



OzonAction

# OZONNEWS



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## In this issue

1. Effects of Ozone Depletion Felt in the Tropics
2. Visit OzonAction Information Booth at 39<sup>th</sup> OEWG
3. The Ozone Secretariat is introducing a new system for the registration of delegates to the meetings of the Vienna Convention and the Montreal Protocol
4. Key Greenhouse Gases Higher than Any Time over Last 800,000 Years
5. Are You Committed? The Time to Act on Refrigerants is Now
6. What are Ozone Depleting Substances on Ships?
7. 1<sup>st</sup> IIR International Conference on the Application of HFO Refrigerants
8. Refrigerant Market by Type (HCFC, HFC, HFO, Isobutane, Propane, Ammonia, and CO<sub>2</sub>), Application (Refrigerators, Large-scale Refrigerators, Chillers, Air Conditioners, and Heat Pumps), Region - Global Forecast to 2022
9. The Kigali Amendment to the Montreal Protocol - Opportunities and Next Steps - OzonAction Video
10. The Ozone Awards 2017: Call for Nominations
11. 'Korea Customs Service Organized a Green Customs Initiative Workshop to Interdict Environmentally Hazardous Substances and Endangered Species'
12. Increased Risk of Ozone Loss Over the United States in Summer, Evidence Shows
13. Greening Your Refrigerants — Saving the Ozone Layer and Saving Money
14. European HFC Emissions Fall
15. Use of Climate-Friendly Tech Rising - But Some Supermarkets In for a Nasty Surprise in 2018



**Multilateral Fund**  
for the Implementation of the Montreal Protocol

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



# GLOBAL

## 1. Effects of Ozone Depletion Felt in the Tropics



In Rikitea, French Polynesia, precipitation increased by 50 percent between the 1960s and the 1990s. Climate simulations indicate that this trend will be reversed by the expected recovery of the ozone layer. Credit: commons.wikimedia.org

The hole in the ozone layer above Antarctica has more far-reaching consequences than previously assumed. A study by Bernese climate researchers has now shown that it even affects precipitation in the tropical regions of the Pacific, 10,000 kilometres away. This new finding demonstrates how the climates of extremely remote areas are linked.

The struggle to close the hole in the ozone layer that opens above the Antarctic each spring is seen as one of the greatest achievements of international environmental policy. In the late 1980s, the international community committed to drastically

reducing the use of substances that deplete the ozone layer. This led to a steady recovery of the ozone layer above Antarctica, and in 2014, the World Meteorological Organization (WMO) announced that if this trend continued, recovery would be complete by the year 2050 at the latest.

Now, however, an international team of researchers led by the Oeschger Centre for Climate Change Research at the University of Bern has concluded that the depletion of the ozone layer has had previously unknown effects on the climate system. Researchers found that even rainfall in the tropical regions of the Pacific is affected by the ozone hole. "The fact that there are such connections in the climate system between places so far apart is fascinating. However, it is disturbing that people are responsible for this", says the Bernese climatologist Stefan Brönnimann, who headed the study that has just been published in the journal *Environmental Research Letters*.

### Global impact of the ozone hole

Simulations with a range of different climate models and statistical analyses of observed data from the past 60 years show that the hole in the ozone layer causes a ridge to the east of New Zealand. From that point, a wavy circulation pattern extends over the South Pacific and causes an increase in precipitation in the heart of the South Pacific Convergence Zone, one of the most intense rain belts on earth. For example, precipitation between October and December in Rikitea, French Polynesia, increased by 50 percent between the 1960s and the 1990s. A large part of that increase was down to the hole in the ozone layer. This trend will reverse during the ozone hole recovery that will take place over the next decades: precipitation in the region will be decreasing again.

"Significant ozone depletion was known to affect the winds over the Southern Ocean", explains Stefan Brönnimann, "but the effect as far as the Tropics had not previously been demonstrated." The focus of previous investigations was on the impact of the ozone hole on the subpolar latitudes and the southern mid-latitudes.

"Our study shows that ozone depletion was in the past a key driver of climate change in the tropical regions of the Pacific", says Stefan Brönnimann, "and in the same way, the recovery of the ozone layer will also affect the climate in the future." Considering the impact of the greenhouse effect caused by carbon dioxide and other gases, the Bernese climatologist is concerned by this evidence of the huge impact of human activity on the regional climate on the other side of the world.

## 2. Visit the OzonAction Information Booth at 39<sup>th</sup> OEWG

During the forthcoming 39<sup>th</sup> Meeting of the Open-ended Working Group of the Parties to the Montreal Protocol and Workshop on the Safety Standards Relevant to the Safe Use of Low-GWP alternatives to HFCs, in Bangkok, Thailand, UN Environment OzonAction will be hosting its Information Booth.

This booth will provide, as we always do, the latest OzonAction capacity building and information products and tools.

All delegates are invited to visit the booth to obtain factsheets, posters, publications, videos etc. – available in paper or on USB sticks. You can also learn about and download the latest OzonAction smartphone applications.

The exhibition booth will be open, between the 10<sup>th</sup> and the 14<sup>th</sup> July.

**We look forward to seeing you there!**



## 3. The Ozone Secretariat is introducing a new system for the registration of delegates to the meetings of the Vienna Convention and the Montreal Protocol

The new registration system, which is more user-friendly and interactive, will provide delegates with an easier way to register for the meetings and give them the flexibility to keep their profile information updated at all times. Furthermore, the new system is built on a modern and better structured database, hence it will allow focal points to register all members of their delegation using pre-existing information from previous meetings and enable delegates to register only for specific back-to-back meetings. In addition, the new system is expected to expedite the issuance of meeting badges

at the registration counter with the introduction of a Priority Pass that is emailed to all pre-registered delegates.

We are pleased to pilot the new system as part of the registration process for the forthcoming workshop on the safety standards relevant to the safe use of low-GWP alternatives to HFCs and the 39<sup>th</sup> Meeting of the Open-ended Working Group of the Parties to the Montreal Protocol, to be held from 10 to 14 July at UNESCAP in Bangkok. The system will only be used to facilitate the issuance of badges for the upcoming meetings during this piloting phase, but it will go fully live with all its enhanced features during registration for the Joint Eleventh Conference of the Parties to the Vienna Convention and the Twenty-Ninth Meeting of the Parties to the Montreal Protocol to be held from 20 to 24 November 2017 in Montreal.

As we transition from the old to the new system, please excuse us for any multiple notifications that you may have received or may receive as we seek to ensure the details of all pre-registered delegates for the upcoming meetings are accurate and that each delegate receives a Priority Pass.

Once delegates receive the Priority Pass, they will simply need to show it either as an electronic copy on a handheld device or as a print-out at the registration counter at UNESCAP from Sunday, 7 July 2017, at 8:00 am to receive a meeting badge. Delegates should have their Passport/Photo ID ready for verification. Any corrections to the information on the Priority Pass should be submitted to the registration counter prior to the issuance of the badge.

Please note that registration for the upcoming meetings in Bangkok is currently ongoing. We kindly remind all delegates to **pre-register** as soon as possible to enable us to issue their Priority Passes and to facilitate a smooth changeover to the new registration system. The registration code for the meetings is OEWG39-WS.

▶ For any questions, suggestions or feedback, please contact [Betty Kamanga](#) and [Kathleen Creavalle](#)

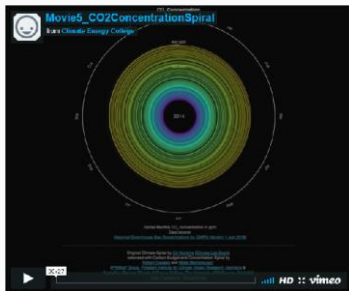
## 4. Key Greenhouse Gases Higher than Any Time over Last 800,000 Years

The most comprehensive collection of atmospheric greenhouse gas measurements, published [1 June], confirms

the relentless rise in some of the most important greenhouse gases.

The data show that today's aggregate warming effect of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) is higher than at any time over the past 800,000 years, according to ice core records.

Building on half a century of atmospheric measurements by the international research community, we compiled and analysed the data as part of a group of international scientists, led by Malte Meinshausen from the University of Melbourne in collaboration with CSIRO.



Together, the data provide the most compelling evidence of the unprecedented perturbation of Earth's atmosphere. They clearly show that the growth of greenhouse gases began with the onset of the industrial era around 1750, took a sharp turn upwards in the 1950s, and still continues today.

Research has demonstrated that this observed growth in greenhouse gases is caused by human activities, leading to warming of the climate – and in fact more than the observed warming, because part of the effect is currently masked by atmospheric pollution (aerosols).

The new collection of records comes from measurements of current and archived air samples, air trapped in bubbles in ice cores, and firn (compacted snow). The data cover the past 2,000 years without gaps, and are the result of a compilation of measurements analysed by dozens of laboratories around the world, including CSIRO, the Bureau of Meteorology's Cape Grim Station, NOAA, AGAGE and the Scripps Institution of Oceanography, among others.

These data include 43 different greenhouse gases released into the atmosphere from dozens of human activities and industrial processes. While CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O are on the rise, some other greenhouse gases such as dichlorodifluoromethane (CFC-12) are slowly starting to decline as a result of policies to ban their use.

