai, Marukyu, Patine Leisure (all Japan), and PT Adib Global Food Supplies (Indonesia).

MORE COMPACT INDUSTRIAL SYSTEMS

While much of the focus was on CO₂ solutions for the commercial sector, a number of manufacturers and end users discussed the latest technology developments for low-charge ammonia and ammonia/CO₂ technology in Tokyo, including Mayekawa, Mitsubishi Heavy Industries, Danfoss, Yokorei, Yokohama Reito and Chemical Grouting.

Mayekawa has so far installed an impressive 880 sets of its NH₃/CO₂ NewTon cooling system in Japan and abroad. In 2016, the company plans to develop a smaller ammonia package solution using scroll compressors, to target smaller applications.

Adib Global Food Supplies and Patine Leisure were among the end users to disclose results of their NewTon installations, achieving energy savings of 30% and 50% respectively. Patine Leisure utilised solar power in combination with two NewTons at its Saitama Ice Arena and in view of the impressive results would like to market the concept outside Japan.

There were collective calls from manufacturers and end users alike to make the MOE's subsidy scheme more flexible so as to not bind end users to impractical installation times. ● JR & KS



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NATURAL REFRIGERANT COMPONENTS ON PARADE

Growing interest in hydrocarbon and CO₂ systems was evident at the AHR Expo in Orlando, Florida as component manufacturers unveil a slew of new products.

— By Michael Garry

Despite travel havoc caused by winter storm Jonas, the AHR Expo held true to form on 25-27 January, attracting almost 61,000 attendees to its mammoth exhibition floor at the Orange County Convention Center in Orlando, Florida. Occupying the equivalent of 20 football fields, the Expo featured 2,063 exhibitors showcasing all manner of air conditioning, heating and refrigeration equipment.

Ninety of those exhibitors showcased components related to natural refrigerants, particularly hydrocarbons and carbon dioxide, and to a lesser degree ammonia. In an effort to discover new natural refrigerant-based products and see where the market is heading, *Accelerate America* crisscrossed the exhibition floor.

Here's a selection of what we found:

HYDROCARBONS

Brazilian compressor maker Embraco unveiled three hydrocarbon products. Firstly, the EM3 on-off propane compressor is designed for the light commercial market in North America, delivering up to 1,400 BTUs/hr of capacity. Secondly, Embraco's Fullmotion variable-speed, a bestseller in Europe, is new to the North American market for glass-door upright freezer, reach-ins and other applications. Finally, Embraco's Plug 'n' Cool propane condensing unit is a pre-charged, sealed system, which can be used as a less expensive alternative to a rack system in smaller footprint grocery and convenience stores.



Embraco's Plug n' Cool R290 condensing unit

Tecumseh Products, based in Ann Arbor, Michigan, unveiled a new platform of small compressors, the TC series, designed for hydrocarbons R290 (propane) and R600a (isobutane). The

compressors, which will be in production by the end of 2016, have a capacity range of 300-1,500 BTU/h, and would typically be used in self-contained/stand-alone beverage coolers, reach-in refrigerators and freezers, and vending machines.



Tecumseh's TC series hydrocarbon compressor

Danfoss showcased a pressure switch recently designed for R290 (propane) and a new 1.5-cubic-inch filter drier, designed for small low-charge propane units. Also on display was a fractional horsepower R290 compressor, new to the US market.



Danfoss's fractional horsepower R290 compressor



Orange County Convention Center

CARBON DIOXIDE

In January, Emerson Climate Technologies launched production on a new line of small, semi-hermetic compressors – 5, 7 and 9 horsepower – for transcritical CO₂ systems. The compressors are designed for “smaller CO₂ condensing units” on the medium temperature side, offering a capacity of 40,000 to 64,000 BTUs.



Emerson's CO₂ electronic expansion valve

Among the AHR Expo's Innovation Award winners, Baltimore Aircoil Company (BAC) received honourable mention in the refrigeration category for its transcritical CO₂ TrilliumSeries Condenser, an adiabatic gas cooler. BAC is also doing well in the marketplace with the product, selling it to retailers in the southern part of the US, where transcritical systems need a way to operate efficiently despite ambient temperatures that often exceed 88°F (31.1°C, the critical point of CO₂).



Baltimore Aircoil's transcritical TrilliumSeries Condenser

At the AHR Expo, Danfoss showcased its AKPC781 CO₂ transcritical rack and condenser controller, whose newest feature allows control of heat reclaim. The company also displayed its

AKCC550 case controller, which is new to the US; it manages electronic expansion valves, anti-sweat controls and a food safety sensor, among other functions.



Danfoss's transcritical rack and condenser controller

Bitzer, which showcased its 30 HP transcritical CO₂ compressor at its booth, plans to introduce a 50 HP version in April. The larger compressor “should greatly reduce the cost of the rack” because it will lower the number of compressors needed, said Joe Sanchez, application engineering manager at Bitzer US.

At its booth Carel promoted its CO₂ transcritical technology, which supports over 5,000 transcritical installations in Europe and is gaining a foothold in the US market. In expansive signage, Carel featured such products as the pRack controller for transcritical CO₂ compressor racks; the E3V-C high pressure electronic expansion valve, rated for 2,030 psi and used in CO₂ booster systems to manage back pressure and flash gas; and the ChillBooster controller that controls evaporative cooling for CO₂ gas coolers.

Responding to requests from OEMs to raise the maximum-rated-pressure of valves for subcritical CO₂ refrigeration systems, Parker Hannifin did so for several products that it displayed at the AHR Expo. For example, Parker raised the pressure rating for its solenoid valves (E2 to E10) and its electronic expansion valves (SER AA, A, B and C) to 70-bar/1,015 psig from 48-bar/700 psig.

AMMONIA

With the US Environmental Protection Agency warning of impending SNAP refrigerant proposals aimed at industrial refrigeration, BITZER is ready with its line of compressors designed for distributed, low-charge ammonia and ammonia-CO₂ systems.

BITZER is also getting more inquiries about its 30 HP subcritical CO₂ compressors that are used in NH₃-CO₂ cascade systems for industrial settings like food processing. “CO₂ is gaining popularity in industrial applications,” said Sanchez. NH₃-CO₂ systems also operate at much-reduced ammonia charges compared to conventional systems.



Joe Sanchez, Bitzer US

Another company at the AHR Expo promoting an ammonia-CO₂ system was Chinese manufacturer Fujian Snowman. The company, also known for its ice machines, showcased a large NH₃-CO₂ cascade system for the first time in the US; it includes compressors and a heat exchanger with connections to a condenser and an evaporator. **MG**



Fujian Snowman's NH₃-CO₂ cascade system

BLAZING A TRAIL FOR NATURAL REFRIGERANTS

Brewing giant SABMiller is recognising natural refrigerants as a key component of its sustainability strategy – and demonstrating how natural refrigerants are a winning recipe for corporate success as well as the environment.

– By Andrew Williams



André Fourie, Head of Water Security & Environmental Value, SABMiller plc.



A global presence: SABMiller plc.

Headquartered in London, SABMiller plc. is the world's second-largest brewer by revenue, with global annual sales of over €23.5 billion. Founded as South African Breweries in 1885, it is now a FTSE 100 company with operations across six continents, employing some 70,000 people in more than 80 countries.

Among SABMiller's portfolio are premium international brands such as Peroni, Nastro Azzurro, Miller Genuine Draft, Foster's and Grolsch alongside leading local names such as Pilsner Urquell, Castle, Tyskie and Lech.

André Fourie, the company's Head of Water Security and Environmental Value, is acutely aware of the responsibility that global multinationals like SABMiller share to help put the world on a more sustainable development path. This is what underpins its 'Prosper' sustainability ambitions. "When our business does well, so do the local communities, economies, and environment around us. When they prosper, so do we."

"We measure the carbon impact of the company across the value chain – we look at agriculture (the barley, the malt and the hops that we buy), we look at the malting process, we look at the manufacturing process, we look at the

refrigeration and packaging of our products, we look at the distribution process, and we look at end-of-life – so measuring carbon across all those activities is complex," Fourie told *Accelerate Europe* at his base in Woking, Surrey.

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

Measuring the impact of refrigeration is particularly challenging for a global brewing giant, with SABMiller operating different fridge models in different parts of the world. "Many of the retail sites are not under the direct control of the company on a day-to-day basis, but we think it is important to factor in the emissions from the cooling of our beers. We can't realistically say, 'we made the beer, we distributed the beer, but the fact that you're now cooling it is none of our business,'" he argues.

For commercial reasons, in recent years SABMiller has been encouraging retailers to sell cold beer. "Therefore we need to take some responsibility or accountability, from a carbon

perspective, for the energy emitted to cool it," he agrees.

Energy efficiency plays a vital role in improving the company's carbon footprint. Unlike most retailers, the bulk of the environmental impact from refrigeration for a brewer actually comes from electricity consumption. The fridges tend to consume electricity on a 24/7 basis, each day of the year. An estimated 90% of the environmental impact of the cooling of SABMiller's products over their full lifetime comes from electricity, rather than the choice of refrigerant.

GETTING AHEAD OF THE GAME: TOWARDS 100% NATURAL REFRIGERANTS

Natural refrigerants are a central pillar of SABMiller's strategy for reducing the environmental impact of refrigeration. The company is committed to using natural refrigerants in 100% of new fridges procured by 2020.

Delve deeper and the scale of this commitment becomes clear. The brewing giant owns some 900,000 fridges, making the strategic decision by such a large multinational company to adopt natural refrigerants a potential landmark moment.



The annual purchase rate of new fridges across the markets in which it is active is around 10,000. Procurement on such a massive scale plays a vitally important role in growing the market for natural refrigerant technology worldwide.

As concerns mount over the contribution of HFCs to global warming, Fourie warns that companies that fail to reduce consumption could find their operating environments constrained over the next decade.

Fridges tend to have a 10-15 year lifecycle. "If the world changes and you don't either change with it or get ahead of the curve, you'll end up with assets which the world values differently than ten years previously," he warns.

"It was important for us to try and get ahead of that game, in terms of moving in the direction we thought would

be the most appropriate, which is to phase out HFCs and to phase in natural refrigerants," he says.

Having taken the decision to switch to natural refrigerants, Fourie stresses the importance of keeping up the momentum. "Despite some challenges, we are pleased that we're currently on track to meet our commitments," he insists.

"Once the curve bends, it goes quite quickly. Once the suppliers have one or two models, all of a sudden their competitors are under pressure to have similar models, they have more confidence, and their maintenance suppliers quickly make the shift to support the industry," he says.

"We know that there will be a disproportionate shift towards the end. The tough part is in the beginning."

SABMiller is keen to make the financial case for adopting natural refrigerants for fridges. Fourie himself is confident that fridges using natural refrigerants are cheaper to run. The company is currently collecting data from its suppliers and retailers to help demonstrate this. "We've had very encouraging data. There are definitely financial savings for the retailer, and at the same time, CO₂ savings."

Customers want the best fridges, at the best price, at the best energy performance. "It's about getting to a critical mass – once you see that it's either the same cost or cheaper, that it's better for the environment, and that the customer is happy," he says. "It's about how we get the market to a place where you're being rewarded for the right things."

In Poland, for example, where SABMiller has deployed the highest number of natural refrigerant-based equipment, the market is already reaching a point where the best performing and best value fridges on the market use natural refrigerants.

COOPERATION WITH PARTNERS HOLDS KEY TO MAKING BUSINESS CASE FOR NATURALS

Recently, SABMiller became the 5th member of Refrigerants, Naturally! – an initiative of international companies taking action against global warming and ozone layer depletion by replacing harmful greenhouse gases in point-of-sales cooling and freezing units with climate-friendly natural refrigerants.

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

Fourie is keen to stress the importance of working together with global partners to tackle the challenges facing our planet. "It's part of our understanding that in just about all the areas in which we invest in terms of sustainable development, the challenges and the solutions are bigger than us as a company," he explains.

He cites carbon emissions, sustainable agriculture, and water among the main areas of activity in which SABMiller as a global brewing company can help to make a difference to the environment. "In none of those areas can we solve the problem on our own. It's much bigger than us. We need partners. We need policy. We need regulation. We need innovation. We need NGOs. We need commercial partners," he says.

It is this understanding that drove SABMiller to get involved with groups like Refrigerants, Naturally! and the Consumer Goods Forum...of which more later.

continued on p.36



IN NUMBERS

1895

FOUNDED IN 1895

SABMILLER
HEADQUARTERS

20

A FTSE 20 COMPANY

200+

MORE THAN 200
LOCAL BRANDS

11%

11 % VOLUME GROWTH
IN 2015

70,000

EMPLOYS OVER 70,000 PEOPLE

26

GLOBAL ANNUAL
SALES OF OVER
\$26 BILLION

140,000

EVERY MINUTE OF EVERY DAY
MORE THAN 140,000 BOTTLES
OF SABMILLER BEER ARE
ENJOYED AROUND THE WORLD

21

21 BILLION LITRES
OF BEER SOLD
PER YEAR



9 OF SABMILLER'S LEADING BRANDS AND WHERE THEY ARE ENJOYED

- 1 
- 2 
- 3 
- 4 
- 5 
- 6 
- 7 
- 8 
- 9 

Fourie says it was particularly helpful to see other major multinational brands like Red Bull, Unilever and the Coca-Cola Company commit to sustainable business practices under the Refrigerants, Naturally! umbrella – both in terms of seeing how other companies have overcome some of the obstacles involved in wider uptake of natural refrigerant solutions, and in raising awareness of SABMiller's sustainability initiatives among its own workforce.

"It brings credibility. It was as much about us recognising our internal progress for our internal audiences, for people to see that we're now part of that group and that we're being recognised for what we've done, in order to encourage the journey."

