

OZONENEWS

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A fortnightly electronic news update on ozone and climate protection and the implementation of the Montreal Protocol



GLOBAL

1. New OzonAction Multimedia Video Application: Refrigeration and Air-conditioning Technician Video Series

OzonAction has launched an exciting new application which hosts series of short instructional videos on techniques, safety and best practice for refrigeration and air-conditioning technicians.

This application, consisting of short instructional videos on techniques, safety and best practice, serves as a complementary training tool for refrigeration and air-conditioning (RAC) sector servicing technicians to help them revise and retain the skills they have acquired during hands-on training. Additional videos will be added regularly.

Please share with your RAC associations, technicians and other interested stakeholders...

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Get the new RAC Technician Video App

Watch our short instructional videos on refrigeration & air conditioning techniques, safety and best practices on your mobile device

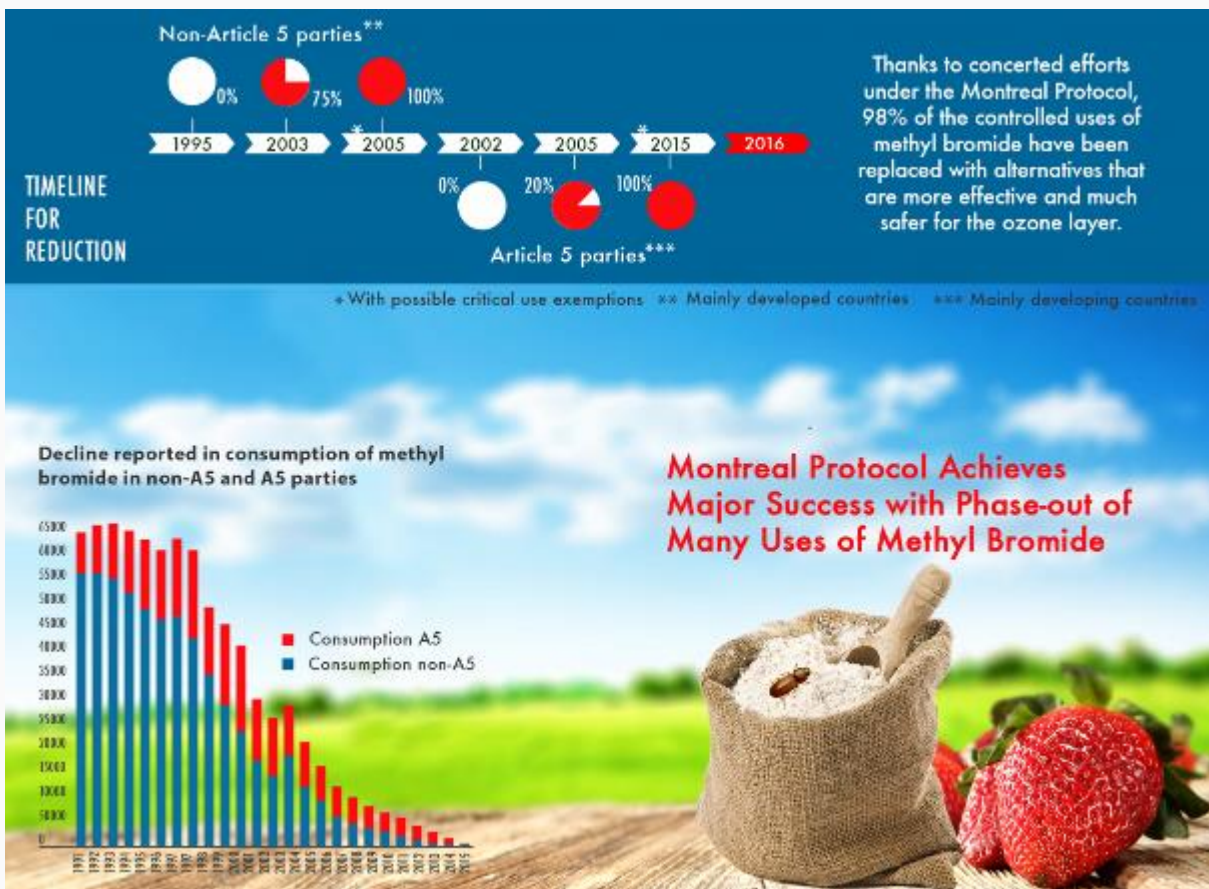
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2. Decline Reported in Consumption of MBr in A5 and Non-A5 Parties

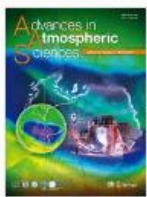


3. Future Challenges for Stratospheric and Tropospheric Ozone

[...] future ozone research challenges, in the context of varying trends and emerging threats to human health and food security due to ozone effects, for instance in fast developing regions in East and Southeast Asia.

Regarding stratospheric ozone, a future challenge will be to observe the predicted slow recovery from the decrease of halogenated ozone depleted substances. This decrease will occur in the context of climate change and the evolving ozone measurements system. Indeed, the future evolution of ozone will also crucially depend on the increasing abundances of CO₂, CH₄ and N₂O, and it will be driven by projected stratospheric circulation changes—an extremely challenging question for current observations. In the tropics in particular, the projected circulation-forced total ozone decrease can be masked by increases of tropospheric ozone. The impact on ozone of increases in the abundance of very short-lived halogenated substances (currently not controlled by the Montreal Protocol) will need to be quantified. [...] For policymaking, it will become increasingly important to better quantify the respective roles of natural processes and anthropogenic emissions changes.

In both cases, one of the main issues concerns the global system of measurements: will we have the observational capacity in place to detect future changes in both stratospheric and tropospheric ozone?



Excerpt from [The Quadrennial Ozone Symposium 2016](#) - Authors: Sophie Godin-Beekmann, Irina Petropavloskikh, Stefan Reis, Paul Newman, Wolfgang Steinbrecht, Markus Rex, Michelle L. Santee, Richard S. Eckman, Xiandong Zheng, Matthew B. Tully, David S. Stevenson, Paul Young, John Pyle, Mark Weber, Johanna Tamminen, Gina Mills, Alkis F. Bais, Clare Heaviside, Christos Zerefos.