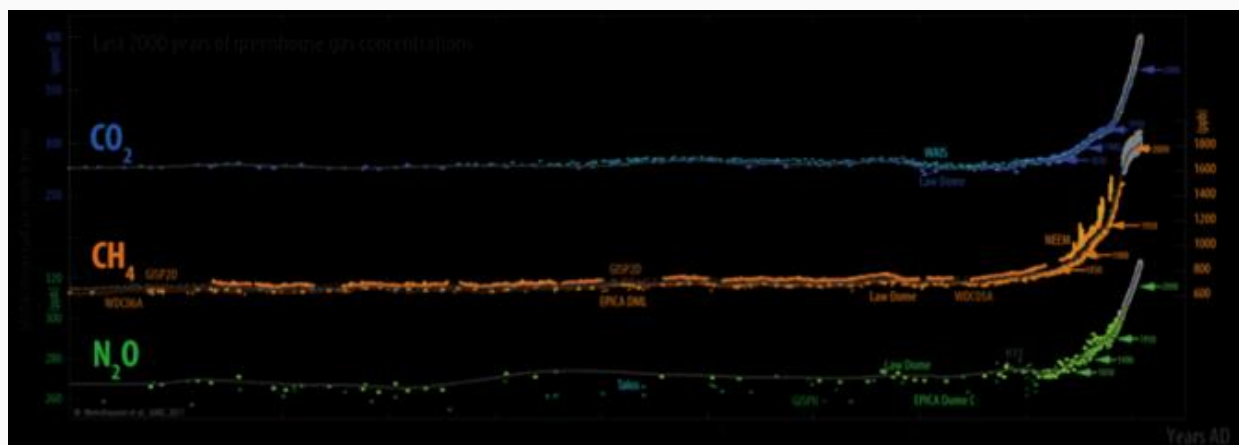
### The greenhouse gases

Most of us know that CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O are among the principal causes of human-induced climate change. They are found in the atmosphere in the absence of human activity, but the increases in their concentrations are due to human activities such as burning fossil fuels, deforestation and agriculture (livestock, rice paddies, and the use of nitrogen-based fertilisers). They are all from biological or fossil fuel sources.

But there is much more when it comes to greenhouse gases. Our analysis features a further 40 greenhouse gases (among hundreds that exist), many of them emitted in very small quantities. Although many might play a small role, dichlorodifluoromethane (CFC-12) and trichlorofluoromethane (CFC-11) are the third and fifth most important greenhouse gases respectively, in terms of their overall contributions to global warming.

Most of these gases are emitted exclusively by humans, the so-called synthetic greenhouse gases, and have been used variously as aerosol spray propellants, refrigerants, fire-extinguishing agents, and in the production of semiconductors, among other industrial applications.

Synthetic greenhouse gases include chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs), most perfluorocarbons (PFCs), sulfur hexafluoride (SF<sub>6</sub>), and others. Several, most famously CFCs, also deplete the ozone layer and are regulated under the Montreal Protocol. Others, such as HFCs, were actually first produced in large quantities to replace the ozone-depleting substances, but unfortunately turned out to be potent greenhouse gases too. [...]



## 5. Are You Committed? The Time to Act on Refrigerants is Now



[New research](#) shows that our society is only four years away from keeping the global average temperature of rising to no more than 1.5C. Reductions of CO<sub>2</sub> through measures such as the phasing out of chemical refrigerants are necessary. Thankfully, much progress has been made by the global consumer goods industry in transitioning away from fluorinated gases in refrigeration since we published our first Refrigeration Resolution in 2010. This progress was reflected in [the] revised resolution on refrigeration, published in October 2016, and [the] first-ever, member-led [Refrigeration Case Studies Booklet](#).

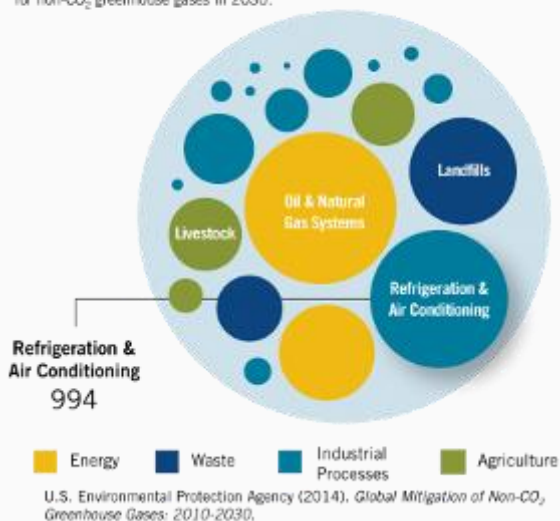
From the policy perspective, we now have incredible momentum. The success of COP 21 and the Paris Agreement gave energy and a final push to achieve consensus for an amendment of the Montreal Protocol. Under the amendment, countries have committed to cut the production and consumption of hydrofluorocarbons (HFCs) by more than 80% over the next 30 years. Most developing countries will freeze consumption in 2024 (with a small number of developing countries with unique circumstances) freezing consumption in 2028. The plan also provides financing to certain nations, to help them transition to climate-friendly alternatives.

However, while there are several shining examples of success in the use of natural refrigerants (NRs) within the consumer goods sector – Coca-Cola moving to 100% CO<sub>2</sub> refrigeration in its vending machines worldwide, Carrefour transitioning 170 stores to NRs, including in warmer climates – it's clear that much work is still necessary. Worldwide, commercial and light-commercial refrigeration is still dominated by the use of HFCs and hydrochlorofluorocarbons (HCFCs). So, what is the current state of the industry, what are the barriers to further progress and what more can CGF do to align its members with best practice?

With commercial refrigeration making up around 40% of the world's HFC use, switching to natural refrigerants has huge potential benefits for the environment. As technology continually improves, NR systems are also increasingly offering significant cost benefits over HFCs and HCFCs. This is due to less leakage, lower maintenance requirements and better energy efficiency. As commercial refrigeration represents 30-60% of supermarkets' total energy demand, employing NR technology can also offer companies a clear bottom-line advantage. Although many retailers have begun using NRs, progress among our members has been mixed. Ahead of our [2017 Global Summit in Berlin](#), there are still members to whom refrigeration is relevant that have not yet made a public commitment to phase down HFCs.

### HFC Emissions from Refrigeration and Air Conditioning Systems: Emissions Reduction Potential in 2030

Assuming full implementation of current technology, emissions in the refrigeration and air conditioning systems sector could be reduced by up to 994 MtCO<sub>2</sub>e in 2030. This accounts for 22% of the 4,615 MtCO<sub>2</sub>e in global reduction potential for non-CO<sub>2</sub> greenhouse gases in 2030.



### European leadership – North America in need for a push to NRs

Europe currently leads the way for the switch away from fluorinated gases. A survey of north European supermarkets found 65% had started implementing NR technology. Research from market analyst shecco showed

greater than 8,700 European supermarket/food stores using transcritical CO<sub>2</sub> systems – more than three times the number in 2013. One of the main drivers of Europe's switch to NRs is legislation, namely the 2014 EU F-Gas Regulation. The regulation sets dates from which HFCs with specific GWPs will no longer be allowed to be placed on the market. This has had the effect of rapidly reducing the amount of HFCs placed on the market from 2015.

A combination of policies that improve the business case for NRs coupled with innovations in technology are helping to fuel a surge in NR take-up in light commercial refrigeration in the US, Canada and Mexico. There are various elements to policy in North America pushing the industry towards NRs, as well as an accelerated phase down of HCFCs. The US Environmental Protection Agency's (EPA) Significant New Alternatives Policy (SNAP) Program has sanctioned the use of a wide range of NRs and banned other high-GWP refrigerants. The US Department of Energy has also recently released tougher energy efficiency standards for commercial refrigeration, which it hopes will help cut carbon emissions by more than 140m tonnes over the next 30 years. Some individual regions are also pursuing their own local policies to help promote the take-up of NRs. These include California, which is considering offering financial incentives for organisations that switch to new, low-GWP commercial refrigeration.

Other notable initiatives include the US EPA's GreenChill partnership, which helps food retailers to reduce their refrigerant gasses emissions. The CGF was featured on the February webinar that provided a great opportunity to address GreenChill's network in the US on the challenges of phasing down synthetic refrigerants within our membership and beyond.

### **Asia: potential in China and Japan**

Despite HFCs (75%) and HCFCs (62%) still being the dominant refrigerants used in China, shecco's recent research suggests the country has the potential to be a major market supplier and user of NRs between now and 2020. As in other territories, leadership from policymakers has been key to prompting a take-up of NRs. Critically, China has relaxed its long-held opposition to the Montreal Protocol's aim of reducing global HFC use, and has agreed to eliminate the production of HCFCs by 2030. China's revised Environmental Protection Law imposes unlimited financial penalties for polluters. Clearly, there is an opportunity for China to switch from HCFCs straight to NRs.

Japan has seen huge growth in the use of NRs in the light-commercial sector. With Japan boasting the highest number of beverage vending machines per capita in the world, its use of NRs should have positive ramifications for the light-commercial market worldwide. Another Japanese success story is in the number of food retailers, including some supermarkets and other smaller outlets, using CO<sub>2</sub> transcritical systems. The number of stores has rocketed to more than 1,800 today.

### **Harnessing the power of multinationals**

There is huge scope for international companies to accelerate take-up of NRs in multiple territories by setting policies at a global level. For example, Coca-Cola, Red Bull and Unilever (all members of the [Refrigerants, Naturally!](#) initiative) have committed to eliminating HFCs from their vending and cooler machines across the globe. This has boosted take-up of NR equipment in places where progress might otherwise have been much slower. Similarly, European supermarket chains Tesco and Metro (also active CGF members) have introduced CO<sub>2</sub> refrigeration in their stores in China after first successfully employing the technology in their core market of Europe.

There is an opportunity for CGF's members to adopt this approach more universally.

