

Natural refrigerants - Update on projects in Article 5 countries and EITs



32nd Meeting of the Open-ended Working Group of
the Parties to the Montreal Protocol

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shecco

2012 developments & achievements



- Project implementation
- Putting in place enabling conditions (knowledge, standards)

many “firsts” in 2012

Turkey



Carrefour installs first CO₂ transcritical system in Turkey

19 June 2012

As part the Carrefour Group's bid to mitigate climate change by reducing HFC refrigerant charge and refrigerant leakage, the retailer recently installed its first CO₂ transcritical refrigeration system in Turkey (Istanbul), at the Kurtköy-Millennium Carrefour Express.

Put into operation on 9 May 2012, the Turkish Kurtkoy store with a retrofitted refrigeration system is one 4 sites by the retailer using 100% natural working fluids. Overall Carrefour will continue to set up new stores using natural refrigerants across Europe.

Reduction in GHG emissions and significant energy efficiency improvements

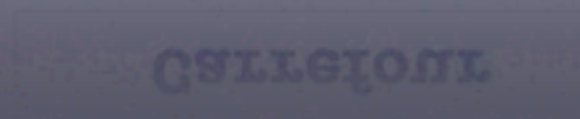
Food refrigeration accounts for two thirds of the Carrefour Group's greenhouse gas emissions. The problem arises from refrigerants leaking into the atmosphere, as well as electricity consumed by refrigeration units. To reduce these emissions more effectively, Carrefour Turkey is testing a highly innovative solution - both refrigeration units (fridges and freezer) at the Kurtkoy-Millennium Carrefour Express now use the natural fluid CO₂. The technology adopted in Turkey is quite rare in this part of the world, and only the fourth time it has been used within the Group.

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- First CO₂ transcritical refrigeration system by Carrefour in Turkey (Istanbul)
- The technology adopted in Turkey is quite rare in this part of the world (high ambient temperatures)
- Only the fourth time it had been used within the Group (by June 2012)

Thailand



Tesco Asia's first zero carbon store uses hydrocarbons

20 January 2012

Last month, Tesco Lotus opened Asia's first zero carbon supermarket in Bang Phra, Thailand, incorporating hydrocarbon based refrigeration equipment.

"Our zero carbon stores use the latest technologies to reduce our environmental impact and really show our commitment to greener growth", said Helen Fleming, Group Climate Change Director at Tesco. "Our climate change programme is central to the way we do business - not only are our actions good for the environment, they also make good business sense. Our energy efficient measures reduce costs in the business by about £200m each year."

Previously, the Thai retailer was the first in Asia to have installed a cascade refrigeration system using natural refrigerant CO₂ at its Tesco Lotus Salaya store, about 1 hour west of Bangkok.

Store sustainability features

Among the sustainability features to reduce the environmental footprint of the store and ensure that the store's net emissions for lighting, air conditioning and refrigerants are zero over the year are:

- Replacing hydrofluorocarbon refrigerant gases with high Global Warming Potential (GWP) with hydrocarbons
- Use of lower wattage LED lighting and use of natural light on the sales floor
- A wind turbine and solar farm of photovoltaic cells to produce energy for the store, with any excess power being fed into the grid
- Use of biogas from waste for food preparation in the store
- Rainwater collection for use in the car wash and store toilets



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Among the sustainability features to reduce the environmental footprint of the store and ensure that the store's net emissions for lighting, air

- Tesco Asia's first zero carbon store uses hydrocarbons
- Adds to retailer's existing store with CO₂ cascade refrigeration system near Bangkok

India



Indian manufacturer launches R290 AC production line

05 April 2012

A new production line of split and window-type R290 air-conditioners (ACs) has been inaugurated in India by Godrej & Boyce Mfg. Co. Ltd. With the highest energy efficiency in their class, the hydrocarbon refrigerant based ACs constitute a great value proposition for Indian consumers. + PHOTOS

The new R290 AC models are being launched in various cities in India and Godrej service technicians have been specifically trained in their safe installation and maintenance.

Back in 2002 Godrej was also the first to introduce climate- and ozone-friendly hydrocarbon refrigerants in refrigerators. Since then, several million, hydrocarbon refrigerators have been delivered to the Indian market, avoiding large amounts of greenhouse gas emissions.

R290's superior performance at high ambients: 23%+ energy savings compared to top of the line products

R290 (propane) technology is a very suitable alternative for climate-friendly cooling even in high ambient temperatures. Designed on the basis of European and International safety standards, the newly developed air conditioners encompass the highest energy efficiency in their class.

For example, in the 1.5 T split category, which is the most common air conditioner segment in India, the Godrej 5-star R290 AC will consume at least 23% less energy than the current top-of-line 5-star models across brands.