▶ [Advances in Atmospheric Sciences](#), March 2017, Volume 34, [Issue 3](#), pp 283–288, First Online: 31 January 2017

4. Hydrocarbons 'Could Replace' Most Synthetic Refrigerants



Hydrocarbons are ready to move into a host of applications, asserts a new paper from European natural refrigerant advocates Eurammon.

Hydrocarbons – natural refrigerants made as a by-product of natural gas production, or in oil refineries – have huge potential to replace HFCs being phased down under the Kigali Amendment to the Montreal Protocol, according to Eurammon, a joint European initiative of companies, institutions and individuals advocating increased use of natural refrigerants.

“In a number of fields, hydrocarbons are feasible in many areas as a sensible alternative to synthetic refrigerants because they feature similar pressure levels and similar specific refrigerating capacities. They have application-specific advantages when selected correctly,” Eurammon argues in its latest information paper.

Hydrocarbons are already used in many applications:

- Household refrigerators and freezers
- Bottle coolers
- Commercial deep-freeze cabinets and freezers
- Commercial cooling cabinets and refrigerators
- Beer coolers
- Drink vending machines
- Heat pumps
- Refrigeration in grocery stores
- Air-conditioners
- Low-temperature cascades (all stages)
- Water and brine chillers for indirect cooling, especially for outdoor installation

Hydrocarbons could especially benefit from the Kigali Amendment to the Montreal Protocol – agreed in the Rwandan capital last October – to phase down HFC consumption in developed countries by 85% by 2036 (compared to a 2011-2013 baseline period).

Eurammon writes that hydrocarbons “have no harmful effect on the ozone layer, and compared with many other synthetic refrigerant substances, their global warming potential is negligible or non-existent”.

Benefits outweigh costs

Euroammon concedes that hydrocarbons face a number of challenges in that they are highly flammable and combustible, their smell is barely noticeable, and “in the case of a leak they can collect on the ground, displacing the breathable air”.

The group advises compliance with health and safety provisions governing the construction, operation and maintenance of refrigerating systems. The European standard EN 378, the EU’s Pressure Equipment Directive and the ATEX Directive are especially important for manufacturers of hydrocarbon systems in the European Union.

If manufacturers address safety concerns when designing systems, then hydrocarbons have a lot going for them. They have “excellent thermodynamic properties, which reduce the primary energy required for generating a certain refrigerating capacity, and thus the indirect global warming effect,” Eurammon writes.

Hydrocarbons’ TEWI balance (Total Equivalent Warming Impact) – the sum of a refrigeration system's direct and indirect global warming effects – is a lot better than that of synthetic refrigerants.

The direct global warming effect is low because hydrocarbons like propane have a GWP of just three. The indirect effect is also low due to the excellent thermodynamic properties of hydrocarbons.

Unlike synthetic refrigerants, hydrocarbons are also very cost-efficient. The price differences are not only noticeable when initially charging the system, but also when refilling after leakage loss.

“Propane, for example, is considered to be one of the most efficient refrigerants,” Eurammon asserts. “Due to their beneficial properties, hydrocarbons also have the potential to develop new areas of applications.”

HFC	HC alternative	Note
R134a	R600a	Household appliances – larger deviations regarding refrigerating capacity and pressure levels
R134a	R290/600a mixtures	Commercial applications
R404A, R507A	R290, R1270, R290/1270 mixtures	Commercial applications, industrial plants (e.g. petrochemistry)
R407C	R290, R1270	Air-conditioning and heat pump systems
R410A	R1270/170 mixtures	Deviations regarding refrigerating capacity and pressure levels
R23, R14	R170, R1150	Low-temperature cascades
R227ea	R600a	High temperature applications
R236ea, R236fa, R245fa	R601, R601a	High temperature applications, ORC applications

Euroammon lists which synthetic refrigerants can be replaced by the most popular hydrocarbons on offer like n-butane (R600), isobutane (R600a), propane (R290), propylene (R1270), ethane (R170), Ethylene (R1150):

▶ [Hydrocarbons21](#), 13 January 2017

5. The Birth—and Possible Death—of the SAGE III Atmospheric Satellite

On the upcoming SpaceX CRS-10 mission, a rocket will launch carrying the next batch of cargo to the International Space Station. Inside its Dragon capsule’s unpressurized trunk will be a critical Earth-facing instrument—one that maps ozone molecules and other compounds in the atmosphere. Its name is the Stratospheric Aerosol and Gas Experiment III, or SAGE III. [...]

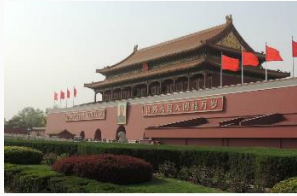


▶ [Wired-Science](#), 27 January 2017



ASIA PACIFIC

6. NEXT Series: China 'the Crucial Player' in Global HFC Phase-down



Efforts by the Asian giant to reduce HCFC and HFC consumption will move the global HVAC&R market, according to the European Commission.

As the world's biggest producer and consumer of refrigerants, efforts by China to reduce HCFC and HFC consumption will have a ripple effect across the global HVAC&R sector, according to the European Commission.

The Commission attended talks in Kigali last year that produced a landmark global HFC phase-down agreement. "We think the EU proved that a phase-down works, because we're showing that alternatives are available," Philip Owen – who heads the unit responsible for Montreal Protocol issues in the EU executive's directorate-general for climate action – told *Accelerate Europe* magazine.

For Owen, the Gulf countries and India were always likely to fight hard in Kigali for an agreement under the Montreal Protocol that reflects their position as fast-growing economies at an earlier point in their phase-down pathway than Western nations.

China at the heart of global phase-down efforts

"The Gulf countries got a pretty good deal. But it was very important to understand the Indian position – this is a country that expects significant growth, and has far lower penetration of air conditioning equipment than China, for example. There are good reasons for allowing India the flexibility to grow its economy in a satisfactory way," Owen said.