### **Natural refrigerant supply challenges**

NRs are some of the longest-used refrigerants in the world, some dating back to the 19th century. Ammonia, for example, has been widely used in large-scale industrial refrigeration systems in many countries for several decades. As in many markets, supply of NRs are (and will be) to a large extent a function of demand. As refrigeration markets around the world inevitably move – albeit at different speeds – towards the use of lower-GWP gases, refrigerant suppliers will have to scale up their production of NRs.

Specific types of NR have their own production characteristics and challenges. Ammonia and CO<sub>2</sub>, for example, are widely available and produced in many global locations. However, the local purity of these gases may sometimes be lower than recommended for their R717/R744 (respectively) refrigerant versions. In such scenarios, purification or importing are both expensive solutions. Hydrocarbons (HCs) are mostly generated as a by-product of natural gas processing and petroleum refining. However, there are currently few sources of many HCs and even fewer companies that can purify them to the required specification for refrigeration. Some original equipment

manufacturers (OEMs), meanwhile, warn that the phasing-down of fluorinated gases, coupled with regulations on charge limits for alternative refrigerants, will create supply problems.

In an attempt to head-off this potential supply bottleneck, other OEMs are campaigning for NR charge standards to be amended. For example, in February 2016, UK-based Carter Retail Equipment submitted an application to the US EPA to increase the maximum charge of the HC propane permitted in food/commercial retail refrigeration standalone equipment from 150g to 1kg.

Many commentators argue that the best way of ensuring adequate supply of NRs – which will in turn ensure a downward pressure on price – will be to **create sufficient demand from end-users**.

***Collaboration between end-users and refrigerant manufacturers can lead to new – greener and cheaper – supply streams.*** For example, UK supermarket chain Sainsbury's is currently piloting the use of the "eCO<sub>2</sub>" refrigerant in one of its stores. eCO<sub>2</sub>, produced by suppliers A-Gas, is made from a by-product of the bioethanol production of sugar beet supplied by the manufacturers that make sugar for Sainsbury's supermarkets. This contrasts with the often far higher emitting industrial processes that are used in much CO<sub>2</sub> refrigerant production. There is clearly scope for the CGF to encourage its members to explore new and greener means of refrigerant supply, such as eCO<sub>2</sub>. Wherever possible, retailers should be encouraged to use the principles of the circular economy to extract value from all the products in their supply chain.

### **Next steps – the transition challenge**

As well as the supply issues already considered, there are a number of challenges that the consumer goods industry faces in enabling the switch to NRs.

***Safety standards.*** In many jurisdictions around the world, the take-up of NRs is hampered by standards that prevent or limit their use (eg, the regulations limiting HC charge in certain commercial refrigeration equipment to 150g, as noted above). Many of these regulations are predicated on safety concerns around the use of NRs. If not used in the appropriate way, HCs are flammable, while ammonia can be toxic. CO<sub>2</sub> installations, meanwhile, operate at high pressures. However, standards differ in different jurisdictions. Regulations will be altered in the near future, driven by pressure on policymakers from multinational companies who want to pursue the NR pathway.

***Lack of technical expertise.*** Many commentators bemoan a lack of available technical expertise and training in using and maintaining NR technology in certain territories of the global refrigeration industry. However, as take-up of NR systems has increased, technical knowledge has certainly improved, with many more training programmes for NR available today than a few years ago.

Many operators now also offer in-house training. The US, Canada and Mexico are committed to a global phase down of HFCs. In 2016, they again (for the eighth consecutive time) tabled a proposal to phase down HFCs under the Montreal Protocol. To date, a number of developing countries have blocked the proposal, citing concerns about cost, legalities and technical issues.

### **Next steps for the CGF**

Following the announcement of the CGF's second refrigeration Resolution in 2016, there is clearly much more transition work to be done – and more the CGF itself can do.

Through the canvassing of expert industry opinions, the key points to emerge of how the CGF can help move the industry further towards best practice in refrigeration include:

- CGF members becoming more vocal on their HFC phase-out plans and progress.
- Encouraging information-sharing among CGF members about the safety and cost issues associated with NRs.
- Initiating and coordinating collaborative research, tests and pilot projects on the use of NRs to boost global demand for and supply of NRs.
- Working with members to remove barriers to NRs, including revising national and regional standards to allow more widespread use of NRs.
- Increasing the dissemination of knowledge about NRs, through, for example, technical and policy webinars, case studies, workshops, papers and online materials.

There is clear scope for companies to be more ambitious in phasing out harmful chemical refrigerants and move to natural alternatives. There are environmental and economic benefits from the switch, but initial investment costs

are proving to be a challenge, as are some legislative frameworks that favour – perhaps inadvertently – existing technology over innovation.

***An HFC phase-down could prevent warming of up to 0.1°C by 2050 and 0.5°C by 2100, offering one of the most cost effective climate mitigation strategies available in the world TODAY!!!***

- ▶ [The Consumer Goods Forum](#), 20 April 2017, By: Ignacio Gavilan, Director of Environmental Sustainability

## 6. What are Ozone Depleting Substances on Ships?

The ozone layer is the most important protection zone in the atmosphere of the earth. Having a molecular formula  $O_3$ , the element in the ozone layer is well-known for absorbing the ultra-violet rays emitted by the sun and thus protecting the earth from harmful radiation effects. In the past three decades, owing to the superfluous usage of substances that contain Chlorofluorocarbons (CFCs), it has become a widespread knowledge that the layer is depleting, which could cause severe problems not just for humans but also for plants and animals as well.



Considering the precariousness of the oceanic environment, a MARPOL regulation referred to as the Prevention of Air Pollution from Ships has been put into active force from the 19<sup>th</sup> March 2005. Under this regulation, all ships that have a gross tonnage of over 400 tons and have been constructed prior to this date have to have an International Air Pollution Prevention (IAPP) certificate. This certification will be issued by the officials in the administration department of the country to which the ship belongs.

A survey is carried out to determine the maintaining of stipulations prescribed by the MARPOL regulation pertaining to hazardous components like ozone depleting substances along with other pollutants. Based on this primary survey, the certification is awarded to a ship. Detailed below is a list of ozone depleting substances that are categorically stated in the MARPOL extension.

- Stipulation 12: Ozone Depletion Substances
  - CFCs: These include Trichlorofluoromethane (CFC11), Dichlorodifluoromethane (CFC12) and Chloropentafluoroethane (CFC15)
  - **Halon (Organic Compound):** These include two sub-categories where the first category compounds have been banned from being used in ships with a construction date of 19<sup>th</sup> May 1995 and the second category compounds have been banned from being used in ships with a construction date of 1<sup>st</sup> January 2020

The first type compounds are R11 to R13, R111 to R115 and R211 to R217 while some of the second type compounds include R21, R22, R31 and R271.

- **Methyl Chloroform**
- **Methyl Bromide**
- **Bromochlorodifluoromethane**
- **Bromotrifluoromethane**

If the ozone depleting substances from ships are found to emitting the toxic fumes into the waters either during repair or maintenance work, they shall be brought under the purview of the Parties to the Protocol (1997) governance. Also these kinds of discharges of the ozone depleting substances from ships are regarded to be as being deliberate and therefore merit stringent disciplinary action.

Also in accordance with this protocol, all the governments whose countries are a part of this protocol need to have a proper facility (stipulation 17) to ensure that the gadgets and devices containing ozone depleting substances are repaired or removed entirely without causing any unwanted detaining to the operation of the vessels.



As Per MARPOL Annex VI, an ozone depleting substance record book to be kept and maintained onboard.

Apart from the ozone depletion substances, the other pollutants listed in the MARPOL regulations' extension are:

- [Oxides of Nitrogen](#) (Stipulation 13)
- [Oxides of Sulphur](#) (Stipulation 14)
- Organic Compounds volatile in nature (Stipulation 15)

Due to the availability of the list of ozone depleting substances and the proper maintenance facilities, a substantial contribution to save the fast-depleting ozone layer has been undertaken. It is only by these proactive measures that we can help to ensure a better and safer planet for the generations of civilisations to come.

► [MarineInsight](#), January 2017

## 7. 1<sup>st</sup> IIR International Conference on the Application of HFO Refrigerants



1st IIR International  
Conference  
on the Application  
of HFO Refrigerants

Birmingham  
2nd – 5th September  
2018

The Institute of Refrigeration is proud to announce that it will be hosting the 1<sup>st</sup> IIR International Conference on the Application of HFO Refrigerants.

The conference will take place on the 2<sup>nd</sup> -5<sup>th</sup> September 2018 in the centre of Birmingham at Austin Court Conference Centre.

The conference papers will provide up-to-date, information on the experience and use of the new family of A2L refrigerants known as HFOs. Papers will be invited on themes including:

- Characteristics of low GWP refrigerants
- Design issues for systems, components and controls
- Safety issues (flammability risk analysis, design considerations, operating experience)
- Legislation, codes of practice and standards
- Responsible use and environmental considerations

Papers may also include comparisons with other low GWP fluids such as ammonia, CO<sub>2</sub>, hydrocarbons and R32.

The event will attract an international audience of those with an interest in HFO refrigerants including end users, component manufacturers, product development specialist, researcher and development experts, system and equipment designers, senior managers and policy makers.

The conference will be supported by relevant IIR commissions and will incorporate Commission B1, B2, C2, D1, D2, E1 and E2 and Working Group meetings.