Transitioning from HCFC to HC ACs: emissions savings opportunity in India and beyond

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- Indian manufacturer Godrej launches R290 AC production line
- Direct switch from HCFCs to hydrocarbons (leapfrogging HFCs)
- Consumes at least 23% less energy than current top-of-line 5-star models

Russia



A Russian first: ammonia refrigeration plant for a sports facility

17 February 2012

GEA has been granted special permission from the Russian authorities for what will be the country's first ammonia based refrigeration plant to cater for the cooling needs of a Russian sports facility: the 1814 meter bobsleigh track in Krasnaya Polyana, about 60 km north-east of Sochi, Western Caucasus, which will host the 2014 Winter Olympics competition.

The contract includes project engineering of the complete refrigeration facilities, delivery and installation of the refrigeration equipment in the machine room, as well as a total of 4 km of main ammonia piping along the bobsleigh track.

At the heart of the new refrigeration plant are four ammonia screw-compressors:

- 3 screw-compressor units type WB-5A from the GEA Large Series – three type WB-5A
- 1 screw-compressor model PB-5A from the GEA Large Series
- A total of 4.2 MW of cooling duty
- Ammonia refrigerant playing a key role in ensuring superior efficiency

The project agreement was signed in November 2011 between GEA Refrigeration Technologies and NPO Mostovik, one of Russia's largest construction companies.

Works are scheduled for completion in spring 2012, with the first international bobsleigh competition planned for the track already in March. The track is eventually slated to host the bobsleigh competition during the 2014 Winter Olympics.

Safety aspects

For this long bobsleigh track, which is served by 4 km of supply piping along the track, the great evaporation enthalpy and the above-average volumetric cold duty provided make positive contributions. The required cooling duty can be transported with less volume of refrigeration and, in turn, in smaller diameter pipes.



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- Ammonia refrigeration plant for a sports (bobsleigh track) facility (2014 Winter Olympics)
- 4 ammonia screw-compressors
- Ammonia refrigerant playing a key role in ensuring superior efficiency
- Special permission for ammonia novelty in sports facilities

several initiatives in 2012

3 key areas:

- ▶ **Training & Know-How**
- ▶ **Awareness & Information**
- ▶ **Safety & performance Standards**





training - Brazil



BITZER Brazil: First CO₂ transcritical system in the Americas

11 June 2012

At the beginning of this year BITZER Brazil built a fully functional, transcritical CO₂ supermarket booster system in its training center and provides refrigeration and air-conditioning professional experts a hands-on experience.

BITZER Brazil is one of the biggest developers of CO₂ technology in South America, and since 2008 more than 1,000 technicians have been trained in CO₂ technology at the BITZER Brazil Training Centre. The focus of the Training Center, which is the only one of its kind in the Americas, is to present new technologies and to introduce carbon dioxide as a refrigerant and promote its application in industrial and commercial refrigeration systems. During the CO₂ training courses, safety issues, design features, installation, commissioning, servicing and maintenance procedures will be discussed in both practical and theoretical classes.

CO₂ Transcritical System

The system is built as a booster system with gas bypass. The gas from the low pressure compressor is mixed with gas from the gas bypass as well as from the medium temperature evaporators. The gas that exits in the low temperature compressor is cooled and can then safely enter the high temperature compressor. The booster principle is used because it gives a safe oil return and good system efficiency.

General information about the CO₂ training course

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- ◎ BITZER Brazil built a fully functional, transcritical CO₂ supermarket booster system in its training centre
- ◎ Provides refrigeration and air-conditioning professionals a hands-on experience



training - Pakistan



Pakistan inaugurates Natural Fluids Refrigeration Center

18 April 2012

Yesterday, 17 April 2012, saw the official inauguration of the Natural Fluids Refrigeration Center (NFRC), established in Topi, Pakistan by GIK Institute of Engineering Sciences and Technology in collaboration with Isotherm, Inc. USA. The center serves as an R&D hub for natural refrigerants and offers hands-on training to students and professionals.

Senator Engineer Farhatullah Khan Babar, chief advisor to the President of Pakistan performed the ribbon cutting ceremony that was well attended by the national press, who were on hand to witness the occasion.

In a brief interview to Pakistan Television Dr. Zahid Ayub, Founder and Director of the Center explained that it was already operational for the last three years concentrating on world-class research and analytical services to industry, academia, private and government organizations.

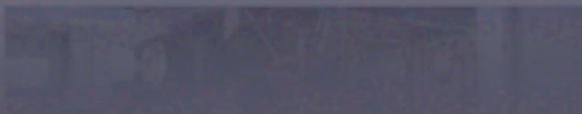
The NFRC serves as a research and development hub covering all aspects of refrigeration technology, i.e., compressors, heat exchangers, controls, piping, novel materials and metallurgy. For example, the center has been actively conducting research on thermal-hydraulic characteristics of high efficiency heat exchangers using natural refrigerants. Manned with highly qualified researchers and well-trained technical staff and state-of-the-art equipment, the center is ready to coordinate with different International Institutes and technical societies that have common goals.