The company also plays an active role in pushing for stronger government policies on phasing down HFCs. "We understand that regulation is critical," Fourie says.

This is where the Consumer Goods Forum (CGF) comes to the fore. In 2010, the CGF – which brings together over 400 manufacturers and retailers of consumer goods seeking to pursue more sustainable, safer and consumer-friendly business practices – adopted a resolution recognising that the HFCs used in the majority of refrigeration systems are powerful greenhouse gases and pledging to start the process to replace them with naturals.



Fourie at his Woking base

Fourie recently assumed the chairmanship of the CGF's Refrigeration Working Group. "There is a clearer policy logic for this group to explore how it can improve the environment for more sustainable refrigeration of their products," he says.

The 2010 resolution saw some of the world's biggest companies pledge "to begin phasing out HFC refrigerants as of 2015 and replace them with non-HFC refrigerants (natural refrigerant alternatives) where these are legally allowed and available for new purchases of point-of-sale units and large refrigeration installations".

NATURAL REFRIGERANTS GAINING GROUND

Fast-forward to this year, and CGF members have installed low-carbon refrigeration systems in over 4,000 supermarkets and four million ice cream and drinks chiller units worldwide. The majority of these systems use natural refrigerants. And in January, they agreed to consider increasing their use of natural refrigerants as an alternative to climate-damaging HFCs ([see box on page 39](#)).

SABMiller is working with partners in both bodies to ascertain which policy processes would be most helpful to promote. Think about how helpful it would be for a business voice to speak out in favour of the F-Gas Regulation in Europe, he enthuses.



Not everyone may agree on exact formulations, dates, or targets. "But to say, 'this is the type of regulation that we want in the rest of the world,' whatever the appropriate timeline – I think that would be possible. It could be powerful," Fourie argues.

Having business voices commit to including HFCs in the Montreal Protocol would also be a massive step forward. "To positively state this, not just saying that's something we'd tolerate – rather saying, 'that's something we want to encourage'. Having a global, enforceable agreement rolled out across the world would be powerful," Fourie adds.

Business voices need to be careful about how their actions are perceived, he says, admitting that this may lead some companies to exercise caution in calling for strong regulation. And yet he is also in no doubt about the vital role that regulatory action can play in forcing businesses to move decisively.

In Europe, for example, the EU F-Gas Regulation has helped to focus business minds on the need to phase out HFCs. "There is only one reason why our European business is ahead of the rest – and that's because regulation has moved faster in Europe."

In turn, regulation plays a key role by triggering overarching cost structure changes, investment in new suppliers, technological innovation, and new maintenance processes. "So it's a package. You cannot deny that regulation is a very important part of that," he states.

PARIS CLIMATE ACCORD: AN OPPORTUNITY FOR NATURAL REFRIGERANTS?

Some manufacturers and end users of natural refrigerants – including Carrier Commercial Refrigeration, Dorin, EVAPCO, Unilever and the Coca-Cola Company – broadly welcomed the historic climate agreement reached among nearly 200 countries at COP21 in Paris last December.

They saw business opportunities in delivering a zero-emission economy and in reducing HFC use to help keep the global temperature rise below two degrees Celsius. They feel the deal

gives clear momentum to the heating, air-conditioning and refrigeration industry to seek viable alternatives to substances with high global-warming potential.

Fourie shares the enthusiasm about the accord. However, he is more cautious on the implications for sustainable refrigeration. He felt that in Paris, the policy discussion around refrigerants was not strong enough. But with national governments now charged with coming up with national plans to deliver on the global objective agreed at COP21, a new window of opportunity might be about to open.

"The fact that national governments now need to work out their own targets for how they're going to get there is really important, and hopefully over time they'll see some opportunity in refrigeration," he says.

Fourie suggests the G20 group of the world's major economies holds more promise for phasing down HFCs – with the majority of its governments supportive of taking decisive action. What if the CEOs of the world's 20 biggest companies were to echo a political agreement with a similar declaration themselves? "I think that would be quite powerful," he says.

Fourie hopes that by sharing SABMiller's experiences with his counterparts from other companies, he can inspire others to commit to natural refrigerants. "That's very much part of the journey – to inspire and challenge, but also to learn and to find consensus," he says.

EU POLICY ACCELERATING HFC PHASE-DOWN IN EUROPE

Policy certainty has played a key role in accelerating the phase-down of HFCs in Europe, particularly by helping to create a stable market for replacements. To a certain extent, the F-Gas Regulation is already triggering business investment in natural refrigerant solutions. "Over the years it was quite clear which direction it was going. The suppliers started moving in that direction," Fourie says.

continued on p.38 →

→ In turn, this triggers price drops. "That's just the way technology goes. Once suppliers are convinced this is the direction that it's going, the market takes action," he explains.

In Europe, Fourie estimates that around 90% of SABMiller's new fridges are already HFC-free. "From next year, the only equipment which will not be HFC-free are particular models, where our staff have ordered something because they can't find it in an HFC-free model yet. Europe has been the easy part," he explains.

In Europe, where hydrocarbons such as propane (R290) are already widely used for refrigeration purposes – particularly in the beverage sector – the company has found it more straightforward to implement the switch to natural refrigerants.

As the European market for hydrocarbons grows, suppliers are growing with it – making it easier for companies like SABMiller to source large numbers of new fridges at the scale needed to make a decisive move away from HFCs.

Other parts of the world, particularly Latin America and Africa, have proven to be more challenging. "It's a story of Europe, and then the rest! In Europe, we're over that hump now," he says. But suppliers in other regions are often wary of initial investment costs, and infrastructure challenges can mean that safety is more of a concern.

He firmly believes that the more companies adopt natural refrigerant solutions, the safer they will become. "One explosion in a million is one too many," he says, warning that it would be irresponsible to promote equipment in parts of the world where maintenance is not always of the same standard as Europe.

"Of course, many of them either have international parents or connections, so they know where this is going. But to make that initial investment in terms of setting up new models, testing them, getting them into the field, getting new maintenance suppliers – it's costly for them too," Fourie concedes. But he is keen to report that he is seeing progress in both regions.

'MAKE MINE A NATURAL': MARKETING THE ADVANTAGES OF NATURAL REFRIGERANTS...

Having chosen to phase out HFCs, did SABMiller plc. consider other options such as synthetic refrigerants before opting for 100% natural refrigerants? No, says Fourie. "Our decision was that when you're moving, you may as well move out of HFCs. Why repeat what we had with CFCs? Let's not repeat that. It's quite clear which way the world is going."

Customers tend to sell SABMiller's products in small fridges in small stores, making CO₂ (R744) or propane (R290) obvious choices of refrigerant.

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

...AND PUTTING THEM AT THE HEART OF SABMILLER'S ACTIVITIES

Currently, SABMiller's policy is to adopt propane as the refrigerant of choice for trade fridges, because they understand its use very well. However, some retailers prefer CO₂ – particularly for soft drinks, a sector in which some of the firm's commercial partners operate – so the company decided against imposing one particular refrigerant on their retailers.

"We're entirely comfortable with CO₂. When we buy it ourselves, we prefer to use propane."

All SABMiller's breweries use ammonia – another natural refrigerant – for industrial refrigeration purposes.

"We used to operate quite distinct ammonia systems in different parts of the breweries. We're getting better at managing it more centrally and making sure that they are efficient. But that's very much at brewery efficiency, layout and operations level," Fourie says.

Brewers and retailers alike are acutely aware of the challenges of operating in a very competitive global beverage market. For retailers, "appearance is very important. The fridge is their display cabinet," Fourie says. It is therefore essential to ensure that the beers look appealing. "Your visual display is very, very important," he says.

In South Africa, for example, people tend to socialise in small venues known as 'taverns': localised licensed drinking places in townships. "There, we have competing brands. So it's very important for us to ensure that our beers are stocked properly, that they're branded properly, that they're visually attractive – all at the same time," Fourie explains.

For this reason, SABMiller also encourages its retailers to use energy management devices to ensure that the beer is ready to be sold at the optimal temperature when the shop opens.

"In a smaller retail store, the fridge is often the most important piece of kit in the whole shop. It's quite visual – so it's often the central, focus feature of the store," Fourie says. An important factor for all the company's fridges, therefore, is to show off the goods – regardless of which refrigerant is inside.

On the retail side, in larger markets, SABMiller draws up contracts with direct service providers, whose telephone number will be clearly visible on the fridge. They take care of maintenance and tackle any faults with the refrigeration equipment on SABMiller's behalf.

Perhaps the fridges are not cold enough, or the lighting does not function properly. In smaller markets, "because we're delivering beer all the time, they would be very quick to tell us, 'this fridge that you brought us doesn't work'," Fourie explains.

For many food retailers, distribution also plays a large role in their refrigeration footprint. But SABMiller took the strategic decision not to go down that road.



"By and large, we don't transport our beer cold. And in many cases, we don't own the transport," he explains. In fact, the company actively discourages the transportation of cold beers, which it sees as a waste of energy. "Because you unpack them, and they get warm again."

"It used to be quite common in the US to transport beer cold. But that's changed over time," he adds.

CHANGING TIMES AHEAD

In November 2015, AnheuserBusch InBev – the world's largest brewer – agreed a merger with SABMiller in a deal that will combine the planet's two largest beer makers.

Headquartered in Leuven, Belgium, AB InBev boasts a portfolio of over 200 brands including Budweiser, Stella Artois, Leffe, Beck's, Hoegaarden and Corona. With a total market share of over 20%, it employs over 155,000 people in 25 countries.

Asked what effect the merger would have on SABMiller plc's environmental practices, Fourie is keen to stress that it is too early to speculate. Nevertheless, he states that SABMiller will be keen to promote the lessons learned from all its environmental initiatives.

"There are lessons we have learned on how to save energy from making beer, how to manage water risks to our operations and how to make refrigeration sustainability have environmental and financial value for us and our partners. All this is an important part of our story. These are things that we will be sharing with them," he says.

If approved by regulators, the merger is expected to take place in the second half of 2016. The newly created firm would produce about 30% of the world's beer. **AW**

CONSUMER GOODS INDUSTRY CONSIDERING BROADER USE OF NATURALS

On 20 January, the CGF board formally triggered the development of a potential new resolution demonstrating industry's commitment to further increasing natural refrigerant uptake in the coming years.

"The CGF has been a leading voice on phasing out harmful HFC refrigerants since 2010. And, although 2015 is now over, we remain committed to helping members amplify the impact of their solutions and in bringing the entire industry forward," said SABMiller's Fourie and his CGF refrigeration group co-chair Emma Coles (Vice-President, Responsible Retailing at Albert Heijn and Royal Ahold).

CGF members' experiences have helped to raise industry awareness of natural refrigerant technologies, their performance and the availability of trained installers and maintenance engineers.

For some, the switch to naturals can pose particular challenges, for example in terms of financial implications, operational issues or how different systems work in different climates. CGF member companies had to work with each other, governments and technology suppliers to overcome such problems.

"This has helped us to discuss the barriers and solutions to a faster and geographically wider uptake of natural [...] refrigeration systems, [to] help those that haven't yet explored or invested in these refrigeration systems to realise the benefits of doing so; and [to] give suppliers confidence that the sector is interested in this technology," Ignacio Gavilan, director (sustainability) at the Consumer Goods Forum, told *Accelerate Europe*.

Consideration of further steps to boost uptake of natural refrigerants begins now.



MIGROS PUTTING CO₂ REFRIGERATION TECHNOLOGY AT HEART OF CLIMATE STRATEGY

Switzerland's biggest retailer Migros is aiming to become a leader in climate protection and energy savings under its 'Generation M' sustainability programme. In its latest effort to trial and spread state-of-the-art CO₂ refrigeration technology, Migros partnered with system engineering expert Frigo-Consulting in its Ibach store to save 45% energy while setting new benchmarks for using ejectors across Europe.

- By Nina Masson

"We knew that if this project [to install a parallel compression CO₂ system with ejectors] would fly, others – including our competitors – would benefit from this, too. That's alright for us – others should be able to do so," argues Daniel Duss, head of building and technology at Migros Luzern, at the close of his meeting with *Accelerate Europe* at the firm's Luzern headquarters.

Duss paints a picture of Migros – Switzerland's largest retailer, the country's largest supermarket chain and its largest employer – as a group with well-defined reasons to invest in refrigeration technology as a crucial part of its drive to place long-term financial success on a sustainable footing.

"We want to be a partner for a healthy lifestyle that promotes the 'together' in our activities. For us, it is very important that Migros offers a broad range of sustainable products and services, and that it sets high standards for climate protection and resource efficiency," he explains.

Duss is responsible for turning Migros Luzern's commitments into reality by planning new stores and refurbishing existing ones. He works for one of 10 entities which together make up the Migros Group, run as a cooperative society of which a large proportion of the Swiss population are members – around two million of Switzerland's eight million-strong population. Owned by its own customers who can vote in the cooperative's general assembly, more than 90% of its goods are produced by 90 Migros subsidiaries. In addition to supermarkets of various sizes, the Migros portfolio includes petrol stations, electronics stores, DIY stores, garden centres, fitness centres, banks, bookshops, sports shops and many more.

No surprise, then, that the Migros Group's energy and climate commitments are primarily guided by a strategy that binds all Migros companies and includes ambitious targets to reduce energy consumption and environmentally harmful emissions by 2020. Chief among its 2020 goals are reducing electricity consumption by 20% and fossil fuel consumption by 55%, as well as reducing the climate impact from refrigerants by 60%.