For more information about the conference, registration, papers and abstracts, or about the sponsorship opportunities Please contact IIR at [hfo2018@ior.org.uk](mailto:hfo2018@ior.org.uk)

► [International Institute of Refrigeration](#), June 2017



## 8. Refrigerant Market by Type (HCFC, HFC, HFO, Isobutane, Propane, Ammonia, and CO<sub>2</sub>), Application (Refrigerators, Large-scale Refrigerators, Chillers, Air Conditioners, and Heat Pumps), Region - Global Forecast to 2022

The refrigerants market is projected to reach USD 18.05 billion by 2022, at a CAGR [Compound Annual Growth Rate] of 4.5% between 2017 and 2022. The drivers for this market are the increasing demand for consumer appliances such as refrigeration and air-conditioning equipment and growing cold chain market. Factors such as growth in organized retail framework, shift towards horticultural crops, and growth in the processed food sector also contribute to the growth in demand for refrigerants. Increasing regulations against the use of fluorocarbon refrigerants and flammability and toxicity issues are expected to be restraints for the refrigerants market. Owing to increasing regulations on the use of fluorocarbons, the refrigerants market is expected to witness an increase in demand for natural refrigerants, which in turn, is expected to be an opportunity in the refrigerants

market. Fluorocarbons—The largest refrigerant type in the refrigerants market in 2016.

Fluorocarbon refrigerants lead the overall refrigerants market. However, with several countries agreeing to completely phase out the usage of fluorocarbons by 2047, the market for this segment is expected to witness a decline. The European Union (EU) has already stopped the usage of HCFCs in cooling equipment manufactured after 2000. Thus, the hydrocarbon refrigerants segment is expected to be the fastest-growing refrigerant type owing to its low environmental impact and long term viability.

*Air conditioners—The largest and fastest-growing application in the refrigerants market* -Air conditioners lead the overall refrigerants market. The MAC sub-application of air conditioners is projected to be one of the fastest-growing applications in the refrigerants market. The Asia-Pacific leads the refrigerants market in the MAC application segment due to the growing automotive industry in the region. Factors such as low cost of labor, shifting of manufacturing facilities from Europe to the Asia-Pacific, and rising spending power of consumers are driving the automotive industry, which in turn, is driving the refrigerants market in the MAC application segment.

*Middle East & Africa expected to be the fastest growing market in refrigerants* The refrigerants market in the Middle East & Africa is projected to grow at the fastest rate from 2017 to 2022. In the Middle East & Africa, growth in applications such as large-scale refrigerators and chillers are driving the growth of the refrigerants market. Macroeconomic factors such as massive economic growth, steady population growth, increasing tourism, and economic diversification (for instance, shifting dependency from the oil & gas industry to the retail and service industry) are responsible for the increase in the use of refrigerants in various applications. Increasing economic prosperity, growing populations, and rising disposable incomes are attributed to the increase in overall consumer expenditure in the region.

### **Break-up of profiles by the primary participants for the report**

- By Company Type – Tier 1–37%, Tier 2–50%, and Tier 3–13%
- By Designation – C Level– 50%, Director Level–31%, and Others–19%
- By Region – North America–28%, Europe–22%, Asia-Pacific–17%, Middle East & Africa-28%, and South America–5%

The companies profiled in this report are The Chemours Company (U.S.), Honeywell International Inc. (U.S.), Arkema SA (France), Dongyue Group Co. Ltd (China), Asahi Glass Co., Ltd. (Japan), Daikin Industries Ltd. (Japan), Sinochem Corporation (China), Mexichem S.A.B. de C.V. (Mexico), The Linde Group (Germany), Gujarat Fluorochemicals Ltd. (India), and Air Liquide (France), among others.

### **Research Coverage**

The refrigerants market for this study is segmented on the basis of type and application. The type segment is further segmented into fluorocarbons (HCFCs, HFCS, and HFOs), inorganics (ammonia and CO<sub>2</sub>), and hydrocarbons (propane and isobutane). The applications for this report include refrigerators (domestic, commercial, and transport), large-scale refrigerators (supermarkets/hypermarkets and industrial), chillers (displacement and centrifugal), air conditioners (portable, single split, multi-split, and mobile air conditioners), and heat pumps.

### **Reasons to Buy the Report**

This research report is focused on various levels of analyses—industry analysis (industry trends), dive matrix, and company profiles, which together comprise and discuss the overall views on the competitive landscape; emerging and high-growth segments of the refrigerants market; high-growth regions; and market drivers, restraints, and opportunities.

### **The report provides insights on the following pointers:**

- Market Penetration: Comprehensive information on refrigerants offered by the top players in the global refrigerants market
- Product Development/Innovation: Detailed insights on upcoming technologies, research & development activities, and new product launches in the refrigerants market
- Market Development: Comprehensive information about lucrative emerging markets – the report analyzes the markets for refrigerants across regions
- Market Diversification: Exhaustive information about new products, untapped geographies, recent developments, and investments in the global refrigerants market

- Competitive Assessment: In-depth assessment of market shares, strategies, products, and manufacturing capabilities of the leading players in the refrigerants market

▶ [Research and Markets](#), May 2017

## 9. The Kigali Amendment to the Montreal Protocol - Opportunities and Next Steps - OzonAction Video

The Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer reached agreement at their 28<sup>th</sup> Meeting of the Parties on 15 October 2016 in Kigali, Rwanda to phase down hydrofluorocarbons (HFCs).

The UN Environment, OzonAction developed a video to find out from renowned international scientific, health, technical, financial and national experts about background and significance of this Kigali amendment.



The amendment presents many opportunities: improving the environment, refrigeration and air-conditioning systems and especially energy efficiency. It also presents new challenges.

It is absolutely critical now for industry, governmental bodies and civil society to work together to adopt greener technologies in each country of the world and fight global warming.

▶ [OzonAction YouTube](#) | See also: [United Nations Treaty Collection](#)



## 10. The Ozone Awards 2017: Call for Nominations

In celebration of the 30<sup>th</sup> anniversary of the adoption of the Montreal Protocol, the Ozone Secretariat, in cooperation with the Government of Canada, will host the Ozone Awards at the Twenty-Ninth Meeting of the Parties, to be held in Montreal, Canada, from 20 to 24 November 2017.

The Ozone Awards will recognize the achievements of individuals, groups, and organizations that have demonstrated extraordinary commitment and contribution to the progress and achievements of the Montreal Protocol in the past 10 years. These individuals, groups and organizations also exemplify the power of cooperation on large and small scales to accomplish goals and produce tangible change.

The Ozone Secretariat is calling for nominations for the Ozone Awards from individuals, governments and implementing partners including the United Nations and international bodies, non-governmental organizations and industry and their associations.

### [Download the Call for Nominations](#)

#### HOW TO NOMINATE

##### Who is eligible?

You may nominate individuals, groups, civil society organizations, government agencies at local or national level, non-governmental organizations or private sector entities for these awards. You may nominate yourself or the institution to which you belong.

Please note that the Ozone Secretariat, the Secretariat of the Multilateral Fund for the Implementation of the Montreal Protocol, and the individuals working in the two Secretariats are not eligible to be nominated and shall not be part of the selection process.

##### How do I submit a nomination?

Complete and submit the [online nomination form](#). If you wish, you may submit additional supporting materials such as documents, photos, videos and character references together with the nomination.

Tell us how the nominee has made significant contributions that are required for being considered to win the relevant award.

## When are nominations due?

All nomination forms and supporting materials must be submitted by **20 July 2017**.

## SELECTION PROCESS

The winners for each award category will be selected through a two-step review:

1. A Technical Screening Committee made up of experts from non-governmental organizations, governments and other stakeholders that are knowledgeable about the ozone layer protection regime and processes will review all nominations and make their recommendations. The Committee may fact-check the details of the nominations with relevant UN bodies. The names of the Committee Members will be published in due course.
2. An International Jury made up of eminent experts will review the Technical Screening Committee's recommendations of nominees and decide on a final list of award recipients in each of the award categories. The names of the Jury Members will also be communicated in due course.

Please note that Members of the Technical Screening Committee and International Jury are also eligible for awards and will recuse themselves from their roles when appropriate.

Award recipients will be announced and awarded during the award ceremony to be held on 23 November 2017 during the Twenty-Ninth Meeting of the Parties, to be held in Montreal, Canada.

## KEY DATES

<b>8 May – 20 July 2017</b>	Nomination period: All nomination forms are to be submitted by 20 July.
<b>21 July – 16 October 2017</b>	Review and selection of award recipients.
<b>23 November 2017</b>	Ozone Awards ceremony at the Twenty-Ninth Meeting of the Parties in Montreal, Canada.

- ▶ For further inquiry about the Ozone Awards, please contact:

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- ▶ [Learn more](#) | Ozone Secretariat, [2017 Award](#)



## ASIA PACIFIC

### 11. 'Korea Customs Service Organized a Green Customs Initiative Workshop to Interdict Environmentally Hazardous Substances and Endangered Species'

The Korea Customs Service announced that the 'Green Customs Initiative Workshop' would be organized at the Customs Border Control Training Institute on 7~8 June 2017 aiming at strengthening capacity of customs officers against cross-border environmental crimes.

\* Green Customs Initiative: A partnership of international organizations including UN Environment, WCO and Interpol cooperating to prevent the illegal trade in environmentally-sensitive commodities

In this workshop, four experts from international organizations including UN Environment and Basel, Rotterdam & Stockholm Convention participated as resource persons to share transnational environmental crimes status and enforcement guidelines & techniques for detecting and preventing illegal trade of hazardous wastes, ozone depleting substances (ODS) and endangered species. Forty customs officers from all over the country responsible for customs clearance, investigation and surveillance, gathered to attend the training. In addition, participants discussed how to improve customs responses against transnational environmental crimes as well as control tactics at the borders to facilitate implementation of Multilateral Environmental Agreements.