Ultimately he believes China holds the key to what the future will bring. "If we've already moved developed and other developing countries to lower GWP alternatives sooner, then the supply side will cut back. That's why I don't think India will grow into high-GWP HFCs – because of China more than anywhere else. China is the crucial player," Owen argued.

In international climate diplomacy, "the expectation of negotiators is that these countries will jump from [HCFCs] straight to lower GWP alternatives," the Commission official insisted.

As countries around the world begin to implement the Kigali agreement, chemical companies that manufacture a new generation of fluorinated refrigerants (so-called HFOs) are expected to push for these to be adopted as alternatives to HFCs. What will happen if these require phasing down further down the line as environmental protection measures intensify?

The European Commission must remain technologically neutral and cannot back one option over another as long as they all comply with existing legislation. "We wouldn't want to pick winners," said Owen. Nonetheless, he predicts that natural refrigerants will continue to grow. "They have to increase to make the phase-down work," he said.

Towards an EU-wide cap-and-trade system?

The introduction of a paid cap-and-trade system governing production and consumption of HFCs, in the spirit of the EU's Emissions Trading Scheme, would be one way for politics to steer the European market towards alternatives.

The idea is being championed by Bas Eickhout, a Dutch Green member of the European Parliament. "I'm interested in it. It creates revenue that helps industry and supports it in making the shift," he told *Accelerate Europe*. But like any potential EU initiative involving new taxes or fees, a cap-and-trade system for HFCs would be difficult to introduce. Not least because "this was heavily opposed in the [F-Gas Regulation] negotiations," he warned.

The European Commission is more cautious. The cap-and-trade system is "something that the Parliament was very keen for the EU member states to do something about," Owen said. "I think the political reality is that the Council [of EU countries] wouldn't want it. It's not something that found favour a couple of years ago," he explained. "At present I don't think there's the appetite for [cap-and-trade], for many reasons – such as the complexity and the administrative burden, let alone the politics of it," Owen said.

Nonetheless, the Commission official expects it to be discussed. "I'm sure it'll be one of the questions on the table in the next review," he said.

▶ [r744](#), 11 January 2017, By: Andrew Williams

7. New Zealand Increases HFC Taxes



The Kiwi (*the national bird of New Zealand*)

On 1 January 2017, the island country increased its synthetic greenhouse gas (SGG) levy rates for imported goods and vehicles by 295.5% compared to the previous year.

Two years before it is expected to start phasing down HFCs under the Kigali Agreement, New Zealand has opted to increase tax rates on synthetic greenhouse gases (SGGs) by 295.5% compared to last year.

SGGs include hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF6).

Raising the price from \$0.30 per unit (as applied in 2016) to \$9.85 from 1 January 2017 is increasing the tax burden on importing HFCs into New Zealand.

The levy targets common goods like fridges, freezers, heat pumps and air conditioners, as well as refrigerated trailers and motor vehicles whose air-conditioning units contain HFCs.

Further increase likely

The move should significantly help New Zealand to meet the first step of its HFC phase-down obligations under the Kigali Agreement. Kigali obliges the country to reduce its HFC consumption by 10% compared to 2011-2013 levels by 2019.

New Zealand's environment minister, Dr Nick Smith, said following October's Kigali deal: "The Ministry for the Environment will work closely with industry in New Zealand to implement the phase down over the next 20 years."

The New Zealand government has begun consultations on a proposed extension of the Synthetic Greenhouse Gas Levy. This would extend the levy to HFCs imported as components in formulated polyol, used in the manufacture of polyurethane foam.

▶ [Ammonia21](#), 5 January 2017, By Charlotte McLaughlin



LATIN AMERICA AND CARIBBEAN

8. Implementan inédito sistema de refrigeración con CO₂ transcrito



Jumbo. Foto diario Valdivia.

La iniciativa tuvo el objetivo de brindar una oportunidad para facilitar la introducción de una tecnología ambientalmente adecuada que será una herramienta para el país y la región, para reducir al mínimo el uso de tecnologías basadas en HFC al tiempo que ofrecen una nueva opción ambientalmente sostenible para la eliminación de los HCFC.

En el 2011 PNUMA reportó que "bajo las actuales prácticas, el consumo de hidrofluorocarbonos (HFC) se proyecta para exceder en 2050 el nivel más alto de consumo de CFC en la década de 1980". Esto se debe principalmente al crecimiento de la demanda de economías emergentes y el crecimiento de la población. Y sin intervención alguna, se proyecta que el aumento de las emisiones de HFC puede llegar a compensar gran parte del beneficio climático alcanzado por las reducciones anteriores de las Sustancias Agotadoras de la Capa de Ozono (SAO).

Bajo este marco, la Unidad Ozono del Ministerio del Medio Ambiente con financiamiento de la CCAC (Coalición del Clima y el Aire Limpio para Reducir los Contaminantes de Vida Corta), implementó esta semana

junto al Supermercado Jumbo-Valdivia un inédito sistema de refrigeración con CO₂ transcrítico. La iniciativa tuvo el objetivo de brindar una oportunidad para facilitar la introducción de una tecnología ambientalmente adecuada que será una herramienta para el país y la región, para reducir al mínimo el uso de tecnologías basadas en HFC al tiempo que ofrecen una nueva opción ambientalmente sostenible para la eliminación de los HCFC.

Se trata del proyecto "Asistencia técnica y financiera para adoptar la tecnología de refrigeración con CO₂ transcrítico en un supermercado en Chile", que sirve como eje conector entre los diferentes actores involucrados en la cadena de refrigeración del sector supermercados para impulsar la adopción de la tecnología de CO₂ transcrítico y por tanto, minimizar la introducción de sistemas basados en HFC en Chile", señala Claudia Paratori, coordinadora de la Unidad Ozono.