"Migros's sustainability programme 'Generation M' signifies a balanced approach towards our activities concerning economic, ecological and social consequences, with the target of ensuring the long-term success of the Migros Group," explains Duss, before adding that progress in the field of refrigerant emissions is measured year on year to verify that the group and its ten entities are still on track to meet their 2020 targets.

A GREEN COOLING LEADER

Mindful of the harmful effects of synthetic refrigerants, the Migros Group is committed to using natural refrigerants in its supermarkets and in other Migros companies. Migros phased out a large proportion of HCFCs in 2014. As an alternative to synthetic refrigerants, it is focusing strongly on the natural refrigerant CO₂.

Migros has made R744 applications a standard across its supermarkets with the aim of adopting the technology in new and existing stores. By 2014, Migros was using CO₂ in 455 of

“ This is a quantum leap for CO₂ refrigeration systems in terms of efficiency - not only in Switzerland, but beyond.”

- Marcus Hoepfl, Frigo-Consulting



Frigo Consulting's Markus Hoepfl

continued on p.42



Harnessing the benefits of R744

- the 2,000 systems in operation throughout its stores. Around a third of Migros stores have at least one CO₂ cooling system. For its work with environmentally friendly refrigerants, Migros was named a Green Cooling Leader by the Environmental Investigation Agency in 2014.

"Our aim remains 100% CO₂. But knowing when we will have reached this goal would be to read tea leaves. I only know that we have an ambitious five-year plan, and that for every single construction project we will discuss the question of which type of CO₂ system we will best use," says Duss.

Migros Luzern alone operates 53 stores with refrigeration systems out of which 28 use CO₂ as a refrigerant. Last year it replaced three existing systems with R744 and in 2016 will do another five. Its use of natural refrigerants goes even further than that, since in 2010, all three buildings in their headquarters in Dierikon, near Luzern, were changed from R22 to ammonia-based cooling systems.

THE IMPORTANCE OF A PROGRESSIVE PARTNER

Migros has partnered with refrigeration system engineering expert Frigo-Consulting to carry out innovative projects in Switzerland. The fact that Frigo-Consulting has engineered a greater number of CO₂ transcritical than subcritical installations has gone hand-in-hand with the drive of far-sighted customers such as Migros. "It was our conscious decision to take the risk and move towards transcritical systems, and there was

also a smooth pressure coming from progressive customers," explains Marcus Hoepfl, managing director of Frigo-Consulting International Ltd.

"When testing new technologies, there is a big need for brave customers ready to invest in the latest technologies and who do not solely look at the very short-term return on investment. Migros is a good partner for this, and it was in a Migros store that Frigo-Consulting installed the world's first CO₂ ejector system in 2013," Hoepfl says.

Duss from Migros confirms this, saying that one of the retailer's largest triggers for action is simply having proactive engineering partners who approach them with new refrigeration technologies and concepts to test and then commercialise. "We will always listen if our partners come to us asking us to field-test a new solution that is more energy-efficient than the previous one and that will at some point also become more cost-competitive."

continued on p.44 →

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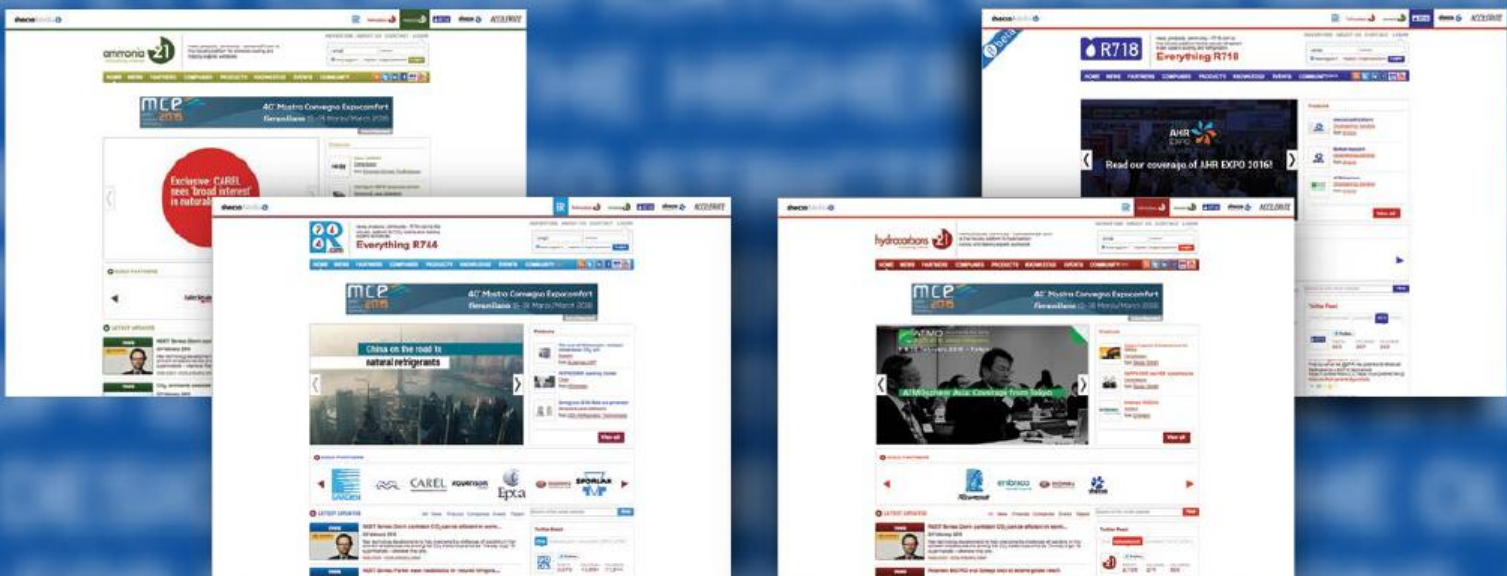
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→ MIGROS IBACH STORE: A BLUEPRINT TO FOLLOW

Being aware of the importance of further establishing CO₂ technology and of eliminating its drawbacks in warmer climates, Frigo-Consulting was looking for a partner to take the ejectors one step further.

The refurbished Migros store in Ibach, Switzerland, provided such an opportunity to install and optimise a CO₂ system with parallel compression and ejectors. The advanced CO₂ refrigeration system supplies 170 metres of medium and low-temperature cabinets and 280m² of cold rooms and freezers with cooling capacity. Two identical CO₂ booster units provide a total of 250 kW of refrigeration capacity. Frigo-Consulting developed the solution together with Italian rack supplier enEx, which provided the ejectors. Swiss system contractor Alpiq Intec West installed the system in November 2014.

Results are highly encouraging after one year of operation. The facility has achieved an increased efficiency of at least 25% compared to traditional CO₂ systems, and of 45% compared to the HFC-based previous system.

"This is a quantum leap for CO₂ refrigeration systems in terms of efficiency not only in Switzerland but beyond, especially in wiping away the so-called 'efficiency equator' for CO₂ transcritical systems in warmer ambients," enthuses Hoepfl. He is convinced that it is only a matter of time before ejector technology becomes more widespread and will ultimately become state-of-the-art in retail and industrial refrigeration.

Migros Luzern echoes this enthusiasm. "Frigo-Consulting's team convinced us that with this innovative solution we could save a lot of electricity. This was our largest driving force. We knew there were risks, financial and from a technology perspective, but Migros decided to take this risk. Today, we know that the system will be amortised in a very short period of time and that any additional costs became small enough to make it a worthwhile investment," says Duss.

EJECTOR TECHNOLOGY: SETTING NEW BENCHMARKS FOR CO₂ REFRIGERATION EFFICIENCY

The significant increase in efficiency for a system using parallel compression in combination with ejectors compared to conventional CO₂ refrigeration systems is attributable to three effects. First, the CO₂ refrigerating units are designed to ensure that all medium and low-temperature evaporators can be operated "partially flooded". This means that the refrigerant is still partly liquid at the outlet of the evaporators. This increases the heat exchange efficiency of the evaporators significantly and the product temperature can be guaranteed despite the higher evaporation temperatures. The exceptionally high evaporation temperatures of -2°C or -26°C compared with conventional refrigerating units with average values of -8°C and -33°C results in significant savings of electrical energy. The high temperature levels in commercial refrigeration are set to create new benchmarks worldwide.

Using five ejectors for each CO₂ refrigerating unit boosts efficiency significantly. Driven by pressure differences in the system – which range from medium to high pressure – the ejectors convey liquid or gaseous refrigerants. The liquid refrigerant in the medium temperature suction line receiver is returned to the medium pressure receiver, after which it is brought back to partially flooded evaporators. The gaseous refrigerant, which has been pre-compressed by the ejectors in the medium pressure receiver, is further compressed into high pressure by the parallel compressors. The five ejectors allow the system to react to all operating conditions and load situations and deliver the highest possible operational reliability.

Ensuring constant operation, the systems are planned in a way that they can normally operate as CO₂ booster systems even without the ejectors. The risk of a total failure can be minimised that way, Duss confirms.





AN INTEGRATED APPROACH TO A RETAILER'S ENVIRONMENTAL SAVINGS

As a result of the system's reliability and efficient operation, Migros Luzern confirms that another CO₂ ejector system has been installed, with two more in the process of being commissioned. As regards its long-term strategy, the retailer plans to use ejector technology in medium to large-sized stores, while smaller store formats up to 1,000 m² will use standard CO₂ booster technology.

To complement its natural refrigerant strategy, Migros is using propane in new plug-in refrigeration systems. While it has not yet looked into optimising refrigerant emissions in transport and other refrigeration or heating applications, the Swiss group has dedicated further investment to optimising the use of environmental technologies in its stores.

In 2011, Migros became the first retailer in Switzerland to use glass doors on its refrigeration cabinets, reducing power consumption by 30-45%. 167 branches have since been fitted with glass doors (fully or partially), with more conversions to follow. This corresponds to 5,400 metres of cooling units. While the use of doors, especially in larger store formats, is not yet mandatory, Duss hopes that this might change within the next few years.

LED lighting has been used as standard in Migros supermarkets since 2013, and in its specialist stores since 2014. LED technology is also used as standard in all new buildings and conversions. In its latest

sustainability report from 2014, the retailer notes that 236 supermarkets (38%) and 66 specialist markets (28%) were partially equipped with LED lights, with more to follow in 2015.

Last but not least, Migros has adopted the 'Minergie' passive house standard for new constructions, minimising total energy consumption in buildings. Energy savings from the refrigeration system in isolation, therefore, become less significant in themselves.

"The Swiss government and organisations providing incentive schemes for better refrigeration, lighting or other technology with energy savings potential are raising the bar every single year. We are constantly tasked with increasing our efforts to get still better energy efficiency results. What was good enough two years ago won't do today. Migros has its own yardsticks for success and will continue to reduce its negative impact, despite the projected expansion of its operations," says Duss, confident about driving change. ● NM

STORES KEEP THEIR COOL AS SPANISH CO₂ TRANSCRITICAL MARKET HOTS UP



More and more retailers in Spain are turning to or trialling advanced CO₂ transcritical solutions in response to the economic and political climate. In anticipation of this year's Mediterranean-flavoured ATMOsphere Europe, which will be held in Barcelona, *Accelerate Europe* looks at some of the retailers that are pushing the boundaries in Spain.

– By Robert Davidson & Pilar Aleu

Europe has over 5,500 stores using CO₂ transcritical refrigerant systems to keep their products cool. While this number continues to grow year-on-year, there is a clear division between the north and south of Europe in terms of market adoption rates. This division is typically described as the 'CO₂ equator' and rests on the thermo-physical principles of CO₂, which means its efficiency is reduced above its 'transcritical' point of 31.1°C.

This inefficiency has previously led to doubts over the applicability of CO₂ booster systems – which are typically used in northern climates – to Mediterranean countries such as Spain, Italy and Greece. Over time, however, more advanced solutions that mitigate this inefficiency have gained traction. The use of technologies such as parallel compression, ejectors and adiabatic gas coolers have all contributed to the ongoing evolution of CO₂ in hotter climates, particularly in Spain.

SPANISH BUSINESS CASE FOR CO₂ TRANSCRITICAL STRENGTHENING

The use of CO₂ itself in Spain is nothing new. The majority of the retailers surveyed by *Accelerate Europe* noted their past experiences with using CO₂/R134a cascade systems. The graduation to more advanced CO₂ transcritical solutions is more of a recent phenomenon. Carlos Relanzón, head of facilities management in the development department at Consum, notes that the Spanish retailer's decision to introduce CO₂ transcritical stores where possible came about in 2015.

"In 2014, we opened new stores equipped with CO₂ subcritical systems. In 2015, we decided to move one step forward and use CO₂ transcritical systems wherever possible."

One of the drivers of this adoption across Spain is the recent implementation of a tax on f-gases. The tax, which was put in place in January 2014, targets fluorinated greenhouse gases – including hydrofluorocarbons (HFCs) – with a global warming potential (GWP) greater than 150. This translates into considerable costs for retailers that use HFCs in their supermarket systems. Speaking in 2015, Gabriel Romero,



Inside Supermercados Hiber

technical director at Auchan Super Spain, noted that, "with the new Spanish f-gas tax, we face a potential penalty of three million euros".

Alongside drivers such as the phase-out of high-GWP HFCs such as R134a and associated taxes, the promise of improved energy efficiency appeals greatly to retailers searching for new solutions. Gabriel Ruiz, general manager at Supermercados Hiber, explains:

"CO₂-based technology results are very attractive in supermarket installations, where the payback period is relatively gradual and equipment has a long life expectancy [...]. It allows for about 30% energy savings compared to traditional systems plus the return of investment is also quick [three years]."