\* Multilateral Environmental Agreement (MEA): Legally binding agreement signed by multiple states to control international trade of environmentally sensitive items (e.g. Montreal Protocol (ODS), Basel Convention (Hazardous wastes, household wastes, etc.) Rotterdam Convention (hazardous chemicals and pesticides), Stockholm Convention (Persistent Organic Pollutants), CITES (endangered species))



According to the Korea Customs Service, despite increasing social concerns over environmental protection due to climate change and growing pollution, illegal trade of environmentally sensitive items persists such as hazardous wastes and endangered species. Therefore, the roles of customs administrations and responses at the borders are growing ever more important in the fight against cross-border environmental crimes. Against this backdrop, reflecting these increasing needs, Korea Customs Service decided to hold this workshop in order to cultivate environmental crime experts within the agency.

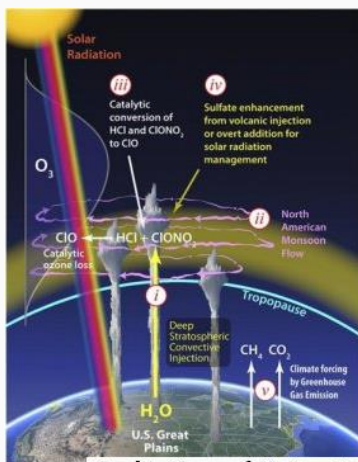
Korea Customs Service plans to enhance control measures against illegal trade of environmentally sensitive items including hazardous wastes and endangered species as well as strengthen cooperation with domestic and international agencies including international organizations, overseas customs administrations, and Ministry of Environment. In particular, Korea Customs Service plans to initiate joint monitoring project in Asia and the Pacific within this year targeting at illegal trade of CITES wildlife species by international criminal syndicates.

▶ [TF News](#), 7 June 2017



## NORTH AMERICA

### 12. Increased Risk of Ozone Loss Over the United States in Summer, Evidence Shows



Credit: Harvard-University'

Central United States vulnerable to ozone erosion from severe storms

The protective stratospheric ozone layer above the central United States is vulnerable to erosion during the summer months from ozone-depleting chemical reactions, exposing people, livestock and crops to the harmful effects of UV radiation, research shows.

In the context of climate-chemistry coupling globally, the central United States in summer represents a combination of factors specific to both the geographic region and the season. Northerly flow of warm moist air from the Gulf of Mexico in combination with heating and convergence over the Great Plains frequently triggers powerful convection that injects water vapor into the stratosphere, where the upper level anticyclonic flow associated with the NAM can sequester the injection for up to a week or more over the United States. These conditions, in combination with cold stratospheric temperatures, can lead to heterogeneous catalysis on ubiquitous sulfate water aerosols that converts inorganic chlorine to

CIO and can initiate ozone loss through an array of gas-phase catalytic cycles. Potential future enhancements in sulfate from volcanic injection or geoengineering increase the likelihood of halogen

Credit: Harvard-University'

activation and ozone loss.

A new study out of Harvard University reveals that the protective stratospheric ozone layer above the central United States is vulnerable to erosion during the summer months from ozone-depleting chemical reactions, exposing people, livestock and crops to the harmful effects of UV radiation.

Powerful storm systems common to the Great Plains inject water vapor that, with observed temperature variations, can trigger the same chemical reactions over the central United States that are the cause of ozone loss over the polar regions, according to a new paper published in the *Proceedings of the National Academy of Sciences*.

The paper, led by James G. Anderson, the Philip S. Weld Professor of Atmospheric Chemistry at the Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS), found that stratospheric ozone concentrations over the United States in summer are vulnerable to both increases in water vapor and observed variations in temperature from storm systems over the Great Plains. Increased frequency and intensity of these storm systems, as well as longer-term decreases in stratospheric temperatures, are expected to accompany climate change.

Using extensive aircraft observations in the Arctic stratosphere from the early 2000's, researchers established the chemical framework defining enhanced ozone loss rates with respect to temperature and water vapor. Then they employed recent NEXRAD weather radar observations to demonstrate that on average 4000 storms each summer penetrate into the stratosphere over the central United States, which is far more frequent than was previously thought.

This combination of circumstances puts the stratosphere over states including Texas, Oklahoma, Kansas, Nebraska, Iowa, Missouri, the Dakotas and states that border the Great Plains, at risk for chemical reactions that deplete ozone during summer, potentially leading to higher levels of exposure to damaging UV light from the sun.

"These developments were not predicted previously and they represent an important change in the assessment of the risk of increasing UV radiation over the central US in summer," said Mario J. Molina of the University of California San Diego, the 1995 Nobel Prize winner in stratospheric chemistry, who was not involved in this research.

Stratospheric ozone is one of the most delicate aspects of habitability on the planet. There is only marginally enough ozone in the stratosphere to provide protection from UV radiation for humans, animals and crops. Medical research specific to the United States has determined that a 1 percent decrease in the amount of ozone in the stratosphere corresponds to a 3 percent increase in the incidence of human skin cancer. There are now 3.5 million new cases of skin cancer each year reported in the US alone. Thus, for each 1 percent reduction in ozone, there would be an additional 100,000 new cases of skin cancer annually in the United States.

"Thunderstorms that hydrate the stratosphere can have significant local and regional impacts on Earth's radiation budget and climate," said Cameron R. Homeyer of the University of Oklahoma, a co-investigator on the paper. "This work demonstrates our increasing knowledge of such storms using ground-based and airborne observations and evaluates their potential for depleting stratospheric ozone now and in the future. The results strongly motivate the need for increased meteorological and chemical observations of such storms."

"Every year, sharp losses of stratospheric ozone are recorded in polar regions, traceable to chlorine and bromine added to the atmosphere by industrial chlorofluorocarbons and halons," said Steven C. Wofsy, the Abbott Lawrence Rotch Professor of Atmospheric and Environmental Science at SEAS and co-author of the study. "The new paper shows that the same kind of chemistry could occur over the central United States, triggered by storm systems that introduce water, or the next volcanic eruption, or by increasing levels of atmospheric carbon dioxide. We don't yet know just how close we are to reaching that threshold."

The scientific community has observed the chemical reactions that attack ozone over the polar regions in winter, but the important combination of observations that define the cause and the rate of stratospheric ozone loss have never been made over the central US in summer. This represents a major shortcoming in researchers' ability to forecast increases in UV radiation that might result from a volcanic event or climate change now and in the years to come.

"Rather than large continental-scale ozone loss that occurs over the polar regions in winter characterized, for example, by the term Antarctic ozone hole, circumstances over the central US in summer are very different," said Anderson. "In particular, because of the very frequent storm-induced injection events detailed by studies at Texas A&M and the University of Oklahoma using advanced radar methods, this structure of highly localized but

numerous regions of potential ozone loss requires carefully specified observational strategies and systematic surveillance in order to provide the basis for accurate weekly forecasts of ozone loss."

The researchers are calling for extensive characterization of the stratosphere over the central United States in order to forecast short-term and long-term ozone loss related to increasing frequency and intensity of storm systems, higher levels of atmospheric carbon dioxide and methane, and other factors.

► [Harvard John A. Paulson School of Engineering and Applied Sciences](#), 5 June 2017



## 13. Greening Your Refrigerants — Saving the Ozone Layer and Saving Money

### Introduction

Chemical refrigerants are the heart of a large majority of building HVAC and refrigeration equipment. These manufactured fluids provide enormous benefits to society, but in recent decades have been found to have harmful consequences when released to the atmosphere: all refrigerants in common use until the 1990s caused significant damage to the protective ozone layer in the earth's upper atmosphere, and most also enhanced the greenhouse effect, leading to accelerated global warming.

The world community has recognized the seriousness of ozone depletion, and [197] countries have signed the Montreal Protocol on Substances that Deplete the Ozone Layer. The United States, as one of the world's largest emitters of ozone-depleting substances, has signed the treaty, which includes a timetable for the phase-out of production and use of ozone depleting substances.

Refrigerant regulation is thus forcing change on the buildings HVAC industry, but on phased schedules that vary with how harmful the refrigerant is and with the phase of the refrigerant life cycle being targeted (i.e., original production vs. on-site usage). Greening your refrigerant practices means changing ahead of the regulated schedule, which may actually save you money.

### CFCs: an outdated option

Historically virtually all HVAC&R equipment in buildings used refrigerants containing chlorofluorocarbons (CFCs). CFCs are halogenated substances that, when inevitably released to the atmosphere, cause ozone depletion. The reaction between a CFC and an ozone molecule in the earth's stratosphere destroys the ozone and depletes the Earth's natural shield for incoming ultraviolet radiation. Overexposure to UV rays can lead to skin cancer, cataracts and weakened immune systems.

In addition to their ozone depletion effects, CFCs in the stratosphere also absorb outgoing infrared radiation from the earth, functioning as potent greenhouse gases. Thus, banning the use of CFCs in refrigerants not only slows the depletion of the ozone layer but also reduces the human-caused component of global warming.

Under the Montreal Protocol U.S. CFC production ceased in 1995. Consequently, specification of non-CFC building equipment is now standard and CFC-based refrigerants are no longer available in new equipment. These developments mean CFCs will eventually no longer be used at all in buildings, but phasing CFCs out completely will take time because of the long lifetimes of some existing HVAC equipment. Accelerating this phase-out is an essential green building strategy in the LEED-EB green building rating system: Energy & Atmosphere prerequisite 3 requires that the building either use no CFCs in its base building systems or that an independent economic analysis show that system replacement or conversion is economically infeasible.