Actualmente, continúa la experta, no hay ejemplos en Chile sobre el uso de la tecnología del CO₂ transcrítico en los sistemas de refrigeración de los supermercados, por lo que este proyecto es una oportunidad para promover las acciones de esta tecnología en el país. "La implementación de este proyecto generará múltiples beneficios al medio ambiente y la sociedad, para lo cual, el Ministerio del Medio Ambiente espera que además aporte a la gestión ambiental local de la ciudad de Valdivia", asegura Paratori.

Beneficios del proyecto

Climáticos: reducción de emisiones de gases efecto invernadero (GEI).

Económicos: aproximadamente un 20% de ahorro energético

Técnicos: tecnología amigable con el medio ambiente

Sinergias con el Protocolo de Montreal, especialmente a la recientemente aprobada Enmienda de Kigali, que incluye medidas de control para los HFC (potentes GEI), a partir del año 2020.

Chile es socio de la CCAC (Coalición del Clima y el Aire Limpio para Reducir los Contaminantes de Vida Corta), iniciativa lanzada en el 2012 por el Programa de Naciones Unidas para el Medio Ambiente (PNUMA) y un grupo de países, para ejercer una acción colectiva que permita reducir los Contaminantes de Vida Corta (CCVC) como el carbono negro (hollín), metano y los hidrofluorocarbonos (HFC). El Subsecretario del Medio Ambiente, Sr. Marcelo Mena, es Co-Presidente del Grupo de Trabajo de la CCAC.

Dentro de la CCAC, se desarrolla la Iniciativa de los HFC que tiene por objetivo el reducir significativamente el crecimiento proyectado de uso y emisiones de HFC de alto potencial de calentamiento global en las siguientes décadas. Para ello, moviliza esfuerzos en el sector privado, la sociedad civil, organizaciones internacionales y gobiernos.

► elEconomistaAmérica.com | Chile, 16 enero de 2017



NORTH AMERICA



9. Settlement Helps Protect Public Health in South Windsor, Conn.

BOSTON - Area residents and first responders in South Windsor, Conn. are better protected from potential accidental exposure to harmful chemicals, following an EPA settlement ensuring that a local pasta manufacturing company complies with federal laws related to its use of anhydrous ammonia in its refrigeration system.

Carla's Pasta, which makes dry pasta at 50 Talbot Lane in South Windsor, has a refrigeration system that cycles about 12,000 pounds of anhydrous ammonia through various physical states to freeze its products. The company recently reached a settlement with EPA, resolving allegations that it violated risk management requirements of the Clear Air Act and planning/notification requirements of the federal Emergency Planning and Community Right-to-Know Act.

The company is subject to the requirements of Clean Air Act's risk management program because it handles or stores more than 10,000 pounds of anhydrous ammonia. In an August 2014 inspection, EPA inspectors identified several potentially dangerous conditions relating to the refrigeration system. [...]

EPA has started a national enforcement and compliance initiative to reduce the risks of chemical releases from

various types of facilities that use extremely hazardous chemicals, including those that use anhydrous ammonia as a refrigerant.

The company has certified that it corrected these violations and is in compliance with these federal environmental laws. This company also agreed to pay a \$78,184 penalty.

▶ [US EPA](#), Press release 13 January 2017



10. US EPA GreenChill Webinar: Efforts to Reduce Refrigerant Emissions through the Consumer Goods Forum

Date: Tuesday, February 28, 2017 | Time: 2:00 pm to 3:00pm (Eastern time)

Description: This webinar is focused on efforts to reduce refrigerant emissions through the Consumer Goods Forum (<http://www.theconsumergoodsforum.com/>). Ignacio Gavilan will introduce the CGF and provide background information on what steps the forum has taken to reduce refrigerant emissions at an organizational level. The webinar will include testimonials from supermarkets who participate in the CGF, with explanations of how those companies are demonstrating the business case for phasing down HFCs; the challenges they face in reducing refrigerant emissions; and how they are addressing those challenges.

To join the webinar: 1. Go to http://epawebconferencing.acms.com/cgf_greenchill/

2. Select "Enter as a Guest". It is important that you select the option to enter as a guest.

3. Enter your name. | 4. Click "Enter Room". | 5. Click "OK".

For audio: 1. Call the toll free call-in number: 1-866-299-3188 (706-758-1822 from outside the U.S.)

2. Use Conference Code: 202 343 9185#

▶ Web: <http://www2.epa.gov/greenchill>



EUROPE & CENTRAL ASIA

11. Updated German Regulation to Support Natural Refrigerants



The amended refrigeration and air conditioning directive, which entered into force on 1 January, will subsidise the installation of natural refrigerant-based systems in Germany.

The updated version of Germany's refrigeration and air conditioning directive, which entered into force on 1 January, will subsidise the installation of refrigeration systems based on "non-halogenated and low-GWP refrigerants".

Natural or non-halogenated refrigerants like CO₂, ammonia and hydrocarbons (such as propane, isobutane and propene/propylene) are naturally occurring and do not need to be chemically synthesized.

The subsidy scheme seeks to reduce the energy consumption of refrigeration and air-conditioning systems and runs from 1 January 2017 until 1 January 2019.

Applicable throughout German territory, the scheme is open to companies, not-for-profit entities, schools, hospitals, and municipalities and other local authority bodies, among others.

The amended directive extends funding to partial retrofits in addition to new system installations and full retrofits or replacements. Applicants can hope to be awarded a maximum of 150,000 EUR per installation, calculated on the basis of installation type (new installation or full or partial retrofit), cooling capacity and the refrigerant used rather than system cost.

All new installations must use natural (non-halogenated) refrigerants, with the exception of small compression refrigeration units of 2-5 kW (which can use refrigerants whose GWP is below 750).

Systems that adopt halogenated refrigerants with a higher GWP than the previous installation or where the

switch is from a non-halogenated to a halogenated refrigerant are ineligible for subsidies.

Installations cannot take place until the applicant has received the grant notification. Under the previous regime, installation could begin following submission of the funding request.

Applications received on or since 1 January 2017 will be evaluated on the basis of the new criteria.

The Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) introduced the subsidy scheme in 2008 under the auspices of the National Climate Protection Initiative. The Federal Office for Economic Affairs and Export Control (BAFA) operates it.