INNOVATION SPIKES AS ROLLOUT WIDENS IN SPAIN

As CO₂ transcritical continues to enter Spain, the market is gradually getting more acquainted and familiar with the technology. José María De Santos, Makro's Head of Refrigeration Installations, says:

"Transcritical installations are not really as complicated as people believe. Once we know the performance of a CO₂ transcritical booster system, then the greatest difference from other systems is their high operating pressures."

This familiarity is increasing confidence in the system type and engendering the use of innovative solutions. Makro is showing a growing interest in newer, more advanced systems. De Santos explains:

"The installation at Makro Barajas [Madrid] has been equipped with parallel compressors. We are currently studying the performance of the installations. We also follow very closely the evolution of systems with ejectors to evaluate its performance."

Consum is going a step further by rolling out trials of CO₂ transcritical systems in all regions of Spain, including in the intense heat of the very south. The installation of a CO₂ transcritical system in Murcia will be used to test the capabilities of the system for future stores. Consum note that:

"We will get the data and analyse the energy efficiency levels so that we can decide if we continue doing it or [if] we just limit it to specific latitudes."

LIMITATIONS WITH TRAINED TECHNICIANS IN CO₂

While market uptake is steadily growing and retailers are trialling new solutions, it would be premature to declare CO₂ transcritical a future-proof solution. Makro notes:

"We still have a lot to do regarding this technology and there are a lack of prepared and skilled professionals on CO₂."

Consum is encountering similar challenges but is proactively addressing them. The company has organised four internal training courses to train staff in conjunction with the system supplier and believes that the industry must group together to ensure a better market climate for CO₂ transcritical solutions. "The main handicap is training for installers and maintenance. Most of them are not prepared or don't have a chance to work with this kind of installation. It will take a bit of time, three or four years."

Due to potential limitations such as the lack of trained engineers or crucial efficiency testing in the south of Spain, the use of CO₂ transcritical systems remains on the cusp of expansion. If these challenges are overcome, we could finally see the south catch up with the north – with CO₂ becoming standard across the continent. **RD & PA**

PUSHING FOR CO₂ IN JAPAN

Retail powerhouse AEON is seeking to fulfill its commitment to CO₂ refrigeration by overcoming challenges in the Asian market

— By Yukari Sahashi



Haruko Kanamaru, AEON

AEON Co. Ltd., the holding company for AEON Group, is the largest retailer in Japan as well as Asia as a whole, and one of the biggest global retailers. It is also one of the most ambitious proponents of natural refrigerants in the world.

AEON, based in Chiba, Japan, staked out that position in 2011 when the group issued its 'AEON Declaration on Natural Refrigerants,' committing to introduce natural refrigerants, specifically CO₂, at all new stores opening in and after the fiscal year 2015 (which ends on 31 March 2016), while also converting 3,500 existing stores to natural refrigeration. The company was the first retailer in Japan to use CO₂ refrigeration in its stores.

As of the end of the 2015 fiscal year, AEON will have installed CO₂ transcritical condensing units in 45 stores, somewhat behind schedule. But the company is working hard to overcome the challenges that are impeding its progress.

The air-cooled condensing units, from Panasonic, typically use 15 or 20 HP and are located either on the roof or next to the building. A supermarket between 20,000 and 45,000 square feet would employ 10-20 of these condensing units.

The massive scope of its operation underscores the daunting nature of AEON's environmental initiatives. In Japan alone, as of February 2015 it had 541 general merchandise stores, 1,929 supermarkets, and 2,151 convenience stores. It operates 207 shopping malls and over 4,600 convenience stores in Asia outside Japan.

All told, it runs over 18,700 stores across 13 worldwide businesses (mostly Asia), with its largest food-store representation in Japan, the Philippines, South Korea, China and Thailand. Its total revenue in the fiscal year 2014 came to 7,078 billion yen (\$63 billion), the most among Japanese retailers.

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“ We reached the conclusion that natural refrigerants are what we are to pursue in the future.”

- Haruko Kanamaru, AEON

→ FIRST IN JAPAN

AEON began its natural refrigerants journey in 2009. To give the technology a try and see for itself what results it would bring, AEON launched a CO₂ refrigeration system – the first in Japan – in the food section of a one of its supermarkets. The results suggested that the increased initial costs should eventually be recovered through reduced energy consumption and running costs, creating a positive momentum within the Group towards the full-scale adoption of such systems.

Once it had confirmed the safety of the system and was able to achieve 20% energy savings – larger than expected – compared to conventional HFC equipment, “we reached the conclusion that natural refrigerants are what we are to pursue in the future,” said Haruko Kanamaru, general manager of the corporate citizenship department at AEON.

Between 2009 and 2011, AEON piloted a Panasonic refrigeration system using CO₂ at its MaxValu Express Rokugo Doteeki store in Tokyo, with financial support from the New Energy and Industrial Technology Development Organization (NEDO).

The pilot served as an important stepping-stone for AEON Group, which at that time was moving towards the adoption of CO₂ refrigeration systems for its energy-saving benefits. Since then, the Group has been expanding its use of CO₂ refrigerant, as described in a presentation by Kanamaru at an ATMOSphere Asia conference organised by shecco in November 2014.

Following the pilot introduction of the CO₂ refrigeration system in 2009, AEON continued the installation of CO₂ at MaxValu stores in Fukuoka Prefecture in 2010 and in Hyogo Prefecture in 2011. At that point, each of these stores demonstrated about a 10% reduction in energy use and a 50% drop in CO₂ emissions compared to conventional refrigeration units, providing the company with an adequate basis to evaluate the safety and stability of the new system.

In 2012 and 2013, the Japanese Ministry of Economy, Trade and Industry (METI) chose AEON for the funding programme ‘Pilot





CO₂ showcases at AEON's Kisarazu store

Projects to Reduce HCFC and HFC Emissions Through Energy-Saving Technology'. This funding allowed AEON to install CO₂ refrigeration equipment at five supermarkets. For small-scale stores like AEON's Ministop convenience store chain, the company set a goal of reducing energy consumption by 20% compared to conventional Freon-based equipment; some of the freezer cases installed at Ministop locations exceeded the goal by achieving as much as a 30% reduction.

Since 2014, AEON has received funding from the Ministry of Environment (MOE) under its project 'Promotion of Energy-Saving Natural Refrigerant Equipment Based on Advanced Technology'. This allowed the company to increase the number of its general merchandise and convenience stores using CO₂ refrigeration, with 28 stores getting equipment in 2014.

In addition to Panasonic systems, some of these stores are equipped with the Mitsubishi Electric Corporation's self-contained CO₂ showcases for beverage and alcohol products. AEON is willing to consider other natural refrigerants, such as propane-based, self-contained refrigeration showcases, "as long as the safety and reliable performance are assured," said Kanamaru.

DEALING WITH CHALLENGES

While AEON is set on pursuing CO₂ installations in new and existing stores, it has encountered a number of challenges and concerns along the way. So far, deployment is behind schedule; in particular, the conversion of existing stores is not seeing smooth progress.

One factor is the long business hours of its convenience stores and supermarkets, making it difficult to temporarily stop operations to replace the refrigeration equipment. "It is, realistically speaking, extremely difficult to convert to natural refrigeration at all our existing stores," said Kanamaru.

The natural refrigerant market is another issue. When AEON made its natural refrigerants declaration in 2011, it expected market conditions to improve with time, but they have not, said Kanamaru. "The major bottlenecks remain the same."

One of those remains high capital and installation costs of natural refrigerant equipment. Panasonic currently provides nearly 90% of the CO₂ equipment used at AEON stores, and more competitors are not expected to step up in the immediate future.

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AEON by numbers

* As of February 2015

13

Number of markets

18,740

Total stores

\$63 billion

Total revenues

4,683



Convenience stores

2,030



Supermarkets

381



Discount stores

618



General merchandise stores

→ But Kanamaru sees several counterbalancing factors. One is that she has high expectations that the funding scheme for introducing natural refrigerant equipment administered by the Ministry of Environment will continue "until it is only natural for each company to choose natural refrigerants without financial concerns".

She also notes that the running costs of natural refrigerant systems are less than those of legacy systems, and that natural refrigerants are the "future-proof choice" as they are not among those refrigerants to be prohibited by Japan's revised f-gas regulations.

Moreover, she anticipates that more system manufacturers will join the market and develop natural refrigerant systems, rather than engaging with the repeated question of "demand first or supply first," which prevents the number of such manufacturers from increasing. Kanamaru also believes that developments in the US market are important elements "to bring changes to the Japanese market".

Kanamaru also thinks that further technological progress will help to solve cost-related issues. For example, the development of larger CO₂ systems and showcases to meet the needs of bigger food sections would cut down on the additional costs of installing numerous small-scale systems.

AEON hopes to play a leading role in boosting the entire market by working in close cooperation and exchanging information with other businesses in the industry. For example, it offers store visits and tours for those in the retail industry and promotes the sharing of knowledge through the Japan Chain Stores Association.

In an effort to communicate information on natural refrigerants to its consumers, AEON describes its initiatives in annual reports for consumers and investors, as well as applying labels and point-of-purchase ads in stores.

These activities are aimed at motivating consumers to ultimately ask other companies: "Why have you not made the decision to go natural?" **YS**



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

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

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AMMONIA: A STABLE INGREDIENT IN THE EVER-CHANGING WORLD OF FOOD LOGISTICS

In a very transient and changing sector, “the only stable ingredient I can see at the present stage is ammonia,” says Chris Sturman, chief executive of the Food Storage and Distribution Federation. Safety concerns surrounding its use can be resolved with clear regulations, making ammonia a viable long-term solution as the alternative to HFCs and addressing the need to fully comply with f-gas regulations.

– By Blanka Zoldi & Robert Davidson

Anyone working in a particular industry for over 30 years is sure to acquire a broad understanding of the various trends driving change in their sector. This can certainly be said of Chris Sturman, chief executive of the Food Storage and Distribution Federation (FSDF), which represents the food and drink logistics sector in the UK.

BIG CHANGES DRIVEN BY HFC PHASE-DOWN

At the start of his career, Sturman was operating ammonia systems but as time went on he saw the sector transition towards R12 and R502, which were subsequently phased out and replaced by the now moribund R22. He also saw R134a

and R404A become increasingly popular, and again watched on as they became subject to what is in effect a binding phase-out. Sturman now sees the market at a crossroads: expand its uptake of low-GWP HFCs and repeat history, or do a full-360 and return to tried and tested ammonia systems.

“In Europe there has been a significant amount of change, mainly because of the phasing down of HFCs. The F-Gas Regulations are the driver,” Sturman says. A review of the use of f-gases in the refrigeration industry – in the framework of the EU F-Gas Regulation – led to the implementation of a phase-down over the next 15 years, aiming to cut the use of high-GWP f-gases by 79% before 2030, he explains. This will in effect





make production uneconomic and prices have already risen substantially, he warns.

The FSDF was founded in 1911. From its roots in the cold storage sector, it now represents the interests of the entire UK food and drink logistics industry. Its members include supermarket giants Sainsbury's and Tesco, as well as storage or transport companies like Seafast, XPO Logistics and Cold Move.

"The role of FSDF is very much to help our members, to represent the interests of the sector and to come out of this process in the most cost-effective and economic manner. There are a range of different solutions depending on who you are, where you are, and what sort of equipment you have," Sturman says.

LEADING BY EXAMPLE

The food logistics chief argues that replacing high-GWP refrigerants with medium-GWP HFCs (for example R407F instead of R404A) can play a short-term role in helping companies to prepare for the phase-down. In new equipment, however, he believes that high-GWP HFCs are no longer an option. Instead, HFCs should be replaced with "ultra-low or nil GWP" natural refrigerants such as ammonia or CO₂, which will not be affected by the market restrictions.

"The need to invest in alternative technology to HFCs for refrigeration can be a short-term financial burden. Nevertheless, we must focus on the long-term benefits. By taking a lead in technological and chemical modernisation, the refrigeration industry has the chance to lead by example."

CLEAR REGULATIONS ADDRESSING SAFETY CONCERNS

Ammonia was the standard refrigerant 60 or 70 years ago, Sturman says, remarking that after having tested many new substances, companies seem to be returning to it. "Companies are looking at reinvestment programmes. Ammonia seems to be the most popular, because it is efficient, tried and tested, and there are no secrets about it. It is a very transient and changing world. The only stable ingredient I can see at the present stage is ammonia," Sturman says.

However, some market players have expressed concern about ammonia, which has toxic properties and can be explosive in certain circumstances. "We are aware that certain European continental countries at one stage wouldn't have ammonia anywhere near them, because of their potential hazards to the population," explained Sturman. He cites the United Kingdom



as a shining example of how clear regulations can resolve such concerns.

In the UK, strict regulations govern how ammonia refrigeration systems must be installed, operated, maintained and repaired. This is included in the EU ATEX regulations, which are built into DSEAR, the Dangerous Substances and Explosives Atmospheres Regulations introduced in 2002. The regulations also stipulate that everyone working with ammonia systems must be properly trained and in possession of documentation demonstrating that they are qualified to work with the equipment.

"With the appropriate management systems in place, I think a lot of these particular concerns have been resolved," argues Sturman. He estimates that 70-80% of all static temperature-controlled facilities in the UK are now ammonia-based. CO₂ applications, meanwhile, are less widely adopted, but Sturman says they are on the food logistics radar, with companies currently evaluating their performance in both static and mobile plants.

DO YOU STILL WANT FROZEN FOOD? REASONABLE CHANGE IS NEEDED

The FSDF helps its members to understand the reasoning behind new EU policies and regulations, how they will affect the market, and how companies can efficiently comply with the rules. It also represents the interests of its members vis-à-vis policymakers.