### HCFCs and Halons: better, but not good enough

A common alternative to CFC refrigerants is their chemical cousin, hydrochlorofluorocarbons (HCFCs). While HCFCs are more environmentally friendly than CFCs, with ozone depletion potentials one-tenth or less than those of CFCs, they still cause significant ozone damage. As a result, all HCFCs will be phased out in the United States by 2030. The most damaging HCFCs began to be phased out first, starting in 2003. Halons are used in fire suppression systems and fire extinguishers. Halon production has been banned in the United States since 1994 because of its very high ozone depletion potential, many times greater than those of CFCs or HCFCs.

HCFCs are still in production in the U.S., and HCFC-based equipment will be available for many years to come until the full phase-out has been accomplished. However, in an effort to accelerate this phase-out LEED-EB offers an optional credit for existing buildings that use no halons or CFCs (no economic feasibility exemption) and also either use no HCFCs or reduce the HCFC leakage to low rates.

### Choosing Greener Refrigerants

If CFC refrigerants are bad for the environment and HCFCs are better but still undesirable, what refrigerants are considered sustainable? It turns out no perfect substitute for CFCs yet exists that combines all their desirable properties while avoiding their undesirable properties. Even so, research has led to a new class of refrigerants, the hydrofluorocarbons (HFCs) that are considered “greener” than either CFCs or HCFCs. A key chemical difference is their absence of chlorine atoms, which means their ozone depletion potential is essentially zero. On the downside, they still have significant global warming potentials (like CFCs) and are somewhat less thermodynamically efficient than their predecessors.

Most new HVAC systems without CFCs and fire suppression systems without halons are cost-competitive. As an interim step, many owners are converting to HCFCs while eliminating the use of CFCs. However, since HCFCs face a full ban in 2030, it may be cost-effective to fully migrate to HFC-based equipment now, rather than relying on HCFCs as an interim step. Be sure to consider both approaches if your aging equipment needs to be replaced.

Finally, some HVAC equipment is available that uses “natural” refrigerants such as water, carbon dioxide, or ammonia. These naturally occurring compounds have far lower potential for atmospheric damage than manufactured chemical refrigerants.

#### Accelerated Equipment Replacement and Retrofit

Many existing buildings still have medium-age, well-functioning chillers containing CFCs, and CFC replacement or conversion per se offers no direct financial benefit to the facility owner. Any such facility would seem to have no reasonable option for greening their refrigerants. How does a facility manager in this position make a business case to go green in this area?

The financial benefit comes from modernization: refrigeration technology has improved dramatically in the past 10-15 years, and the ongoing energy and maintenance cost savings resulting from upgrading to modern equipment may offset the cost of converting or replacing these existing systems. For example, replacing a 500-ton CFC chiller (0.85 kW/ton efficiency) with an efficient (0.56 kW/ton) non-CFC chiller can save \$17,000/year, assuming an electricity rate of \$0.06/kWh. Simple payback times for this sort of chiller replacement can be only a few years in some cases.

For conversion or replacement systems, carefully consider the tradeoffs among the various CFC substitutes. Refrigerants have varying atmospheric lifetimes, ozone depletion potentials and global warming potentials. It is more sustainable to choose refrigerants with low atmospheric lifetimes as well as low ozone depletion and global warming potentials, since the longer a compound is present in the atmosphere, the more damage it can cause. This strategy, in addition to being a greener approach outright, also hedges against the risk of possible future environmental regulations.

#### Refrigerant Management

Refrigerants cannot damage the atmosphere if they are contained and are never released to the environment. Unfortunately, in real world applications some or all refrigerant provided for HVAC equipment is leaked to the environment during installation, operation, servicing, and decommissioning of equipment. Because of this, Section 608 of the Clean Air Act of 1990 requires some basic management of these refrigerants and defines specific methods for refrigerant handling and reporting.

If replacing all equipment containing CFCs, HCFCs, and halons is economically infeasible, you can implement a program to minimize refrigerant leakage that goes beyond the minimum federal requirements. The program should specify loss minimization procedures and systems to meet annual loss minimization standards and reporting requirements. For LEED-EB purposes, the best practice in this area is reducing total refrigerant emissions to less than 3% of charge per year while also reducing leakage over the remainder of unit life to below 25% of charge.

#### Conclusion

Changes in building equipment refrigerant have already happened because of environmental concerns, and more are coming. It's really not a question of whether facilities managers will upgrade their HVAC equipment, but when and in what way. Fully evaluating the benefits of using new refrigerant technology before it's absolutely required can get you ahead of the curve and give you a competitive edge for years to come.

- ▶ [LEED for Existing Buildings U.S. Green Building Council](#), 7 June 2017, By: Mike Opitz PE, LEED AP Certification Manager



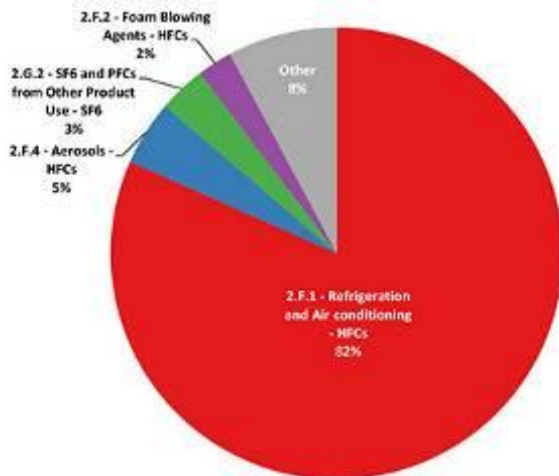


# EUROPE & CENTRAL ASIA

## 14. European HFC Emissions Fall

EUROPE: A switch to low GWP refrigerants and efforts to reduce leakage resulted in a fall in HFC emissions in Europe in 2015, halting huge increases since 1990.

While overall EU greenhouse gas emissions increased by 0.5 % in 2015, the latest figures from the European Energy Agency reveal a drop in fluorinated gas emissions amongst the 28 EU member states. The HFC reduction is mainly thanks to the refrigeration and air conditioning industry which accounts for 82% of all HFC emissions.



HFC emissions amounted to 108 million tonnes of CO<sub>2</sub> equivalent (MtCO<sub>2</sub>e) in 2015 down from 113MtCO<sub>2</sub>e the previous year. 2015 was the final year before the European F-gas phase down began. It is also worth noting that HFCs still represent only around 2.5% of total EU GHG emissions.

The refrigeration and air conditioning sectors recorded emissions of 97MtCO<sub>2</sub>e, down 5MtCO<sub>2</sub>e on 2014. Most notable were the efforts by Spain, where the government now applies hefty taxes on HFC refrigerants. The second largest emitter behind France in 2014, Spain reported a reduction of 45% in 2015 from 14,192ktCO<sub>2</sub>e to 7,745ktCO<sub>2</sub>e. It now stands sixth behind France, UK, Italy, Germany and Poland in terms of emissions.

Ireland, Finland and Denmark, were the next best performers behind Spain, all recording 8% decreases.

Member State	HFCs emissions in kt CO <sub>2</sub> equiv.				Share in EU-28+ISL emissions in 2015	Change 2014-2015		Change 1990-2015		Change 1995-2015		Method applied	Emission factor
	1990	1995	2014	2015		kt CO <sub>2</sub> equiv.	%	kt CO <sub>2</sub> equiv.	%	kt CO <sub>2</sub> equiv.	%		
Austria	NO	38	1 588	1 604	1.7%	18	1%	1 604	=	1 566	4165%	-	-
Belgium	NO	103	2 675	2 620	2.7%	-55	-2%	2 620	=	2 517	2440%	NA	NA
Bulgaria	NO	3	1 049	1 112	1.2%	62	6%	1 112	=	1 108	33301%	NO,T2	D,NO
Croatia	NO	29	400	404	0.4%	4	1%	404	=	374	1283%	T1a,T2	D
Cyprus	NO,NE	2	345	345	0.4%	0	0%	345	=	343	21136%	NA	NA
Czech Republic	NO	0	3 195	3 422	3.5%	227	7%	3 422	=	3 422	1131353%	T2	CS
Denmark	NO	42	642	581	0.6%	-51	-8%	581	=	549	1310%	T2	D
Estonia	NO	10	209	215	0.2%	6	3%	215	=	205	2059%	T2	CS
Finland	0	24	1 622	1 488	1.5%	-134	-8%	1 488	10912751%	1 464	6091%	T2	NA
France	NO	545	16 771	16 564	17.1%	-207	-1%	16 564	=	16 019	2942%	T2	CS
Germany	NA	584	9 674	9 752	10.1%	78	1%	9 752	=	9 169	1571%	T2	CS,D
Greece	NO	42	5 480	5 618	5.8%	138	3%	5 618	=	5 576	13165%	IE,T2	D,IE
Hungary	NO	26	1 585	2 084	2.2%	498	31%	2 084	=	2 058	7832%	T2	D
Ireland	NO	76	969	910	0.9%	-79	-8%	910	=	834	1104%	NA	NA
Italy	NO	285	10 853	11 161	11.5%	308	3%	11 161	=	10 896	4116%	T2	CS,D
Latvia	NE	2	200	218	0.2%	18	9%	218	=	216	10281%	T2	CS,D,OTH
Lithuania	NO	5	427	454	0.5%	27	6%	454	=	449	8370%	T2	CS,D,PS
Luxembourg	0	3	62	61	0.1%	0	-1%	61	85686700%	58	1767%	T2	CS,M,PS
Malta	NO,IE	0.0	224.3	241.1	0.2%	17	7%	241	=	241	12790102%	NA	NA
Netherlands	NO	73	2 037	2 041	2.1%	5	0%	2 041	=	1 968	2706%	T2	CS
Poland	NO	117	8 375	8 443	8.7%	68	1%	8 443	=	8 326	7105%	T2	D
Portugal	NO,NA	18	2 458	2 599	2.7%	141	6%	2 599	=	2 581	14534%	IE,NO	IE,NO
Romania	NO	2	1 337	1 599	1.7%	261	20%	1 599	=	1 597	88437%	T2	D
Slovakia	NO	11.2	623.4	702.4	0.7%	79	13%	702	=	691	6158%	T2	CS
Slovenia	NO	5	321	338	0.3%	17	5%	338	=	333	6125%	T1,T2	CS,D
Spain	NO	NO	14 192	7 745	8.0%	-6 448	-45%	7 745	=	7 745	=	T2	D
Sweden	3	141	744	709	0.7%	-35	-5%	706	22257%	568	401%	NA	CS
United Kingdom	NO	528	13 290	13 285	13.7%	-5	0%	13 285	=	12 757	2415%	T3	CS
EU-28	3	2 695	101 366	96 325	100%	-5 041	-5%	96 322	3023240%	93 631	3475%	-	-
Iceland	NO	10	181	206	0.2%	25	14%	206	=	197	2089%	-	-
United Kingdom (KP)	NO	531	13 396	13 390	13.9%	-6	0%	13 380	=	12 859	2421%	T3	CS
EU-28 + ISL	3	2 707	101 653	96 636	100%	-5 017	-5%	96 633	3032988%	93 929	3470%	-	-