Four system types to receive funding

There are four asset categories eligible for basic funding:

Small compression refrigeration and air conditioning systems with 2-5 kW electrical power consumption;

Compression refrigeration and air conditioning systems with 5-300 kW electrical power consumption (except ammonia plants);

Ammonia plants with electrical power consumption of 5-200 kW.

Sorption systems with 5-500 kW cooling capacity.

To help promote energy efficiency, applicants qualify for a bonus if the new or updated systems include the following features:

Heat accumulator with heat exchanger for waste heat utilisation of the refrigeration or air conditioning system;

Heat pumps for storing waste heat from the refrigeration or air conditioning system.

Cold store with heat exchanger.

'Free cooling' equipment with pipes, pumps, tank, measuring technology and, if necessary, additional heat exchanger.

'Free cooling' refers to the concept of harnessing cold from the surrounding environment to provide cooling without involving a mechanical process. It can be used to improve the efficiency of the mechanical refrigeration cycle or be harnessed as a stand-alone cooling method.

Subsidised installations must be independently monitored for a minimum of five years to ensure efficient operation.

The scheme has thus far proven successful in triggering wider uptake of natural refrigerant-based systems in Germany. In 2015, it subsidised 253 more efficient cooling and refrigeration systems to the tune of 17.7 million EUR, triggering investment of 93.5 million EUR. During the programme's eight years of operation, it has supported 1,300 projects with subsidies totalling some 114 million EUR: triggering investment of 600 million EUR.

▶ [R744](#), 9 January 2017, By: Andrew Williams



WEST ASIA



12. SCE-AREA Cooperation in Refrigeration, Air Conditioning Discussed

Manama, Jan. 25 (BNA): Chief Executive of the Supreme Council for the Environment (SCE), Dr. Mohammed Mubarak bin Dinah, today received Vice-President of Air conditioning Refrigeration European Association (AREA), Secretary-General of Italian Association of Refrigeration Technician, Marco Buoni, and discussed activating the national certificate programme for rehabilitating workers in the refrigeration and air conditioning sectors in accordance with the European certificate (F-Gas Regulation).

Bahrain's strategic plan, 2015-2020, for phasing out ozone-depleting substances, implemented by the SCE, requires rehabilitating personnel operating in air conditioning sectors according to the requirements of the Montreal Protocol on substances that deplete the ozone layer.

Bin Dina said the SCE seeks benefiting from Tamkeen's support for the national programmes for the development of Bahraini aptitudes, chiefly industrial schools graduates.

The SCE had earlier announced that the national certificate programme will be implemented in collaboration with various government and private institutions, including a cooperation with Shaikh Khalifa Institute of Technology on providing training and assessments for school graduates of departments of refrigeration and air conditioning maintenance.

▶ [Bahrain News Agency](#), 25 January 2017



OZONE SECRETARIAT

- ▶ - [Twenty-Eighth Meeting of the Parties.](#)
- ▶ - [Resumed 38th meeting of the Open-ended Working Group.](#)
- ▶ - [57th meeting of the Implementation Committee.](#)

Final text of the Kigali Amendment to the Montreal Protocol is now available in all the six official UN languages ([A C E F R S](#))

Click [here](#) to access MOP 28 documents, General information ...etc.

- Browse through the Ozone Secretariat "[In Focus](#)" to learn about latest updates.
- Click [here](#) for Montreal Protocol Meetings Dates and Venues
- [Methyl Bromide Technical Options Committee 2014 Assessment Report](#)
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Progress & Quadrennial Assessment Reports:

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Halon Technical Options Committee Reports:

- [Halons Technical Options Committee 2014 Assessment Report \(Volume 1\)](#)
- [Halons Technical Options Committee 2014 Supplementary Report #1 - Civil Aviation \(Volume 2\)](#)
- [Halons Technical Options Committee 2014 Supplementary Report #2 - Global Halon 1211, 1301, and 2402 Banking \(Volume 3\)](#)
- [Technical Note #1- Revision 4 - Fire Protection Alternatives to Halon - 2014](#)
- [Technical Note #2 - Revision 2 - Halon Emission Reduction Strategies - 2014](#)
- [Technical Note #3 - Revision 2 - Explosion Protection - Halon Use and Alternatives - 2014](#)
- [Technical Note #4 - Recommend Practices for Recycling Halon and Halocarbon Alternatives - 2014](#)
- [Technical Note #5 - Halon Destruction - 2014](#)

THE MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL



[Report of the 77th Meeting of the Executive Committee](#), 28 November - 2 December 2016, Montreal, Canada

See also: [Adjusted business plan of the Multilateral Fund for 2017-2019 after the 77th meeting of the Executive Committee](#)

[▶ Learn more](#)

OZONACTION

UN Environment, [OzonAction](#) highlights

OzonAction Factsheets:



[The Kigali Amendment to the Montreal Protocol: HFC Phase-down](#) - The phase-down of HFCs under the Montreal Protocol on Substances that Deplete the Ozone Layer has been under negotiation by the Parties since 2009 and the successful agreement on the Kigali Amendment at the 28th Meeting of the Parties on 15 October 2016 in Kigali, Rwanda to phase-down hydrofluorocarbons (HFCs) continues the historic legacy of the Montreal Protocol. This factsheet summarises and highlights the main elements of the Amendment of particular interest to countries operating under Article 5 of the Protocol (Article 5 Parties).



OzonAction Factsheet: [Refrigerant Blends: Calculating Global Warming Potentials](#) (post-Kigali update)



OzonAction Factsheet: [Global Warming Potential \(GWP\) of Refrigerants: Why are Particular Values Used?](#) (post-Kigali update).



OzonAction Factsheet: [Tools Commonly used by Refrigeration and Air-Conditioning Technicians](#)



New OzonAction Multimedia Video Application: Refrigeration and Air-conditioning Technician Video Series - OzonAction has launched an exciting new application which hosts series of short instructional videos on techniques, safety and best practice for refrigeration and air-conditioning technicians. This application, consisting of short instructional videos on techniques, safety and best practice, serves as a complementary training tool for refrigeration and air-conditioning (RAC) sector servicing technicians to help them revise and retain the skills they have acquired during hands-on training. Additional videos will be added regularly.