"Look at the F-Gas Regulation. There were situations when environmental pressure groups were saying: Well, you can almost [stop using HFCs] tomorrow, can't you? And you have to say 'no'. Do you still want frozen and chilled food available for all consumers across the EU? Because if you wanted it done tomorrow, you are going to disrupt that particular marketplace," says Sturman.

By "feeding those realities" into the decision-making process, Europe now has an F-Gas Regulation that will allow HFCs to be phased out in favour of natural refrigerant alternatives in a manageable way, he argues.

"We understood the principles behind the need to make the regulation. But it had to be done in a manageable, reasonable and economic way. And that's what actually happened. Companies can start looking for alternatives, working with refrigeration suppliers who are developing realistic and economic solutions," he says.

● BZ & RD



Ian Garvey

Geoff Amos

GREENING PASTURES NEW: CARTER'S JOURNEY TO BOOST NATURAL REFRIGERANT TECHNOLOGY IN AMERICA

UK-based Carter Retail Equipment is looking to expand its global presence by bringing natural refrigerant systems to the US supermarket sector. *Accelerate Europe* visited their factory on the edge of Birmingham to hear first hand how growing interest in CO₂ transcritical installations in the United States is creating new opportunities for European businesses. – By Robert Davidson

Carter has been in business since 1945, when the late John Carter, DFC, a Squadron Leader in the RAF Bomber Command, returned home from the Second World War, part of which he had spent as a prisoner of war. The magazines Carter read during his detainment offered a glimpse of a world in transformation, including the metamorphosis of grocery stores from primarily small, local shops to self-serve operations.

For Carter, this was a revelation. Resolving to supply this impending demand having read up on business and HVAC during his internment, Carter upon his return set up Carter Thermal Industries Group in a small office in the aptly named Corporation Street, located in Birmingham, United Kingdom.

Fast-forward to 2016 and Carter is a different entity altogether: for one, it is now a group of engineering companies. It no longer sits on Corporation Street but rather on its own land, which features a 150,000 square foot factory built in 2004 with plenty of room for future expansion.

MAKING THE 'CASES' FOR CO₂ AND HYDROCARBONS IN SUPERMARKETS

During a tour of the factory and office, Geoff Amos and Ian Garvey – Carter's Head of Sales & Marketing and Technical Director respectively – detail how manufacturing capacity is now in excess of over 10,000 refrigerated commercial cabinets per year. 60% of case production is now purposed for either hydrocarbons or CO₂.

Like any other growing business, Carter is apt to evolution. The factory itself has seen a gradual transformation regarding the importance of natural refrigerants. For instance, a custom-built hydrocarbon cabinet manufacturing line was introduced to the factory six years ago and additional test labs were built to help accommodate CO₂-specific equipment. The location of the test labs in-house is of great importance to Carter, as Amos notes how this allows them to "constantly evolve the product". Carter is the world leader in higher system charge hydrocarbon self-contained cases. With the increase in interest, what is potentially novel for others is now standard for Carter in hydrocarbons.

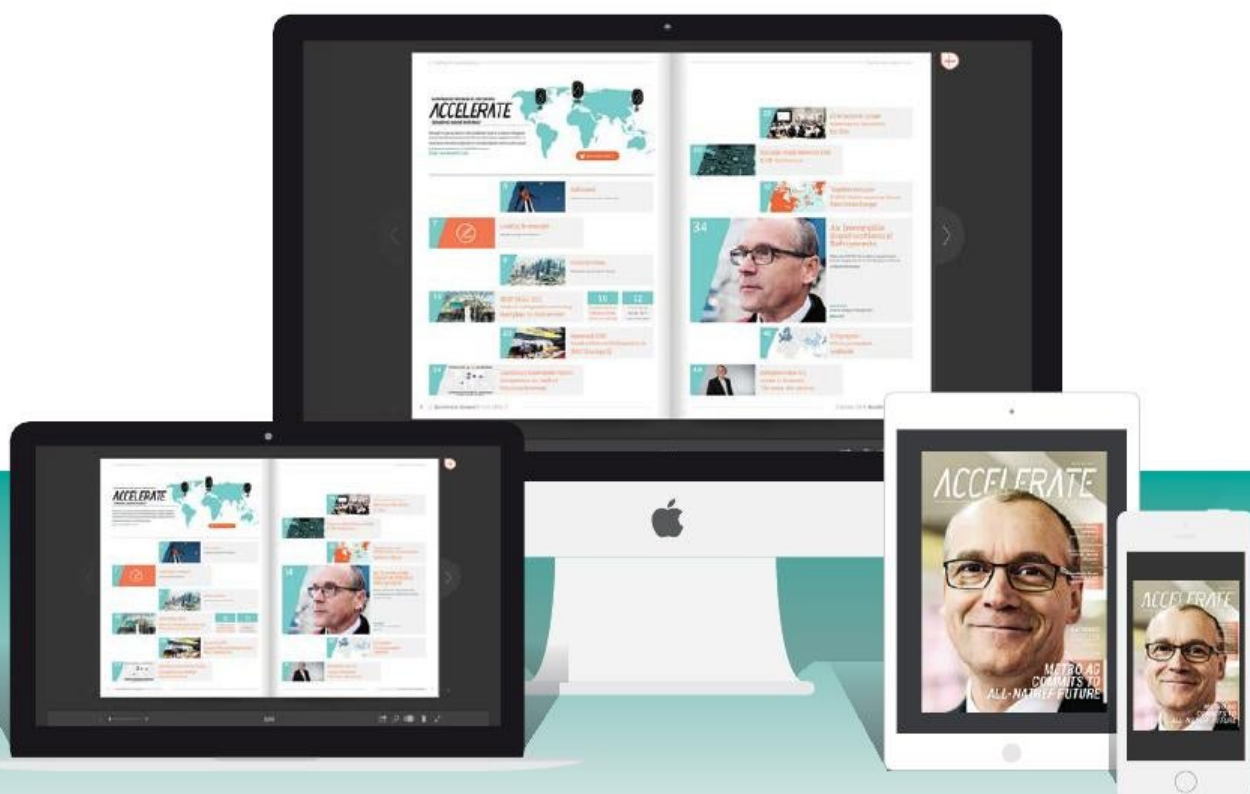
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→ While most of Carter's business remains within the UK, this dedication to the precision of their products has brought Carter opportunities all across the world. Most notably, Carter's presence in the United States continues to grow. Indeed, their innovation was recognised by ASHRAE this year, when their CO₂ transcritical 'net-zero' Walgreens store scooped the most innovative award alongside project partners Green & Cool – something Amos was understandably pleased about:

"Today, it's still the most advanced system North America has, as well as our most advanced installation. It was our first project in the United States, so it was a good opportunity to show what we can do."

And the importance of making a good first impression in terms of CO₂ installations is not lost on Amos:

"The US has gone from zero CO₂ stores at the start of 2013 to over 50 now, so they're in a similar position to the one Europe was in 2006 – and we saw how that grew exponentially from there on in."

After being successfully used in over 200 stores in the United Kingdom, Carter's hydrocarbons water-loop business is also travelling to the United States after having already been exported to mainland Europe, South-East Asia and Australia. The choice that Carter offer – in terms of expertise in both CO₂ and hydrocarbons – usually gives retailers a decision to make. Garvey offered up the typical criteria that dictate which retailers choose which refrigerant:

"It depends on the application and the level of integration the end user wants. If you're looking for energy efficiency and integration with the system such as heating, you'll go down the CO₂ route. If you're looking for a simple, maintenance-free system that is future-proofed, you'll go down the hydrocarbons route."



CARTER: BROKERS FOR BEST PRACTICE FROM BOTH SIDES OF THE ATLANTIC

Transferring knowledge to other regions doesn't come without hurdles. As Carter tries to export their proven hydrocarbon solutions to the US, they are encountering various regulatory obstacles that must be overcome.

The recent Significant New Alternatives Policy application for the use of R1270, a refrigerant more typically associated with industrial refrigeration, in stand-alone food/commercial retail refrigeration equipment is an example of this. However, even with SNAP approval, Carter would still need to change the 150g charge maximum set by the Underwriters Laboratories (UL) and ASHRAE to 1kg to ensure commercialisation of the technology.

But Carter is quick to add that it's not all about exporting lessons to the United States:



"We keep on talking about how we are migrating lessons from Europe to the US, but the US have a lot of lessons to teach. For instance, California's T-24 legislation makes sure that they place 25% of heat back into reclaim. I'm not aware of anything like that in Europe. So, some sort of legislative direction in that direction would be beneficial as we can regularly see 50-60% energy savings with the integration of systems."

These lessons and others are helping craft Carter into a well-informed entity drawing on lessons from two of the biggest economies in the world. With brighter prospects on the horizon, it might be not too long before that manufacturing plant gets bigger. **RD**

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HOSHIZAKI ICEMAKERS TO GO ALL NATURAL BY 2018

Global icemaker and refrigeration equipment manufacturer Hoshizaki is convinced that natural refrigerants will play a major role in the future of refrigeration technology. With plans to use hydrocarbon refrigerants across its entire European product line by 2018, the company is seeking to lead the industry in the design and manufacture of environmentally friendly icemakers and refrigerators.

— By Blanka Zoldi & Nina Masson

With almost 70 years of experience in the commercial kitchen equipment and food service industry, Japanese manufacturer Hoshizaki is looking increasingly closely at the environmentally friendly refrigeration solutions offered by hydrocarbons, and especially by propane (R290).

"Hydrocarbons have been used in our refrigeration system since the early 2000s, so we are comfortable with the manufacturing process," Jeff Basolis, CEO of Hoshizaki Europe, told *Accelerate Europe* during a visit to Hoshizaki Europe's headquarters in Amsterdam, the Netherlands.

Besides having zero ozone-depleting potential and negligible global warming potential, hydrocarbons have enabled Hoshizaki to reduce manufacturing time and increase the efficiency of refrigeration equipment. "It's easier to use hydrocarbon than CO₂, it does not have problems with high pressure. There is not much difference in their cost either," said Akira Ogushi, the company's director of sales.



Photo credit: Hoshizaki <http://en.hoshizaki-europe.com/members/index/id/45>

IM-210KWNH-B-3015A



IM-100NE/110NE



IM-21CNE



IM-30CNE

'YES' TO ENVIRONMENTAL PROTECTION

Hoshizaki started to use hydrocarbons in its FM series five years ago. The FM range produces flake or nugget ice, which can be used for a variety of cooling purposes.

Flake ice applications include:

- » Food processing
- » Fish and fresh produce display
- » Organ transportation

Nugget ice applications include:

- » Display of packed goods such as bottled beverages
- » Key ingredient in cocktails

When Hoshizaki introduced hydrocarbons in the FM series, the price of the components was still high, making end users more reluctant to invest in natural refrigerants. "In the beginning, the typical reaction of a user was: 'yes' to protecting the environment, but 'no' to spending more money for that," says Ogushi.

As the demand for natural refrigerants has grown in the past two years, prices have fallen, allowing Hoshizaki to launch their latest IM series running on hydrocarbons. These icemakers produce ice cubes in five different sizes, together with special shapes such as ball, star or heart ice for premium beverages.

HYDROCARBONS 'THE REFRIGERANT OF CHOICE'

"For us, hydrocarbon is the refrigerant of choice, and we are looking into its use in more equipment, for example in sushi cases. We aim to change our entire offering to a natural type of refrigerant. Looking at our engineering time, we plan to have it by 2018," says Basolis of the company's future plans.

Hoshizaki aims to offer all its equipment with hydrocarbons, but is likely to also look into using CO₂ for larger machines or upon customers' request.

"We are satisfied with our achievements so far, but we are looking forward. Scandinavia, Germany, [and the] UK are very much natural refrigerant-oriented, while we still see a gap in the southern part of Europe. Although the EU tries to act as one, there is a big difference in the mind-set of users and dealers in the North and South," Ogushi explains.

REGULATION CHANGE NOT ENOUGH

Asked to describe the effect of the EU's F-Gas Regulation on the market, Ogushi argues that regulations are not in themselves enough to change people's way of thinking. "There are still a very limited number of customers who have a special request for natural refrigerants. The majority, like small restaurants and pizzerias, are not very much taking care of that."

While Basolis believes global climate agreements – such as that struck at COP21 in Paris last December – are beneficial for raising awareness and showing that companies like Hoshizaki offer solutions, Ogushi was quick to emphasise the importance of incentives from government.

"Nobody can be against these high-level agreements that want to protect the Earth. But customers are very careful when investing in something. If the economic situation is poor, customers will invest less – this is the same problem for all new technologies," Ogushi said.

He calls for more government support in order to promote new technologies – "not only for Hoshizaki, but for the whole ice machine industry". Such support could take the form of special subsidies or tax reductions for natural refrigerants and the technology, he argued.

HYDROCARBONS: A CLEAR CHOICE FOR END-USERS

In influencing consumer choice, Hoshizaki is convinced of the need to educate both end users and dealers. "There is an education gap, and we want to show customers why to use hydrocarbons. We explain that on top of having an environmentally friendly solution, at the end of the day this results in using less energy and getting lower utility costs. Once they realise the savings, it's a clear choice for our end users," Basolis argues.

As for the future of hydrocarbons globally, Ogushi thinks that North America will follow the trend set by Europe, which has taken on a leading role in using natural refrigerants. "In Asia, we need a bit more time for people and governments to follow this trend. Japan is special, as the market has been already strongly oriented towards energy efficiency," he concludes, arguing that natural refrigerants will have a bigger role to play in Asian markets in the coming years. **BZ & NM**

BRINGING NATURALS TO BRAZIL: EUROPEAN KNOW-HOW DELIVERING THE TRANSITION

CO₂ installations are proliferating in Brazilian supermarkets – partly thanks to European know-how imported to South America. Emerson Climate Technologies is one of the manufacturers driving Brazil's switch to natural refrigerants.