Refrigeration and Air conditioning contributions to HFC emissions HFC emissions from refrigeration and air conditioning were about 36 times higher in 2015 than in 1995. France, Germany, Italy, Spain and the UK are responsible for 61% of total emissions

The largest increases in HFC emissions compared to the previous year were reported by Czech Republic (7%), Hungary (31%), Latvia (9%), Romania (20%) and Slovakia (13%).

### Total GHG emissions

Overall EU GHG emissions increased by 0.5 % in 2015 compared with 2014, following a 4% decrease the previous year. This increase was attributed mainly to road transport and the residential sector.

In 2015, total GHG emissions increased by 23MtCO<sub>2</sub>e to reach 4,310MtCO<sub>2</sub>e. It was the first increase since 2010.

Despite its efforts with HFCs, Spain, along with Italy and the Netherlands accounted for the largest increases in GHG emissions, in absolute terms in 2015. In contrast the UK reported the largest decrease of 19.4MtCO<sub>2</sub>e. The lower GHG emissions in the UK were mainly attributed to the liberalisation of energy markets and the subsequent fuel switch from oil and coal to gas in electricity production.

► [Cooling Post](#), 11 June 2017, By Neil Everitt



## 15. Use of Climate-Friendly Tech Rising - But Some Supermarkets In for a Nasty Surprise in 2018

LONDON - The adoption of climate-friendly cooling technology is on the rise in Europe – but some tardy retailers are heading for a major financial shock when drastic cuts in supplies of hydrofluorocarbons (HFCs) kick in.

The EU F-Gas Regulation, in effect since 2015, mandates a swift phase-down in the use of HFCs, a family of greenhouse gases hundreds to thousands of times more powerful than carbon dioxide (CO<sub>2</sub>) which are commonly used in refrigeration, air-conditioning, fire protection, aerosols and foams.

As of next year, market supplies of HFCs will be slashed by about 48 per cent in real terms, a move expected to result in drastic price hikes and supply shortages for those retailers yet to adopt climate-friendly alternatives; prices of some chemicals have already increased by 62 per cent in the first quarter of 2017.

The warning was issued by the London-based Environmental Investigation Agency (EIA) as it launched [Chilling Facts VII](#), the latest in a game-changing series of reports pressing to dramatically reduce the global warming footprint of supermarkets.

For the latest report, 22 retailers submitted data for the 2015 calendar year from supermarkets across 37 countries.

Evaluating preparedness for the F-Gas Regulation and progress in moving away from HFCs, *Chilling Facts VII* named eight stand-out retailers as 'Green Cooling Leaders' – Albert Heijn, Aldi Süd, Carrefour, Kaufland, Metro Cash & Carry, Migros, Tesco and Waitrose.

In the middle of the pack are Marks and Spencer, Jerónimo Martins, Real, Rewe Germany and Sonae, while trailing at the rear are Aldi Nord, Delhaize Belgium, Spanish retailer Dia, Auchan Portugal and Irish retailer Musgrave.

Clare Perry, head of EIA's Climate Campaign, said: "European retailers stand out as global leaders in the adoption of HFC-free commercial refrigeration but, despite well-established and efficient HFC-free alternatives, the uptake across Europe is far short of the pace needed to meet the EU's fast-acting HFC phase-down.

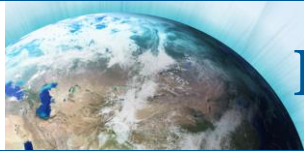
"In addition, there's the very real concern that HFC shortages will not only result in soaring refrigerant bills but that ongoing heavy demand from retailers may actually drive illegal trade in HFCs, something we witnessed when hydrochlorofluorocarbons (HCFCs) were banned."

*Chilling Facts VII*'s recommendations include urging retailers to implement HFC-free refrigeration in all new stores and refits, and to fit doors on all chiller and freezer units.

The report urges manufacturers to invest in CO<sub>2</sub> and other natural refrigerant technologies for large and small-format supermarkets and recommends governments to financially support smaller end-users to transition away from HFCs and provide incentives for doors on fridges.

► Read & download [Chilling Facts VII](#) | *Chilling Facts I-VI* reports available [here](#)

► [The Environmental Investigation Agency \(EIA\)](#), 15 June 2017



## FEATURED

### OZONE SECRETARIAT

- ▶ Vienna Convention and Montreal Protocol Meetings: A Primer - [Read/Download](#)
- ▶ - [Twenty-Eighth Meeting of the Parties.](#)
- ▶ - [Resumed 38<sup>th</sup> meeting of the Open-ended Working Group.](#)
- ▶ - [57<sup>th</sup> meeting of the Implementation Committee.](#)
- ▶ Final text of the Kigali Amendment to the Montreal Protocol available in all the six official UN languages ([A](#) [C](#) [E](#) [F](#) [R](#) [S](#))
- ▶ OEWG 39: The 39<sup>th</sup> Session of the Open-ended Working Group of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer will be preceded by the 58<sup>th</sup> meeting of the Implementation Committee under the Non-Compliance Procedure for the Montreal Protocol, to be held on 9 July and a workshop on safety standards relevant to the use of low-GWP alternatives to HFCs, to be held on 10 July 2017.

Click [here](#) for further information.

#### « Caring for All Life under the Sun” Theme and Logo for 30th Anniversary of the Montreal Protocol and International Ozone Day 2017

The 30<sup>th</sup> anniversary of the Montreal Protocol, which we are commemorating this year, and the International Day for the Preservation of the Ozone Layer to be marked on 16 September, will be celebrated under the theme:

#### **Caring for All Life Under the Sun**

The theme is complemented by a logo that illustrates the Montreal Protocol’s focused and singular goal to protect all life on Earth.

The logo and theme celebrate the Montreal Protocol's critical role in caring for life on the planet over the past 30 years by preventing massive damage to human health and the environment from excessive ultraviolet radiation from the sun by phasing out nearly 99 per cent of close to 100 substances that deplete the ozone layer.

As a result of the unwavering commitment of the parties to the Montreal Protocol during the past three decades, the ozone layer is on track to recovery by mid-century. In addition, up to 2 million cases of skin cancer may be prevented each year by 2030.

The Montreal Protocol is also one of the prime contributors to the fight against climate change, as it averted more than 135 billion tonnes of carbon dioxide equivalent emissions from 1990 to 2010.

The Kigali Amendment to the Montreal Protocol, which was adopted in 2016, is expected to avoid up to 0.5° Celsius warming by the end of the century, while continuing to protect the ozone layer.

The logo and theme in all the six official UN languages are posted on the Ozone Secretariat [website](#) for wider dissemination, together with brand guidelines on their usage. Parties are also encouraged to download and use the email signature image of the logo and theme.

In the coming months, the Ozone Secretariat will conduct a communication campaign to celebrate the 30<sup>th</sup> anniversary and will provide the parties with more information about the campaign and related products to support commemorative activities. We would also be pleased to receive any information products for your planned commemorative activities for wide dissemination through our website.

As in previous years, we expect that the United Nations Secretary-General’s message for International Ozone Day to be shared prior to the day for further dissemination.

Once again, the Ozone Secretariat will provide limited financial assistance to four developing countries to contribute towards organizing their national commemorative activities. The Secretariat invites the parties to



submit their plans of celebration activities and requests for assistance by 31 May 2017. Kindly send them to the Secretariat at [dan.tengo@unep.org](mailto:dan.tengo@unep.org) and [ozone.info@unep.org](mailto:ozone.info@unep.org)

- Browse through the Ozone Secretariat “[In Focus](#)” to learn about latest updates.
- Click [here](#) for Montreal Protocol Meetings Dates and Venues

**The UN Environment Assessment Panels** have been the pillars of the ozone protection regime since the very beginning of the implementation of the Montreal Protocol. Through provision of independent technical and scientific assessments and information, the Panels have helped the Parties reach informed decisions that have made the Montreal Protocol a world-recognized success.