Please share with your RAC associations, technicians and other interested stakeholders...

Now available in the [Android Play Store](#) and Apple Store/iTunes.



(Just search for 'OzonAction' or scan this QR Code)



OzonApp eDocs+ launched in Android Play Store and Apple Store - This new application launched by OzonAction on February 12, includes publications, videos, fact sheets and other awareness materials to help National Ozone Units (NOUs) and other stakeholders to build their capacity to implement the Montreal Protocol in a sustainable manner and at the same time to derive climate benefits. Now available in the [Android Play Store](#) and Apple Store/iTunes.



(Just search for "OzonAction", or scan this QR code)



OzonAction News Drops - UNEP OzonAction is presenting a series of short video “**News Drops**” which focus on ozone layer protection, climate change and the importance of continuing ozone observations.



Regional News Drops

The Regional Networks of National Ozone Units (NOUs) under the Multilateral Fund are a path-breaking mechanism for North-South and South-South cooperation. Networking provides a platform for NOUs from Article 5 countries to exchange experiences, develop their skills and tap the expertise of their peers in both developing and developed countries. Conducted at the regional level, the Networking activity builds the Ozone Officers' skills for implementing and managing their national ODS phase-out activities. During 2016 these videos were filmed at the regional network meetings around the world.

The NOUs were asked about their success stories, alternative refrigerants selected and their personal messages for national ozone celebrations...

Click [here](#) to access the News Drops

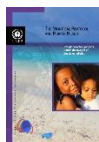
OzonAction Recent Publications:



Lower-GWP Alternatives in Commercial and Transport Refrigeration: An expanded compilation of propane, CO₂, ammonia and HFO case studies - This booklet presents an expanded compilation of case studies on lower-GWP alternatives in commercial and transport refrigeration and provides an update to the first set of case studies which was published in 2014 by UNEP DTIE OzonAction/CCAC (Low GWP Alternatives in Commercial Refrigeration: Propane, CO₂ and HFO Case Studies).



NATIONAL CERTIFICATION SCHEMES FOR RAC SERVICING TECHNICIANS - This publication aims to provide introductory information for institutions in developing countries to better understand the issue of certification in the field of refrigeration and air conditioning, to assist in the creation of such certification and training schemes and to demonstrate to service technicians and enterprises why it is in their interest to participate. [Read/Download](#)



THE MONTREAL PROTOCOL AND HUMAN HEALTH - This booklet summarizes how the successful implementation of the Montreal Protocol has protected human health. It describes how ozone depletion would have led to increases in UV radiation and, based on current understanding of the mechanisms by which UV affects biological processes, how that would have led to a dramatic increase in skin cancers, cataracts and affected human health in other ways. It also covers recent progress in understanding the ‘World Avoided’ – that is the world we would have lived in without a successful Montreal Protocol. [Read/Download](#)



FINANCING THE CLIMATE CO-BENEFITS OF THE HCFC PHASE-OUT - A guide for Low Volume Consuming Countries - Hydrochlorofluorocarbons (HCFCs) are being phased out worldwide under the Montreal Protocol on Substances that Deplete the Ozone Layer. The Parties to this treaty encouraged countries to promote the selection of alternatives to HCFCs that minimise environmental impacts, in particular impacts on climate. The Protocol's Multilateral Fund encourages developing countries to explore potential financial incentives and opportunities for additional resources to maximise the environmental benefits from HCFC Phase out Management Plans (HPMPs). This booklet explains how Ozone Officers in low volume consuming countries can explore such opportunities for climate co-benefits. Read/Download in [English](#) | [French](#) | [Spanish](#)



SAFE USE OF HCFC ALTERNATIVES IN REFRIGERATION AND AIR CONDITIONING - An Overview for Developing Countries - Many of the alternative refrigerants to hydrochlorofluorocarbons (HCFCs) have particular characteristics in terms of toxicity, flammability and high pressure which are different from those used previously. It is therefore important that the refrigeration and air-conditioning industry adapts to both the technical and safety issues concerning these refrigerants. This publication provides an overview of the alternatives, their general characteristics and their

application in the context of the safety issues. It provides guidance for National Ozone Units (NOUs) and other interested parties in developing countries on how they can advise and assist their national stakeholders in the selection and implementation of alternative refrigerants. [Read/Download](#)



PHASING-OUT HCFCs IN SMALL AND MEDIUM-SIZED ENTERPRISES - This booklet aims to assist foam enterprises, especially SMEs, to better understand policies on HCFC phase-out, access to assistance from the Multilateral Fund for the Implementation of the Montreal Protocol and access alternative technologies in different foam applications taking into account challenges in converting to alternative technology. It also discusses some tips on how to identify enterprises that may use HCFCs and verify the HCFCs consumption of enterprises. [Read/Download](#)



INTERNATIONAL STANDARDS IN REFRIGERATION AND AIR-CONDITIONING - This guide provides an introduction and simple overview of the issues related to international standards in the refrigeration and air-conditioning sector and how they can be useful in the context of the phase-out of hydrochlorofluorocarbons (HCFCs) in developing countries as required by the Montreal Protocol on Substances that Deplete the Ozone Layer. Read/Download in [English](#) | [French](#) | [Spanish](#)



[Guide on Good Practices: Phasing out HCFCs in the Refrigeration and Air-conditioning Servicing Sector](#)



[Phasing out HCFCs in Small and Medium-sized Foam Enterprises](#)



[Demonstrating the feasibility of R-290 based AC manufacturing: China's Midea and Meizhi case](#)



[Low-GWP Alternative for Small Rigid PU Foam Enterprises](#)

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EVENTS

2017



[The Sustainable Technologies for Stationary Air Conditioning Workshop](#) will take place in Las Vegas, Nevada, USA on 1 February 2017. The workshop will be held on the margins of the International Air-Conditioning, Heating, Refrigerating Exposition (AHR Expo) and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Winter Meeting from January 28 to February 1, 2017. Please note that the registration from these events are separate from the registration of the Sustainable Technologies for Stationary Air Conditioning Workshop. Click [here](#) to learn more and register to the Sustainable Technologies for Stationary Air Conditioning Workshop.