– By Blanka Zoldi & Nina Masson



"Sooner or later HFCs are going to go" says Higor Almeida



Sooner or later HFCs are going to go. We want to make the market prepared for this big change," says Higor Almeida, business manager (retail solutions) at Emerson Climate Technologies, Brazil.

Subcritical everywhere within 2-3 years

Like their European counterparts, Brazilian companies are increasingly turning their gaze towards natural refrigerants in response to more stringent regulation of f-gases. Today there are around 80 subcritical CO₂ installations in Brazil. "It is still a small number, but the growth rate is very fast," says Almeida, predicting that within two to three years, Brazil is going to be "full of subcritical applications" – not to mention exclusively using CO₂ for low-temperature applications. Medium-temperature applications will follow.

According to Almeida, the transition to natural refrigerant solutions is being driven by large, global food retailers and by component, rack and case manufacturers "who try to bring new technologies, to differentiate themselves from others".

Transcritical systems to come with European help

While the number of CO₂ subcritical installations in Brazil is growing, Almeida nonetheless sounds a cautious note: introducing transcritical technologies in Brazil's warm climate will take more time. "The market is not ready yet. We need some initial tests and pilot projects. We need to learn more about the technology and train our technicians," he says, warning that it may take 5-6 years to change the whole market.

Emerson Climate Technologies – headquartered in Sidney, Ohio but with offices and subsidiaries all over the world – is drawing

from the company's global experience with natural refrigerants when introducing new technologies in Brazil. Before entering the market with subcritical solutions, Brazilian staff received help from European colleagues who had already introduced these systems several years before.

Emerson plans to harness their knowledge before introducing transcritical systems there too. "Someone will fly from Europe to help us in Brazil with our first projects and installations and to train our people. This is one of the big advantages of a global company: we can use our worldwide experience for development in areas like South America," says Almeida.

Supporting local customers

In Brazil, Emerson Climate Technologies develops a full range of compressors and components to satisfy customers' needs. It offers several hydrocarbon and CO₂ solutions together with a complete monitoring system, which can improve both thermodynamic and electrical efficiency.

Emerson has one inventory in Brazil, based in Sorocaba, a small city close to Sao Paulo. Products are imported from several of the company's factories around the world: CO₂ compressors come from Europe, for example, while electronic systems come from Europe and the US.

"Even though we're not manufacturing in Brazil, we have a big technical team to support local customers. We can serve our customers with technical support engineering, sales, and after sales locally, which is really important for our South American clients," Almeida concludes. **● BZ & NM**



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CARRIER'S NEW ACADEMY FAMILIARISING TECHNICIANS WITH CO₂ SYSTEMS

Carrier's CO₂OLacademy, a new training facility opened last year in Germany, provides the company's technicians from across Europe with invaluable knowledge of CO₂ refrigerant technologies. Carrier is looking closely at the market's needs in considering an expansion of its training programme, Bart Driessens told *Accelerate Europe* during an exclusive visit to their training centre in Mainz.

— By Blanka Zoldi & Nina Masson



"The technician is the person who sees our customers on a day-to-day basis. They have to fully understand the system when they help our customers and give them advice," explains Bart Driessens, director of service operations at Carrier Commercial Refrigeration Europe, during a walk through the CO₂OLacademy.

Carrier, which as of December 2015 had installed its CO₂OLtec® system in over 1,800 stores in Europe, aims to set a high knowledge level for its technicians wherever they are based. "As the performance of our CO₂ configurations improves, so do they become more complex, and we have to make sure that across all countries within Europe our technicians have the same understanding of CO₂ technologies."

The company continues to run supplementary local training initiatives. But Driessens explains that it makes sense for Carrier to have a central training site that ensures the company can provide its entire network with the necessary knowledge and skills. Mainz, Germany was identified as the ideal location and Carrier opened its central training facility there in March 2015. "It's in the centre of Europe, where we already had a Research & Development centre close to the airport. We have the right location and expertise here," said Driessens.



MORE PRACTICE, BETTER RESULTS

Carrier organises five-day courses for 7-10 key trainers who come from different countries. Besides picking up technical details, they are also taught how to pass on their knowledge to other people. A few weeks after this training, these key trainers return to Mainz with technicians from their respective countries, and the key trainers teach these technicians in their mother tongue. These two-day training courses are organised in small groups of a maximum of ten participants.

Before the course, technicians receive e-learning material, ensuring that they already have a certain level of knowledge before arriving in Mainz. The training is 40% theoretical knowledge and 60% practical exercises. "You need to have a certain theoretical knowledge, but we realised that this part cannot last too long. The participants constantly work in the field, so we have to do more than provide two days of classroom instruction. Technicians absorb knowledge better if they can see and touch the system, and try it in real life," Driessens explains.

In the past, Carrier used to hold training sessions on the customer's site, but Driessens says the success rate is much higher in the training centre. "Here we can simulate issues that we see in the field: what is the best way to identify root causes, do a refrigerant leak test, or perform a maintenance job, for example. Participants can try these things at the training facility, and if it does not work out, they can try it a second and a third time. This is something that you cannot do at the customer's site, as you cannot close down their system just for training purposes."



Bart Driessens

"We have received very positive feedback, especially regarding the right proportion of theoretical and practical training. People do not see this only as training, but they feel that they are part of a bigger organisation that supports them. As an organisation, investing not only in the hardware, but also in people, is a value that cannot be underestimated," Driessens notes.

LOOKING AT MARKET NEEDS

Since the opening of the training facility, Carrier has targeted training approximately 600 people by the end of 2016 by organising training courses for 25 countries – first concentrating on the regions with the highest density of CO₂ markets, but also planning to expand the programme to other countries later on.

"Our goal is to make sure that all our in-house technicians are well-trained and that their knowledge is constantly refreshed. At a later stage we also will enlarge the programme to our subcontractors," Driessens explains.

Carrier looks closely at what the market needs when planning future training. They collect feedback from technicians and former participants, based on which the CO₂OLacademy council and the council of key trainers decide what steps to take. "It doesn't make any sense to write a nice training [course] from a desk. It needs to come from the field," Driessens says. **BZ & NM**



Schaufler's vision becomes a reality

BITZER INAUGURATES INTERNATIONAL TRAINING CENTRE: THE SCHAUFLEER ACADEMY

BITZER, a specialist in refrigeration compressors, has inaugurated its new 1,500m² SCHAUFLEER Academy international training centre in Rottenburg-Ergenzingen, Germany.

Opened in February after a year under construction, the new international hub is set to have a major impact on the natural refrigerant market with its seminars based on participants' needs.

– By Blanka Zoldi & Nina Masson



Education and knowledge are key elements to provide good solutions for the market. Training has always been important for BITZER, but now we finally have a facility that serves as a central hub," said SCHAUFLEER Academy director Volker Stamer at the inauguration of the new training centre on 3 February. The modern, state-of-the-art facility is named after Senator h. c. Peter Schaufler, BITZER's long-standing owner, who passed away recently.

Building on Senator h. c. Schaufler's vision of encouraging young people to be enthusiastic about technology from an early age, the Academy seeks to develop a close and constructive relationship with schools and universities, while spreading knowledge about new HVAC&R technologies and refrigerants beyond Germany's borders.

Stamer himself is honoured and excited to be taking up his new position as director of the academy, which is seeking to make a significant impact with its needs-based programme of seminars.

continued on p.68



Report on Natural Refrigerants Training in **Europe**



2016

GUIDE TO NATURAL REFRIGERANTS TRAINING IN EUROPE — STATE OF THE INDUSTRY

THE reference tool for those looking for guidance on how to select the right training providers, knowledge sources and partners to build their business case around the use of CO₂, NH₃ and hydrocarbons.

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nina.masson@shecco.com

→ THE BROADER THE CUSTOMER BASE, THE GREATER THE NEED FOR TRAINING

Ever since BITZER installed its first CO₂ training facility in 2010, the company has been organising training and seminars: since November 2010, the company has conducted 150 seminars attended by a total of 1,200 participants from 30 different countries. "Due to the EU F-Gas Regulation and the phase-down of HFCs, more and more users will apply natural refrigerants. With a broader customer base, there is a bigger need for training as well. We want to make it sure that we don't create potential for failures, because it would have an impact on the market of natural refrigerants," says Rainer Große-Kracht, Board of Directors, BITZER SE.

Given the growing complexity of components and system solutions, including integrated frequency inverters, electronic components or compressors using natural refrigerants such as CO₂, demand for proper training is increasing. Natural refrigerants can operate at high pressure, and can be toxic or flammable. As their market share increases, more technicians need to know how to handle them. "Training is needed to overcome fear, and to make it easier for customers to use natural refrigerants – they are a safe option, if you know how to handle them properly," Stamer says.

"We want to avoid a 'fast-food mentality' in the HVAC&R industry whereby the focus is on short-term solutions. We'd rather be recognised as a company that supports sustainable solutions, also through quality in education," he explains.



Learning by doing with BITZER

FLEXIBLE, HANDS-ON TRAINING FOR CUTTING-EDGE TECHNOLOGIES

All the academy's refrigerant training sessions cover issues like thermodynamics, safety, material compatibility and system design. Courses on transcritical and subcritical CO₂ systems also offer hands-on training: participants are equipped with the necessary skills to deal with day-to-day operating demands, as well as learning how to fill systems up properly or start them up from scratch.

"The content of the training depends on the needs of the audience, and we plan to adapt our courses over time. We have the newest technology in house, and we also get the latest information from the market. This is the big advantage of our institution – we are not only covering the fundamentals, and we try to be as flexible as possible," says Stamer. BITZER is planning to launch new courses in the first half of 2016. Course material for ammonia, inverter technology and hydrocarbons is currently being developed.

The academy welcomes consultants, system manufacturers, service staff and operators from all over the world to its courses. With BITZER having already trained many people in Germany, the majority of participants come from other countries – from all over the world. BITZER already runs training centres in





Live-action training courses

Brazil, China, Australia and the US. "In Germany, we are the central hub, and we share ideas with people from other parts of the world," Stamer explains. As CO₂ systems become increasingly popular beyond Europe too, the company has initiatives for CO₂ training outside of Europe as well, adapting to local requirements.

MULTIFUNCTIONAL BUILDING OPENS UP NEW POSSIBILITIES

The idea of a dedicated, centralised training academy was born in 2011. The SCHAUFLEER Academy is located in close proximity to BITZER's production facility at Rottenburg-Ergenzingen, the international competence centre for the company's screw compressors. The new, three-storey, ten metre-high complex was designed to be a multifunctional building: it has five rooms for theoretical work and three rooms for practical training. It also contains an office space for instructors and a canteen with seating for 110 training participants as well as employees of the production facility and competence centre.

The SCHAUFLEER Academy also serves as a new reception building for the production facility. This proximity offers new opportunities for practical training at the centre. "Here, not only can we show the theoretical advantages of our pioneering technology, but also demonstrate modern compressor and electronic components in action. This opens up the possibility of practical training under real system conditions," explains Stamer.

IDEAL ENERGY CONCEPT

The energy concept for the new training centre building is a model in itself: heating is provided by efficient heat pumps, underground latent storage (ice storage), a solar thermal collector, and a combined heat and power system. "This concept underlines our commitment to developing products for sustainable energy use and climate protection. As such, the Academy allows us to present systems that use BITZER components in a direct way to our customers," says Große-Kracht.

The ice storage system collects temporarily available cooling and thermal energy, which can be retrieved when it is required. This enables BITZER to balance the fluctuating energy supply, while also using renewable sources of energy for space heating and cooling. **BZ & NM**



The SCHAUFLEER Academy

EU CLIMATE POLICY SHAPING NATURAL REFRIGERANT INDUSTRY IN 2016

In 2016, numerous legislative dossiers will be launched or reviewed, including targets for energy efficiency and energy performance of buildings beyond 2020. In February, the European Commission unveiled the EU's first ever Heating and Cooling Strategy, which identifies climate-friendly refrigerants as having great energy-saving potential.

– By Justina Tamasiunaite & Klára Skačánová

Maroš Šefčovič, a European Commission vice-president responsible for the Energy Union, declared that “2016 will be a year of delivery” on EU energy policy.

On 16 February, the European Commission presented the first dedicated EU-level Heating and Cooling Strategy. The initiative aims to make heating and cooling in buildings and industry smarter, more energy efficient, and more sustainable. This could represent an immense opportunity for the natural refrigerant industry, as Europe wants to decarbonise its whole building stock by 2050.

According to the Strategy, the F-Gas Regulation will contribute to accelerating the refurbishment of heating and cooling technology in buildings. The document also states that, “climate-friendly refrigerants offer great energy saving potentials, but require for some applications an update of

existing standards to ensure their safe use. To that end the Commission has initiated the process of reviewing the relevant European standards”.

Furthermore, in the Commission Staff Working Document accompanying the Strategy, the EU executive indicates that for heat pump technology, “the choice of refrigerant also influences the efficiency. The phase-down of fluorinated greenhouse gases introduced by the Regulation 517/2014 [F-Gas Regulation] might trigger the higher uptake of natural refrigerants, leading to higher efficiencies”.

As part of this Strategy, the European Commission will review the Energy Efficiency Directive, the Energy Performance of Buildings Directive, and the Smart Financing for Smart Buildings Initiative in 2016. The Commission will also put forward proposals for directives on the New Electricity Market Design and Renewable Energy Framework in 2016.

The EU executive will also engage in non-legislative activities, such as developing a toolbox to facilitate renovation in multi-apartment buildings, promoting energy efficiency examples for public educational buildings and hospitals, and improving training for building professionals through the BUILD UP skills campaign.