UNEP initiated the process of setting up the assessment panels in 1988, pursuant to Article 6 of the Montreal Protocol, to assess the scientific issues of ozone depletion, environmental effects of ozone depletion, and the status of alternative substances and technologies and their economic implications.

Four panels, namely the panels for Scientific, Environmental Effects, Technology, and Economic Assessments were formally established and approved at the First Meeting of the Parties to the Montreal Protocol in 1989 where their first set of Terms of Reference were adopted. Shortly after the Second Meeting of the Parties in 1990, the Panels for Technical Assessment and the Panel for Economic Assessment were merged into one Panel called the Technology and Economic Assessment Panel (TEAP), which together with the Scientific Assessment Panel (SAP) and the Environmental Effects Assessment Panel (EEAP) make up the three assessment panels active today.

In accordance with Article 6 of the Montreal Protocol and subsequent decisions of the Parties, the three panels carry out a periodic assessment at least every 4 years. The first assessment reports were published in 1989 and since then major periodic assessments have been published by all three panels in 1991, 1994, 1998, 2002, 2006 and 2010. For each periodic assessment, the key findings of the panels are synthesized into a short report. The full SAP assessment report for 2014 was published in December 2014, while the EEAP assessment report for 2014 was published in January 2015.

#### PROGRESS & QUADRENNIAL ASSESSMENT REPORTS

- [EEAP](#)
- [SAP](#)
- [TEAP](#)

[Assessment Panels List of Meetings](#)

#### SYNTHESIS REPORTS

- [2014 assessments](#)
- [2010 assessments](#)
- [2006 assessments](#)

## THE MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL



[Learn more](#)

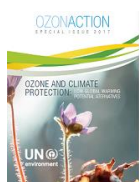
[79<sup>th</sup> meeting of the Executive Committee, Bangkok, 3-7 July 2017](#)

[Report of the 78<sup>th</sup> meeting of the Executive Committee](#)

[Adjusted business plan of the Multilateral Fund for 2017-2019 after the 77<sup>th</sup> meeting of the Executive Committee](#)

## OZONACTION

UN Environment, [OzonAction](#) highlights



**Ozone and Climate Protection: Low-Global Warming Potential Alternatives -  
[OzonAction Special Issue 2017](#)**

## OzonAction Factsheets:



[HS codes for HCFCs and certain other Ozone Depleting Substances ODS](#) (post Kigali update)



[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 28<sup>th</sup> 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... **Over 11, 200 installations to date!**

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, CO<sub>2</sub>, 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, CO<sub>2</sub> 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.



**[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.



**[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. [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.



**[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.



**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.



## EVENTS

**2017**



**9<sup>th</sup> International Conference on Compressors and Coolants**, 6-8 September 2017, Bratislava, Slovakia



**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.



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



**Symposium for the celebration of the Montreal Protocol 30<sup>th</sup> Anniversary - From the safeguard of the ozone layer to the protection of the earth climate**, 19 - 20 September 2017, Paris, France



**EUREKA 2017: Heating, Cooling & Ventilation: Sustainable technologies for a better life**, 11-12 December 2017, Berlin, Germany

**2018**



**2<sup>nd</sup> IIR International Conference on the Application of HFO Refrigerants**  
2018

**1<sup>st</sup> IIR International Conference on the Application of HFO Refrigerants**, 2-5 September 2018, Austin Court Conference Centre, Birmingham, UK.



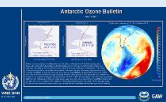
## READING



**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 CO<sub>2</sub>-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 "[CO<sub>2</sub> 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.





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



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...

[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

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

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

[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.

"[The Road to Competence in Future Green Technologies](#)", the International Special Issue 2016-2017 of Centro Studi Galileo. Read/Download [pdf version](#) | [E-book](#)

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

[Quest for climate-friendly refrigerants finds complicated choices](#), National Institute of Standards and Technology (NIST), 17 February 2017, Summary: Researchers have just completed a multiyear study to identify the 'best' candidates for future use as air conditioning refrigerants that will have the lowest impact on the climate.

The second issue of [The Natural Voice magazine](#), entitled 'Mainstreaming Natural Refrigerants' showcases examples of installations using natural refrigerants around the world, including in the Gambia, Jordan, South Africa, China, Thailand, Tanzania and Saudi Arabia.

[Industria & Formazione, no. 2/17](#), Preview of the journal Industry & Training in refrigeration and air conditioning, technical refrigeration and air-conditioning, Centro Studi di Galileo # 406 Technological innovations in cooling and air conditioning with special focus on the F-Gas new regulations, new refrigerants, components and systems, food storage and cold sector. Vol. XLI - No. 2-2017.



Refrigeration: An increasingly strategic issue for data centres - [Cooling data centres: A major economic challenge](#) Today, data centres play a key role in many businesses as information technology is becoming an increasingly strategic factor. Cooling can present a major economic challenge for data centres. If cooling is implemented incorrectly or is inadequate, the amount of energy required to cool a data centre can equal or exceed that used to operate the equipment. Larger data centres can use a staggering amount of energy just to ensure the day-to-day running of electronic equipment. As a result, these data centres can produce a great deal of heat, which require large-scale cooling systems in order to maintain efficient and continual operation... Browse through a selection of [articles and papers](#), by [iifiiir](#)



[shecco](#) GUIDE to Natural Refrigerants Training in Europe shows that training is readily available. [Read on r744](#)



[40 Years of Global Environmental Assessments: A Retrospective Analysis](#), J. Jabbour and C. Flachsland. Environmental Science & Policy



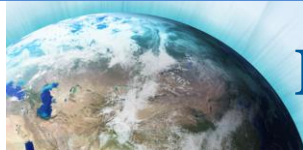
FactSheet - [Hazards during the Repair and Maintenance of Refrigeration Systems on Vessels](#).



[High-performance insulation materials market](#), June 2017



[EIA Applauds Bipartisan Effort to Tackle Super Pollutants, Including HFCs](#). Environmental Investigation Agency, 8 June 2017



## MISCELLANEOUS

### Announcement!

The UN Environment, OzonAction, in collaboration with Marco Gonzalez and Stephen O. Andersen are updating and expanding the Montreal Protocol Who's Who" as part of the celebration of the 30<sup>th</sup> Anniversary of the Montreal Protocol - which was agreed as 16 September 1987.



**The new website will be launched during the upcoming Meeting of the Parties to the Montreal Protocol, Montreal, Canada, 20-24 November 2017.**

We are pleased to invite you to submit your nomination\*, and/or nominate an Ozone Layer Champion(s). The short profile should reflect the nominee's valuable work related to the Montreal Protocol and ozone layer protection.

Please notify and nominate worthy candidates through the [on-line form](#)

Looking forward to receiving the nomination(s), and please feel free to contact our team for any further assistance

concerning your nomination.

**Take this opportunity to raise the profile of men and women who made important contribution to the Montreal Protocol success and ozone layer protection.**

▶ Contact : [Samira Korban-de Gobert](#), UN Environnement, OzonAction

\* *If you are already nominated, no need to resubmit your profile*



**How will the heat pump market move towards natural refrigerants?** Eric Delforge talks about the energy-efficient properties of natural refrigerants when used in heat pump applications.

[Watch on r774's YouTube channel](#)



[UN knowledge platform launches live-tracking tools to review progress towards SDGs](#), UN Environment's dynamic online platform designed for sharing contextualized data...



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
- Access the latest articles as soon as they become available online.
- Browse, search and read each one of the nearly 4,500 papers since Volume 1, Issue 1.
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To access this new service, click "[activate my e-IJR subscription now](#)" and follow the instructions.



**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](mailto:info@area-eur.be)



The Mobile Air Conditioning Society (MACS) Worldwide has released the **MACS Mobile A/C Diagnostics app** powered by Shiftmobility© for use on all mobile devices. The MACS app includes comprehensive mobile A/C and engine cooling system specifications for cars and light duty trucks from 1960-present; A library of heavy duty vehicle specifications donated by MACS member companies; access to MACS training calendar and website, archived MACS **ACTION™** magazines and **Service Reports**, MACS mobile A/C diagnostic checklists and a MACS member supplier directory. The MACS app is available only to MACS members in good standing. Each membership will receive one free download; and additional member downloads are \$60. each annually. The MACS app can be downloaded from the Google play or iTunes store



MONTREAL PROTOCOL  
WHO'S WHO

**The Montreal Protocol Who's who**

*See the latest nominations /*

Nominate Ozone Layer Protection Champion

From Your Country /Region >>

<http://www.unep.fr/ozonaction/montrealprotocolwhoswho>

**Disclaimer:** The United Nations Environment (UNEP), Economy Division, OzonAction provides OzoNews as a free service for internal, non-commercial use by members of the Montreal Protocol community.

Since its inception in January 2000, the goal of OzoNews is to provide current news relating to ozone depletion and the implementation of the Montreal Protocol, to stimulate discussion and promote cooperation in support of compliance with the Montreal Protocol. With the exception of items written by UNEP and occasional contributions solicited from other organizations, the news is sourced from on-line newspapers, journals and websites.

The views expressed in articles written by external authors are solely the viewpoints of those authors and do not represent the policy or viewpoint of UNEP. While UNEP strives to avoid inclusion of misleading or inaccurate information, it is ultimately the responsibility of the reader to evaluate the accuracy of any news article in OzoNews. The citing of commercial technologies, products or services does not constitute endorsement of those items by UNEP.

If you have questions or comments regarding any news item, please contact directly the source indicated at the bottom of each article.



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**Reviewed by:** Shamila Nair-Bedouelle, Head OzonAction Branch, and Ezra Clark, OzonAction

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