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information - India



Association of Ammonia Refrigeration founded in India

20 April 2012

As the new growth of the cold chain and food processing industry in India has increased the use of ammonia as refrigerant, the Association of Ammonia Refrigeration, India (AARI) has been formed to provide information and education to people and government for the safe use of the refrigerant. Anand Joshi, Secretary of AARI Board of Directors discusses the rationale for forming the Association and scheduled activities.

The Association of Ammonia Refrigeration, India (AARI) is based in Pune, also known as "Refrigeration Capital" of India, as most of manufacturers, consultants and contractors are based there. All major ammonia refrigeration equipment manufacturers, contractors and consultants support the Association, which was formally registered in February 2012, in an effort also supported by the International Institute of Ammonia Refrigeration (IIAR).

Long history of ammonia in India, but lack of common platform

"India has a long history of ammonia refrigeration, with the oldest existing ice plant with ammonia as refrigerant dating back to 1914", explains to ammonia21.com Anand Joshi, Secretary of the AARI Board of Directors and Past President of ISHRAE PUNE chapter (Indian Society of Heating Refrigerating and Air-conditioning Engineers).

"The manufacturing base of ammonia equipment has been developed in India since 1960, and ammonia has been widely used for Industrial refrigeration, cold storages and ice manufacturing units", he continues. "At present more than 3,500 open type reciprocating compressors are manufactured every year in India for ammonia, as the new growth of cold chain and food processing industry has increased use of ammonia as refrigerant".



- Association of Ammonia Refrigeration, India (AARI) establish
- Common platform to share knowledge; training of new engineers, plant operators; advise government on standards
- Since establishment AARI has conducted training programmes for dairies, cold stores, seafood processing



information - Middle East



Middle East event explores potential of NH₃

26 March 2012

During a dedicated event on 20-21 March 2012 in Dubai, around 100 participants discussed available refrigerant options, including the potential of ammonia in industrial refrigeration and district heating. A major subject of discussions was the question of how to effectively remove safety concerns impeding a successful use of NH₃ in the Middle East, such as in the 22,500 m² in-door Ski Dubai resort or the world's biggest integrated dairy farm.

Organised by the "Climate Control Middle East" magazine, the event gathered participants from the Arab region, including national ozone officers, municipalities, engineers, and international HVAC&R experts to explore ideal refrigerant options from a technology, environmental and economic point of view in a move away from ozone-depleting substances. Presentations and panel debates showed that the Middle East faces special challenges such as high ambient temperatures and one of the highest energy consumption rates for air-conditioning in the world.

A major barrier for the use of HFC-free solutions such as ammonia can be found in safety concerns, which would mostly be rooted in a lack of awareness and the resulting misconceptions about the use and proper handling of ammonia as a refrigerant. Similarly, the lack of uniform standards and proper after sale service would constitute major challenges. This is despite successful applications in different Arab countries showing the long-term reliability and efficiency of NH₃ refrigeration solutions.

Ghaleb Abusaa from The Three Factors Company, moderator of a dedicated session on the efficient use of natural refrigerants, highlighted in his introductory speech that a powerful business case could be made for HFC-free systems in high-temperature applications in the Middle East, following concrete examples from the food processing, cold storage and chemical industry applications.

Success stories: world's largest milk cow farm and indoor skiing

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- Refrigerants Review, Dubai, UAE (May 2012)
- Available refrigerant options discussed in the transition away from HCFCs
- Ammonia potential in industrial refrigeration and district heating
- High Interest in CO₂ cascade supermarket refrigeration
- Safety



standards - China



China releases national safety standard for flammable refrigerants

12 July 2012

At the end of June 2012, China released a national safety standard for flammable refrigerants, which will come into force on May 1, 2013. The new safety standard formally allows the adoption of flammable refrigerants like R290 in the production of air conditioners in China. It could potentially accelerate the market uptake of R290 air conditioners in the Chinese market.

Last month China released its first national standard on the use of flammable refrigerants. The "Household and similar electrical appliances – Safety - particular requirements for heat pumps, air-conditioners and dehumidifiers" (GB 4706.32-2012) was released by the General Administration of Quality Supervision, Inspection and Quarantine of P. R. China and the Standardization Administration of China on June 29, 2012.

The standard was jointly drafted by the China Household Electric Appliance Research Institute (CHEARI), the Guangzhou CVC Institute of Technology Detection and representatives from air conditioner and refrigerator/freezers manufacturers including Gree and Haier and Midea.