The Strategy still needs to be endorsed by EU member states (in the Council) and the European Parliament.

Companies stockpiling HFCs before the phase-down

The implementation of the EU F-Gas Regulation is underway following its entry into force at the beginning of 2015. As of 2016, the HFC phase-down mechanism requires reducing HFCs placed on the EU market by 7%. This has already triggered 10-15% price increases for the most commonly used high-GWP HFCs, including R410A, R134a and R404A.

More significant cuts in HFC quotas are foreseen in 2018 and 2021 (37% and 55%, respectively). Considering that as of 2017 HFCs pre-charged in equipment will have to be incorporated within the HFC phase-down, the reductions are expected to be even more substantial. As a result of this, companies are expected to intensify their efforts to move away from f-gases already during 2016.

A report from the European Environment Agency, published in December, revealed a 95% increase of bulk imports of fluorinated gases between 2013-

2014 compared to the previous year. This clearly shows that companies were stockpiling HFCs before the phase-down took effect in 2015 – it will, however, not protect them from the more severe HFC quota reductions coming into force in the next couple of years.

Besides the EU F-Gas Regulation, the long-awaited Eco-Design Regulation for commercial refrigeration should be finalised this year. The Regulation will set EU-wide mandatory minimum efficiency requirements for commercial refrigeration technology for the first time.

Future global HFC phase-down – high on EU agenda

After submitting its own amendment proposal in 2015 to phase down HFCs under the Montreal Protocol, reaching an agreement this year is a top priority for the EU.

Although significant progress towards tackling HFC emissions at international level was made during 2015, the most crucial discussions on the details of an agreement that would gradually reduce consumption and production of these gases in both developed and developing countries is still to take place this year. Several Montreal Protocol meetings are planned within the next 12 months, with the first one taking place in April. Hopes are high that a deal will be reached to amend the Protocol in order to phase down HFCs at a key Meeting of the Parties in November. **● JT & KS**



CALIFORNIA'S MASTER PLAN TO SLASH HFC EMISSIONS – AND THE ROLE OF NATURAL REFRIGERANTS

With the help of natural refrigerants, the California Air Resources Board plans to roll back emissions of HFCs in the state by 40% of 2013 levels by 2030, setting a standard for the rest of the United States and much of the world to emulate.

– By Michael Garry

California, the most populous state in the US, also has the world's eighth largest economy. The state also emits more greenhouse gas (11 metric tons) annually per capita than every other world economy except the US itself (18.6 metric tons), according to the World Resources Institute. But California is also among the world's most aggressive economies when it comes to crafting policy to reduce greenhouse gas emissions.

In 2006, the state passed its landmark California Global Warming Solutions Act, AB 32, which calls for greenhouse gas emissions to be cut to 1990 levels by 2020.

One of the key agencies responsible for formulating and executing AB 32's emission-reduction rules is the California Air Resources Board (CARB). California is the only state that is permitted to have such a regulatory agency, because it came into being before the passage of the federal Clean Air Act of 1970.

CARB is on track to meet or exceed AB 32's 2020 emissions-reduction goal, and has added a new one: cutting 1990-level emissions by 40% by 2030 – the same target set by the European Union. The state's ultimate goal is getting emissions to 80% below the 1990 level by 2050.

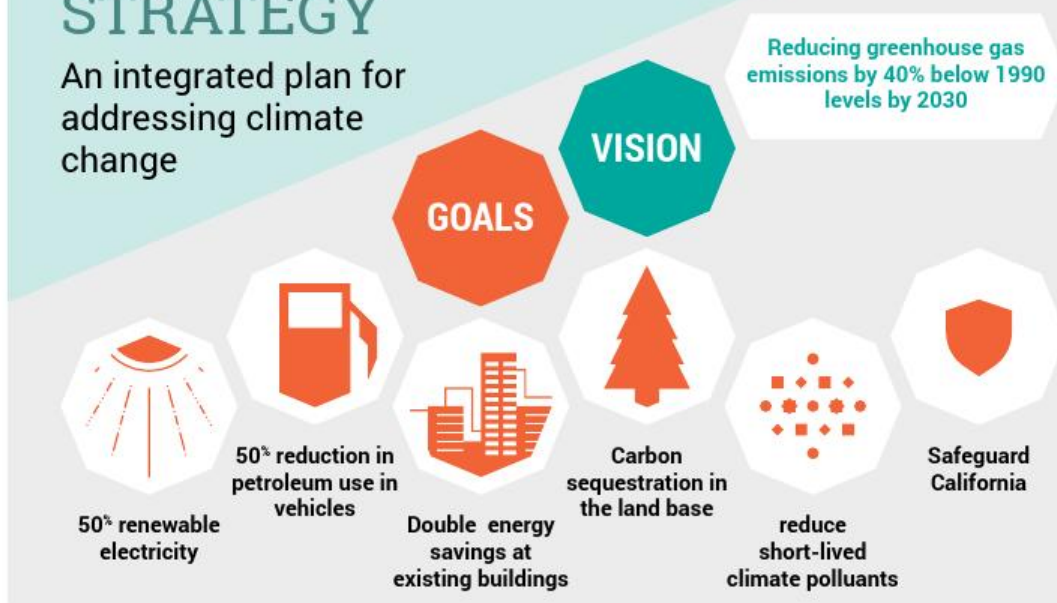
TARGETING HFCs

California's strategies for meeting its emission-reduction goals include a cap-and-trade plan, a low-carbon fuel standard and advanced clean-car standards. But the state is also addressing the contribution to global warming made by short-term climate pollutants (SLCPs) such as methane, black carbon (soot) and hydrocarbons (HFCs).

California has taken steps to curb HFC emissions and is poised to do much more. Pursuant to AB 32, in September 2014 California Governor Jerry Brown – who has spearheaded

CALIFORNIA CLIMATE STRATEGY

An integrated plan for addressing climate change



California's environmental efforts – signed Senate Bill (SB) 605, which called upon CARB to complete a comprehensive plan to reduce emissions of SLCPs like HFCs by 1 January 2016.

The plan includes taking an inventory of sources of SLCP emissions, identifying research needs, consulting with SLCP experts, and identifying existing and potential control measures to reduce these emissions. Among those control measures: refrigeration and HVAC equipment that use low-GWP gases like natural refrigerants in place of HFCs. California's overarching goal of reducing greenhouse gas emissions by 40% below 1990 levels by 2030 "can't be accomplished if f-gases are not included," says Glenn Gallagher, an air pollution specialist at CARB.

TIMELINE FOR ACTION

The idea that reducing SLCP emissions would help California meet its greenhouse gas emissions goals originated in the 2014 Climate Change Scoping Plan, an update to the original 2008 plan established by AB 32; it is being updated again in 2016.

In 2014 CARB released a booklet detailing existing measures used in SLCP emission reduction, and then embarked on a collaborative process with other state and local agencies to develop a formal SLCP Reduction Strategy, as required by SB605.

In May 2015, CARB issued a Concept Paper to initiate discussion on the strategy. After collecting stakeholder comments on the paper at a public meeting, CARB released a Draft SLCP Reduction Strategy in September 2015, for which it solicited additional comments. Since then, CARB has been going through the hundreds of comments it has received and answering stakeholder questions about what the strategy will contain as well as the potential cost of the reduction efforts.

While the original January deadline has elapsed, CARB will have the SLCP Reduction Strategy ready to be presented to its governing board in March as well as an additional meeting in summer 2016. The governing board is made up of 12 members

appointed by the governor, including scientific experts and representatives of regional pollution control agencies.

"If the board doesn't like [the SLCP strategy], they can direct us to go do something else," said Ryan McCarthy, who has served as science and technology policy advisor to CARB chair Mary Nichols since 2011. "But if we say we're going to develop regulations to ban high-GWP refrigerants in new equipment by some timeframe, we expect to do that."

Once the full board approves the SLCP strategy after the summer of 2016, "we would start a separate rule-making process" that would ultimately give the measures in the plan regulatory effect, says Gallagher. Even then, the plan could still be modified if, for example, an international agreement to phase down HFCs comes out of the Montreal Protocol in 2016.

Gallagher estimated that the adoption of regulations would take two years, followed by another "adjustment" year, making September 2019 the soonest the regulations would take effect. During the rule-making process, CARB would develop an extremely detailed cost/benefit and technical feasibility analysis. "We have to be deliberate as a governmental body and take stakeholders' comments and needs seriously," he says. "The benefits [of the regulations] will have to be pretty significant, which we know they are."

To validate the technical feasibility and cost effectiveness of low-GWP commercial refrigeration equipment, CARB has sponsored research under the direction of Dr. Ed Cheng of San Francisco State University and Doug Scott of VaCom Technologies. They are looking at several natural refrigerant technologies, including hybrid cascade systems and transcritical CO₂.

"The energy efficiency question of transcritical CO₂ [in high ambient climates] is of great interest in California, because we have 16 different climate zones, all the way from cool alpine to scorching desert," says Gallagher. CARB hopes to have research results by early 2017. **MG**

ON THE EPA'S TO-DO LIST FOR 2016

The US Environmental Protection Agency's Drusilla Hufford discusses upcoming actions under the SNAP programme, a new federal acquisition amendment, and other plans for 2016.

– By Michael Garry

The United States Environmental Protection Agency (EPA) – which plays a major role in regulating refrigerants – had a busy year in 2015, expanding the list of allowable refrigerants while prohibiting a number of high-GWP HFCs under its SNAP (Significant New Alternatives Policy) programme. The agency's partnership with supermarkets in the GreenChill programme also grew.

Accelerate America interviewed Drusilla Hufford, director of the EPA's Stratospheric Protection Division, to find out what may be coming in 2016 from the agency.

Accelerate America: The Dubai meeting of the Montreal Protocol led to the formation of a contact group to begin negotiating an HFC phase-down amendment. What does the EPA expect will be accomplished in 2016?

the Montreal Protocol will stem the growth in HFC use and avoid an increase that could erode the gains we have made in other climate protection efforts. We are encouraged by the decision in Dubai, but recognise there is a tremendous amount of work ahead, and active leadership will be needed by all parties.

Accelerate America: How would an HFC phase-down amendment to the Montreal Protocol shape EPA policy in the US towards HFCs? How might this affect the use of natural refrigerants (CO₂, hydrocarbons and ammonia)?

identifying and approving climate-friendly chemicals while prohibiting certain uses of the most harmful chemical alternatives.

Drusilla Hufford: At the 27th Meeting of the Parties (MOP-27) to the Montreal Protocol in Dubai in November, parties reached an important agreement on a pathway to an HFC amendment in 2016. A phase-down of HFCs under

Drusilla Hufford: The EPA is already taking action under the SNAP programme, consistent with the President's Climate Action Plan, to encourage private sector investment in low-emissions technology by

Accelerate America: The EPA is proposing to amend the Federal Acquisition Regulations to promote alternatives to high-GWP HFCs. How much of a role will natural refrigerants play as an alternative?

for use by executive agencies in acquiring goods and services. On 11 May 2015, DoD, GSA, and NASA proposed to amend the FAR (FAR Case 2014-026) to implement executive branch policy in the President's Climate Action Plan to procure, when feasible, alternatives to high-GWP HFCs.

This would allow agencies to better meet the GHG emission reduction goals and reporting requirements of the Executive Order (EO) 13693 of 25 March 2015, "Planning for Sustainability in the Next Decade". A final rule is currently being drafted, addressing public comments, and is expected to be published in 2016.

Accelerate America: Would the EPA make incentives available to the private sector to spur the adoption of natural refrigerant systems, as California is considering?

Drusilla Hufford: The Department of Defense (DoD), General Services Administration (GSA), and the National Aeronautics and Space Administration (NASA) jointly issue the Federal Acquisition Regulation (FAR)

Drusilla Hufford: The EPA's SNAP programme is technology-neutral and does not favour non-fluorinated or fluorinated alternatives. **MG**

“The US is playing a leading role internationally and domestically to reduce HFC use and emissions”



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JAPAN'S JOURNEY TOWARDS WIDER UPTAKE OF NATURAL REFRIGERANT SOLUTIONS

A Japanese Ministry of Environment (MOE) subsidy scheme has been providing significant benefits for companies and organisations opting for and working with natural refrigerants since 2014. Now it is at a tipping point in pushing the market to the next level, Tomokazu Ayukawa, director of the Office of Fluorocarbons Control Policy at the MOE's Global Environment Bureau, told *Accelerate Japan*.

– By Yukari Sahashi

Under the MOE's incentive scheme on the 'Promotion of Energy-Saving Natural Refrigerant Equipment', subsidies to support companies introducing natural refrigerants are set to increase in the fiscal year 2016.

NATURAL REFRIGERANTS MAKING SIGNIFICANT MARKET CONTRIBUTION

The fact that the MOE sees the investment value of this technology is encouraging for the natural refrigerant market, and the requested 2016 subsidy budget of 7.3 billion yen speaks for itself. Indeed, the subsidy has been increasing by just over one billion yen annually. And the number of companies requesting the subsidy has also gone up, with the total number of beneficiaries reaching 600 to date. It is clear that both demand for and supply of natural refrigerant solutions continue to increase, driven by an expanding market and by growing awareness and support for natural refrigerants among end users.