[ATMOsphere Japan 2017](#), 20 February 2017, Tokyo, Japan



[Refrigeration Standards Update, Safety and Environmental Requirements](#), AIRAH and Standards Australia are pleased to present a seminar series on the recently adopted and published refrigeration safety and environmental standards; AS/NZS/ISO 817:2016 Refrigerants – Designation and safety classification which replaces AS/NZS 1677.1:1998 and AS/NZS 5149 Refrigerating systems and heat pumps – Safety and environmental requirements: Parts 1 to 4, which replaces AS/NZS 1677.2:1998. Each of these new adoptions have had major modifications and revisions over the previous AS/NZS1677 series and are critical as we move to low global warming potential refrigerants. AIRAH will be holding the update seminars throughout Australia in February and March 2017 to provide an introduction and overview to the main changes

that will affect the HVAC&R industry.



International Ground Source Heat Pump Association (IGSHPA) Technical Conference and Expo, 14-16 March 2017, Denver, USA



AIRAH's Refrigeration 2017 Conference calls for abstracts, 27–28 March 2017, Melbourne, Australia. **The conference committee is now calling for abstracts.**



Sustainable Management of Refrigeration Technologies in Mobile Marine and Fisheries Sectors, co-organized by UNEP, ASHRAE, IIR and UNIDO with the kind support of the Government of the Kingdom of Thailand and the Department of Industrial Works, 6-8 April 2017, Bangkok, Thailand



5th IIR International Conference on Thermophysical Properties and Transfer Processes of Refrigerant, 23-26 April 2017, Seoul, South Korea



7th Conference on Ammonia and CO₂ Refrigeration Technologies, 11-13 May 2017, Ohrid, Macedonia



12th Heat Pump Conference, 15-18 May 2017, Rotterdam, the Netherlands



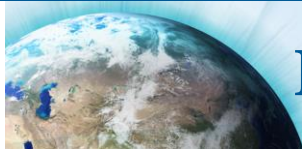
ATMOsphere Asia 2017 taking place a day before the **Bangkok RHVAC trade show**, 7-9 September, which ranks among the world's best HVAC&R exhibitions and is the second largest in the Asia Pacific region.



9th International Conference on Compressors and Coolants, 6-8 September 2017, Bratislava, Slovakia



Future of HVAC 2017 – 13–14 September 2017, Sydney, NSW, Australia



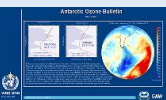
READING



Twenty Questions and Answers About the Ozone Layer, presents complex science in a straightforward manner. It complements the **2014 Scientific Assessment Report of Ozone Depletion** by WMO and the U.N. Environment Programme.



UNEP and USEPA: Promoting ozone and climate-friendly technologies in public procurement - a scoping study of Asia Pacific



WMO Antarctic Ozone 2016 Bulletins - Containing information on the state of the ozone layer in the Antarctic at roughly two week intervals from August to November. The bulletins are based on data provided by WMO Members which operate ozone monitoring stations in the southern hemisphere and satellites to observe ozone globally.



The **EU F-Gas Regulation Handbook**, Keeping Ahead of the Curve as Europe Phases Down HFCs - a free online resource for climate media and other concerned parties, published by the London-based Environmental Investigation Agency (EIA).

[Alternative Refrigerant Evaluation for High-Ambient-Temperature Environments: R-22 and R-410A Alternatives for Mini-Split Air Conditioners](#)

[AREA Guidance on minimum requirements for contractors' training & certification on low GWP Refrigerants](#) - AREA has updated its Guidance on minimum requirements for contractors' training & certification on low GWP Refrigerants.

[Free guide to F-gas changes](#) The European contractors association AREA has produced a timely guide to the F-gas regulations which clarifies the new rules, their impact and their practical application... [Read more](#)

The recent [Alternatives to HCFCs/HFCs in developing countries](#) with a focus on high ambient temperatures" study carried out by Öko-Recherche for the European Commission stresses that the refrigerant and blowing agent demand is expected to triple by 2030 in developing countries as a result of economic growth. A sector by sector analysis shows that a climate-friendly replacement for current and future of HCFCs and high GWP HFCs is possible in most applications ...

[Primer on Hydrofluorocarbons](#), Fast action under the Montreal Protocol can limit growth of HFCs, prevent up to 100 billion tonnes of CO₂-eq emissions by 2050, and avoid up to 0.5°C of warming by 2100. IGSD, January 2014, Lead authors: Durwood Zaelke, Nathan Borgford-Parnell, and Danielle Fest Grabel. Contributing authors: Stephen O. Andersen, Xiaopu Sun, Dennis Clare, Yuzhe Peng Ling, and Alex Milgroom.

[Flammable Refrigerants Safety Guide](#), AIRAH - Many of the refrigerants traditionally used in refrigeration and air conditioning systems in Australia have been non-flammable, non-toxic, synthetic greenhouse gases (SGGs) that have a high global warming potential (GWP). These were typically synthetic refrigerants including CFCs, HCFCs and HFCs. Due to the growing national and international concern regarding the resulting atmospheric effects of SGGs, the use of alternative low GWP refrigerants is increasing. ...