Regulation for flammable refrigerants

The safety standard formally allows the use of flammable refrigerants in China. In particular, it formalises the use of R290 in air conditioners for the first time.



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Regulation for flammable refrigerants

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- China released national safety standard for flammables (June 2012)
- It formalises for the first time the use of R290 in air conditioners



standards - China, EU, US



One step closer to establishing universal CO₂ compressor performance standards

27 June 2012

AHRI, the US based Air-Conditioning, Heating, and Refrigeration Institute, has published CO₂ compressor performance rating standards. They are in line with the soon to be finalised corresponding standards in Europe that are currently being reviewed in order to accommodate for the increased interest in transcritical CO₂ refrigeration in the region.

The aligned standards establish common guidelines worldwide and will enable manufacturers to compare compressor behaviour and performance on a fair, "apple to apple" basis.

US, Europe and China work together to develop common standards

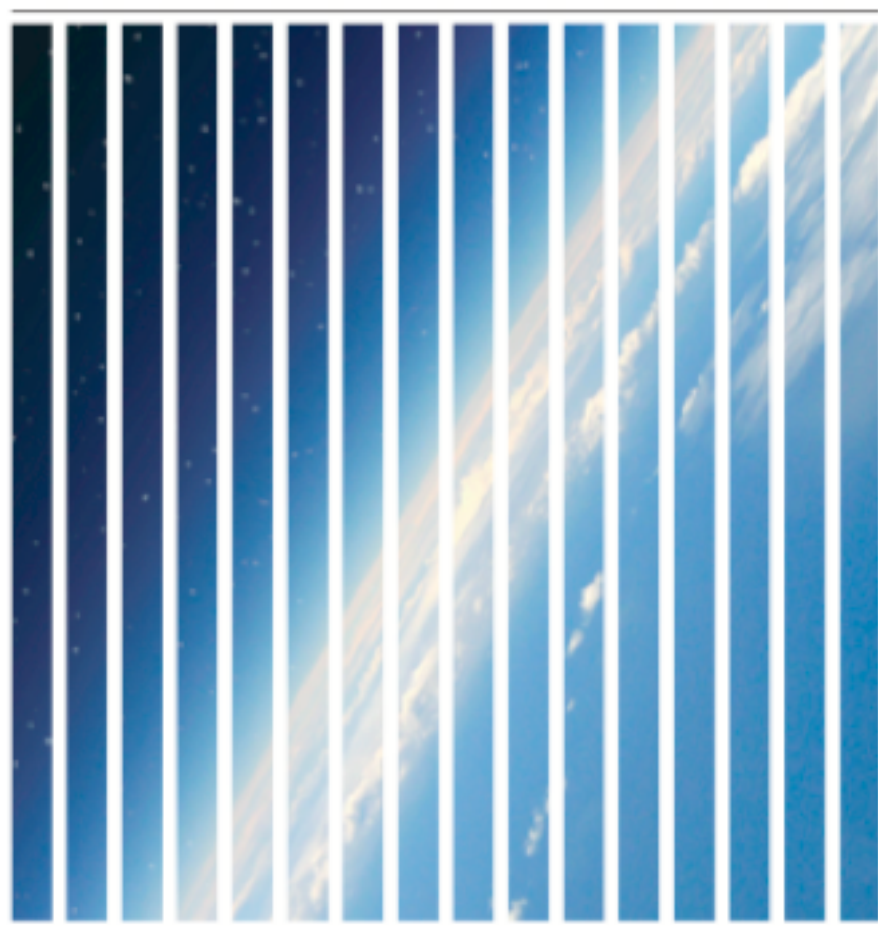
Titled '2012 Standards for Performance Rating of Positive Displacement Carbon Dioxide Refrigerant Compressors and Compressor Units', AHRI developed Standards 571 (SI) and 570 (I-P) in cooperation with the Association of European Refrigeration Component Manufacturers (ASERCOM) and the China Refrigeration and Air-Conditioning Industry Association (CRAA), with a view to harmonising the rating conditions with CO₂ standards under development in Europe and China. The AHRI standards, which concern CO₂ compressors for subcritical and transcritical refrigeration applications, provide for the first time a rating method for compressors and compressor units that use CO₂ as a refrigerant in the US.



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- AHRI published CO₂ compressor performance rating standards (June 2012)
- AHRI (US), ASERCOM (Europe) and CRAA (China) have developed CO₂ compressor performance rating standards
- Standards accommodate for the increased interest in transcritical CO₂
- Standards establish common guidelines worldwide

more examples from last 12 months



**60 EXAMPLES OF NATURAL
REFRIGERANT STORIES IN
ARTICLE 5 COUNTRIES AND EITS**
JULY 2012

- On OEWG32 webpage

thank you