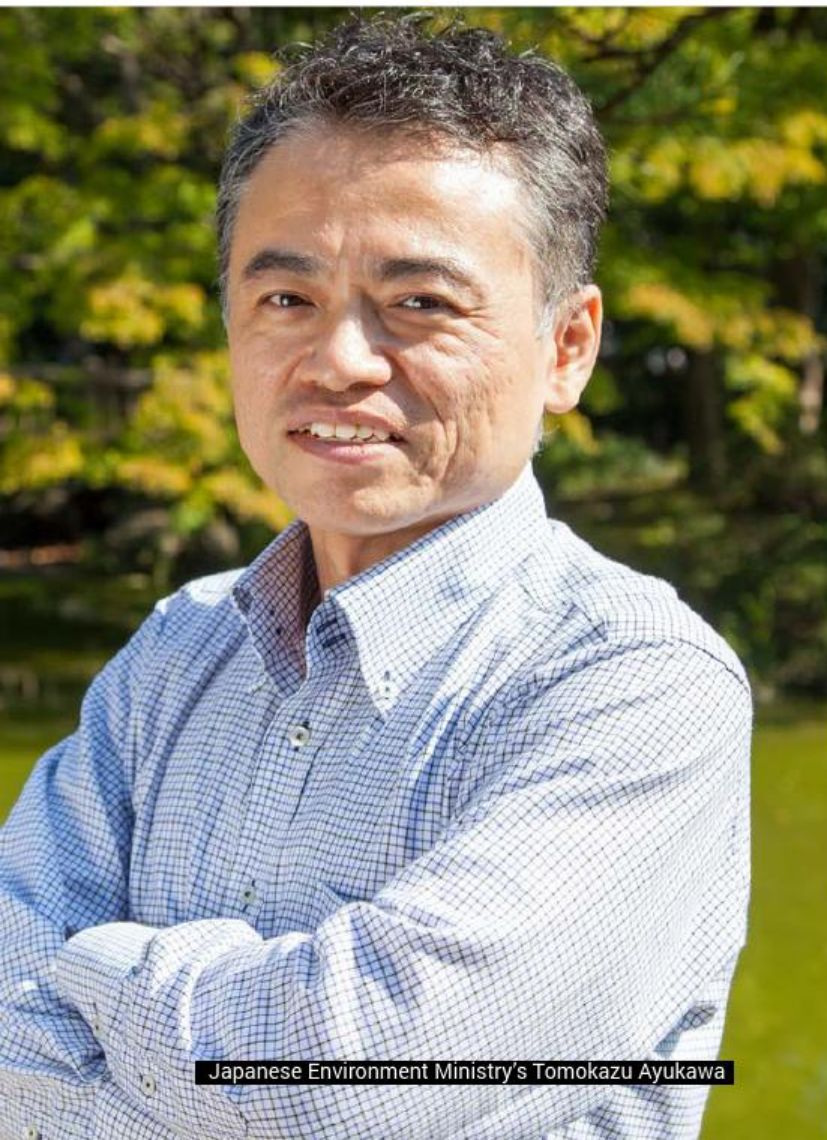
REFORMS REQUIRED FOR WIDER ADOPTION

Communicating the benefits of adopting natural refrigerants helps users to recognise their value. The MOE has taken two approaches to promoting the use of natural refrigerants among end users – 'awareness development' and 'financial assistance'. Indeed, funding and government assistance remain the most important factors in boosting the market. The MOE's scheme sets no priorities based on company size, category of business, or the type of natural refrigerant. The amount of subsidy varies depending on the scale of project, from one million to over 100 million yen.

What effect has the Japanese scheme had on the market? Firstly, it has led to the presence of strong market players such as major convenience store chain Lawson, whose stated goal is to become the world's number one natural refrigerant retailer – with CO₂-refrigerated showcases. Indeed, Lawson's positive push has encouraged other businesses, some of which had previously been hesitant to adopt natural refrigerant solutions due to the high initial cost, to also make the transition.

Nevertheless, the price of natural refrigerant equipment is yet to come down to an affordable level. Having spoken to various end users and manufacturers, Ayukawa believes more of them will be able to switch to natural refrigerants if the difference between initial costs compared to conventional systems is kept within 20%. However, most Japanese companies are still reluctant to adopt new solutions, even though the additional costs are likely to be recovered within several years through the resulting reductions in energy consumption.





Japanese Environment Ministry's Tomokazu Ayukawa



FUTURE DEVELOPMENTS TO HELP SPREAD NATURAL REFRIGERANT TECHNOLOGY

This year, the MOE is expanding the scope of the subsidy scheme to reach a wider range of businesses. In addition to the food industry, chemical manufacturers and ice skating rinks will also be eligible to apply for subsidies. Unlike retail businesses, which primarily receive assistance for opening new stores, the MOE expects to receive applications for renewing old refrigeration systems at existing rinks. As ice-skating is a popular pastime in Japan, the Ministry hopes to raise more public awareness through the revised scheme.

In an effort to introduce Japan's advanced natural refrigeration technology to other countries, the MOE is also sponsoring Japanese companies conducting research to help establish structures for collecting and disposing of f-gases in developing countries. Together with international companies, the Ministry launched five feasibility studies in Thailand and Indonesia in 2015.

The ultimate goal for Ayukawa is to make natural refrigerants affordable and accessible without government subsidies – this is a commonly stated goal of organisations that provide any form of aid based on the understanding that their assistance ends when the aid recipients are able to lead their own development.

Ayukawa notes that natural refrigerant technology is yet to be widely introduced in Japan, and that there is not enough market competition between natural refrigerants and synthetic refrigerants – and even less among different natural refrigerants. To foster this competition, the MOE hopes that more manufacturers and end users will utilise “seamless” support from the government: the subsidy scheme of the Ministry of Economy, Trade and Industry (METI) for the research and development phase, and the MOE scheme for the subsequent promotion phase.

To achieve this ultimate goal, market forces must play a much greater role, Ayukawa says. He believes that continued efforts are required from manufacturers to provide more accessible equipment and systems, and from users to demonstrate their commitment to choosing natural refrigerant solutions. **YS**

SHORT TAKES

By Klára Skačanová & Robert Davidson

GERMANY CONTINUES SUPPORT FOR ENERGY-EFFICIENT NATURAL REFRIGERANT INSTALLATIONS

With the aim of incentivising end users to adopt energy-efficient, climate-friendly technologies and natural refrigerants in refrigeration and air conditioning applications, the German Federal Environment Ministry provided €17.7 million in subsidies in 2015, supporting a total of 252 installations.

In the eight years since the funding scheme was launched under the National Climate Protection Initiative, more than 1,300 installations using highly efficient technologies received funding totalling about €114 million, which has triggered investment of around €600 million.

The subsidy scheme has been instrumental in accelerating the market for natural refrigerants, especially in commercial refrigeration, allowing end users to lower the capital costs of new technology. Besides energy efficiency, the use of natural refrigerants is a key eligibility criterion for new installations receiving the grant, while higher subsidies are awarded to HFC-free refrigerants in existing refrigeration plants.

In 2015, the scope of the scheme was extended to cover integrated heating and cooling systems with 5-150 kW of electrical power, while the range of eligible recipients was broadened from just companies to include other technology end users, such as municipalities, local authorities, NGOs, schools and hospitals. The successful programme continues in 2016 as an important element of Germany's energy and climate strategy. ●KS

SUPERSMART PROJECT LAUNCHES IN BARCELONA ON 18 APRIL

As European supermarkets become increasingly acquainted with energy-efficient refrigeration technology, simultaneous progress is being made in developing newer and simpler ways of smoothing the path for the transition to this climate-friendly new equipment.

The recently launched SuperSmart project is one such initiative seeking to facilitate this adoption. The EU-funded project aims to deliver impressive environmental and cost benefits by helping to speed up implementation of efficient heating and cooling solutions across Europe.

The three-year project seeks to remove non-technological barriers to the uptake of these solutions by helping to raise the level of expertise among technical and non-technical staff, as well as supporting the introduction of a new European Ecolabel for supermarkets by drafting possible criteria.

The project's first workshop will be held at the SuperSmart kick-off meeting at the Crowne Plaza Barcelona on 18 April, the day before the 2016 edition of the ATMOSphere Europe conference. The SuperSmart workshop is now open for registration, and attendance is free. ●RD

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SETTING THE STANDARD

SHORT TAKES

By Andrew Williams

NEXT SERIES: WHAT WILL SHAPE THE NATURAL REFRIGERANTS INDUSTRY IN 2016?



As the ink dries on the global climate deal struck at UNFCCC talks in Paris last December, the natural refrigerants industry is optimistic that the coming months will bring new business opportunities.

On the policy side, Montreal Protocol discussions on a possible HFC phase-down will take centre stage internationally as 2016 progresses. Although significant progress towards tackling HFC emissions at international level was made during 2015, detailed discussions to on a crucial agreement to gradually reduce consumption and production of these gases are yet to take place. Several Montreal Protocol meetings are planned within the next 12 months, with the first one taking place in April. Hopes are high that a deal will be reached to amend the Protocol to phase down HFCs at a key Meeting of the Parties in November.

In the US, meanwhile, action under the Environmental Protection Agency's (EPA) Significant New Alternatives Policy (SNAP) Programme, which has the authority to approve the use of natural refrigerants in additional applications and to

ban the use of high GWP HFCs in certain sectors, is foreseen to continue. A proposed review of the Clean Air Act, which foresees adding HFCs to the regulation and lowering the trigger rate for mandatory repairs from a 35% leak rate to 20% instead, will likewise have an impact this year.

In Europe, implementation of the F-Gas Regulation is ongoing. As of this year, the HFC phase-down mechanism requires reducing HFCs placed on the EU market by 7%. Also in 2016, the Australian government will consider recommendations for delivering domestic HFC emission reductions by 85% by 2036. A recommendations report will be published in April following consultations with industry.

On the technology side, exciting new developments are boosting the efficiency of transcritical CO₂ systems operating in warm climates. With technology evolving and interest in natural refrigerants increasing, manufacturers expect installation and system component costs to fall.

To read in-depth articles and interviews with industry players outlining the policy and market developments expected to shape the natural refrigerant sector this year, please read the NEXT Series on our websites. ● **AW**

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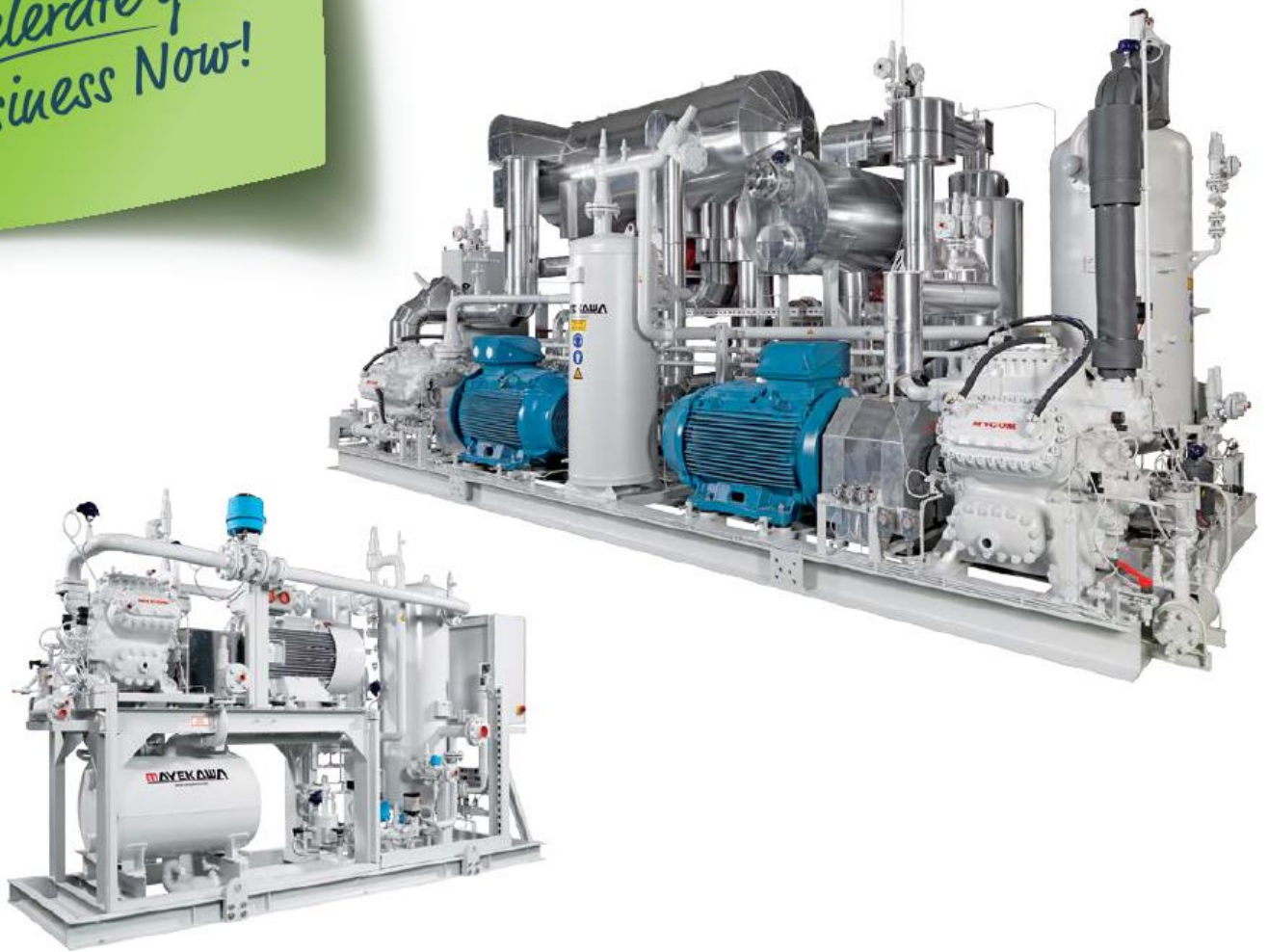
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