[Recent Trends in Global Emissions of Hydrochlorofluorocarbons and Hydrofluorocarbons: Reflecting on the 2007 Adjustments to the Montreal Protocol](#). S. A. Montzka *†, M. McFarland ‡, S. O. Andersen §, B. R. Miller †||, D. W. Fahey †, B. D. Hall †, L. Hu †||, C. Siso †||, and J. W. Elkins †† Earth System Research Laboratory, National Oceanic and Atmospheric Administration, Boulder, Colorado 80305, United States ‡ DuPont Chemicals & Fluoroproducts, Wilmington, Delaware 19805, United States § Institute for Governance & Sustainable Development, Washington, D.C. 20007, United States || Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, Colorado 80309, United States

[Geothermal Heating and Cooling: Design of Ground-Source Heat Pump Systems-ASHRAE](#)

A first edition, the IIR guide "[CO₂ as a Refrigerant](#)" highlights the application of carbon dioxide in supermarkets, industrial freezers, refrigerated transport, and cold stores as well as ice rinks, chillers, air conditioning systems, data centers and heat pumps. This guide is for design and development engineers needing instruction and inspiration as well as non-technical experts seeking background information on a specific topic. Publication, IIR Technical Guide, 2014.

FREE [HVAC Optimisation Guide released](#) by AIRAH and the NSW Office of Environment & Heritage outlines 20 HVAC optimisation strategies and how they can be applied to the vast majority of commercial systems, both in older and modern buildings...



Organic bromine compounds—another threat to the ozone layer

Industrial Refrigeration Equipment Market (Refrigeration systems, Coil and Condensers, Thermal panels and Parts) - Latin America Industry Analysis, Size, Share, Growth, Trends and Forecast 2013 - 2019



Persistence
Chlorofluorocarbon Market: Global Industry Analysis and Forecast to 2015 to 2021



[Organic Bromine Compounds—another threat to the ozone layer](#)

[Latin America Industrial Refrigeration Equipment Market Benefits from Region Flourishing Food and Beverage Production and Processing Market](#) – Trends and forecast 2013-2019.

[Solvents & Bio Solvents Market Outlook - Global Trends, Forecast, and Opportunity Assessment \(2014-2022\)](#)

[Chlorofluorocarbon Market: Global Industry Analysis and Forecast 2015 to 2021](#)

[Getting The World Off the Chemical Treadmill: A per capita convergence framework for an ambitious phase-down of HFCs under the Montreal Protocol](#), By: Umang Jalan, Research Associate, Climate Change Programme, Centre for Science and Environment

[Global Market for Natural Refrigerants to Reach 1,408.20 Million by 2020, Growing at CAGR of 11.0% by 2020](#)

MOPIA New [2016 Regulatory Compliance Guide](#) summarizes regulatory controls (*Manitoba and Canada*) and provides some other useful links and references...

[The Importance of Ambition in the 2016 HFC Phase-Down Agreement](#). Download the full report [here](#)

[Update on the Illegal Trade in Ozone-Depleting Substances](#) – The Environmental Investigation Agency (EIA) briefing to the 38th meeting of the Open-Ended Working Group of Parties to the Montreal Protocol, in Vienna, Austria, from July 18-21, 2016.

Environmental Investigation Agency (EIA) briefing, [The Importance of Ambition in the 2016 HFC Phase-Down Agreement](#), outlining key aspects of the proposals and calling on Parties to seek an agreement securing the highest climate ambition.

[F-Gas Regulation shaking up the HVAC&R industry](#). Commissioned by the Greens in the European Parliament, the study provides qualitative and quantitative analysis of the early impacts of the EU F-Gas Regulation on the European industry and evaluates its influences on other countries and regions in designing their own policies to curb HFCs.

January Edition of [Accelerate America!](#) By shecco

["The Road to Competence in Future Green Technologies"](#), the International Special Issue 2016-2017 of Centro Studi Galileo.

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The [2016 editions of ASHRAE's major refrigerants-related standards](#) have been published as a package with 30 new refrigerants and refrigerant blends added.



MISCELLANEOUS



New *International Journal of Refrigeration* service for IIR members - As of January 2017, not only will IIR members continue to receive the hard copy of the journal but IIR membership will now also give members access to the complete archives of the *International Journal of Refrigeration (IJR)* online. Designed with IIR members in mind, this new and practical electronic subscription gives members substantial advantages:

- Immediate and permanent access to the latest research and to IJR archive
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The [International Institute of Refrigeration](#), January 2017



GIZ first Cool Training 2017 will take place from 27 March to 7 April 2017 in Maintal, Germany. This two-week Cool Training deals with the safe application of the natural refrigerants propane, CO₂, and ammonia. It is composed of 30% theoretical and 70% practical work. It is carried out in cooperation with the Bundesfachschule Kälte Klima Technik (BFS) in Maintal, an international vocational training center in Germany that specializes on cooling technologies. Participants are required to have extensive experience in the RAC field and the capability to act as a multiplier of the acquired knowledge in the training. Furthermore, the training requires that participants are physically fit and able to work in English.

The two-week training package is offered for 3200 EUR and includes the following: course fee, training materials, protective clothing, safety equipment, airport pick up, hotel accommodation (with breakfast), and lunch on training days (i.e. weekdays). Not included in this package are the following: international flights, per diem allowance (as applies per your regulations), and insurance.

Registration and reservation of slots are now ongoing and should be sent to Cool.training@giz.de along with the CV of the proposed participant. Please be reminded that qualified participants are accommodated on a first come first serve basis.



International Observers - New AREA membership category - Due to the significant worldwide interest in European legislative developments and the increase in competence of personnel who handle new refrigerants, AREA is pleased to introduce its brand new "International Observer" membership category. This provides a fantastic opportunity for non-European RACHP installer bodies the world, to benefit from the expertise and discussions within Europe through access to AREA. Contact: info@area-eur.be



Commander of the British Empire (CBE) Award to Dr. John Pyle, Scientific Assessment Panel Co-Chair - Distinguished members of the University of Cambridge have been named in the 2017 New Year Honours list, announced today. [...] Professor John Pyle is among those who have been recognised for their contributions to society.

Thanks to refrigeration, roses are red for Valentine's Day FRANCE: In a new series of videos, Carrier Transicold attempts to explain the role refrigeration plays in ensuring that the millions of red roses to be delivered this Valentine's Day arrive in perfect condition.



MONTREAL PROTOCOL
WHO'S WHO

The Montreal Protocol Who's who
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<http://www.unep.fr/ozonaction/montrealprotocolwhoswho>

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