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OzoNews

A fortnightly electronic news update on ozone and climate protection and the implementation of the Montreal Protocol brought to you by OzonAction

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Global

1. Let's carry on to achieve collectively our common goal: restoring the ozone layer

Message from Ms. Shamila Nair-Bedouelle, Head of OzonAction, UN Environment, Law Division, to the National Ozone Officers, on the occasion of the upcoming International day for the preservation of the ozone layer.

Dear National Ozone Officers,

The International Day for the Preservation of the Ozone Layer on 16 September is fast approaching, and you are likely pondering over suitable awareness activities for this important event. This year's theme and tagline is: Keep Cool and carry on! The Montreal Protocol. How can we interpret this theme and apply it? Certainly, we need to keep cool and protect ourselves from the harmful UV rays penetrating the vulnerable ozone layer, while at the same time we need to carry on in our efforts towards implementation of the Montreal Protocol.

At the Inter-Regional Thematic and Network meeting last January, you all clearly demonstrated your dedication and commitment towards the Montreal Protocol mandate. We urge you to carry on, relentlessly until we collectively achieve our common goal of restoring the stratospheric ozone layer to its original state for the betterment of our planet.

For Ozone Day events and awareness raising purposes please find below some OzonAction material/products/tools which you may use:

1. The Path from Kigali: HFC Phase-Down Timeline

This user-friendly poster produced by OzonAction will help to keep you on track of key HFC phase-down dates.

2. Legislative and Policy Options to Control Hydrofluorocarbons

In order to follow and facilitate the HFC phase-down schedules contained in the Kigali Amendment, the Parties, including both developed and developing countries, will have to implement certain measures. This booklet contains a recommended set of legislative and policy options which the developing (Article 5) countries may wish to consider for implementation. It is intended to be a guide/tool for countries. The booklet is available in English, French, Russian and Spanish.

3. OzonAction Mobile Apps

The mobile apps are designed to build your capacity and ease your work in Montreal Protocol implementation. Download the mobile apps onto your smartphones and help others too!

4. Cold Chain Technology Briefs

The International Institute of Refrigeration partnered with UN Environment OzonAction to introduce a comprehensive set of Technology Briefs about the different Cold Chain sectors with the aim of assisting National Ozone Units (NOUs) and local stakeholders the different segments, technology trends and issues related to each sector.

5. Global Montreal Protocol Customs Enforcement Award

UN Environment OzonAction, in cooperation with the World Customs Organization and the Ozone Secretariat, launched the global Montreal Protocol award for customs and enforcement officers in January 2018. The award aims to provide recognition and encouragement to customs and enforcement officers and their respective organizations for successful prevention of illegal or unwanted trade of HCFCs / HFCs. This also includes equipment or products containing or relying on the use of HCFCs / HFCs. The deadline for submissions for this award is 31 December 2018.

6. Women in the Refrigeration and Air-conditioning Sector



OzonAction launched a global initiative to raise awareness of the opportunities available to women and to highlight the particular experiences and examples of women working in the refrigeration and air-conditioning (RAC) sector, explaining their motivations, training and education, the challenges they may have faced, their experience and day-to-day details of their working lives and to recognise their successes. We encourage women working in the RAC sector in your respective regions to submit short 'stories'. The deadline for story submission has been extended to 6 September 2018.

7. Refrigerants Literacy e-Learning Course

The course is mainly designed for non-specialist in HVAC&R operation and servicing, i.e. NOUs, policy makers, procurement officers, buildings owners, facility managers, etc.

For more information on all the above, please visit the [2018 OzonAction Ozone day website](#). Also, in the right-hand column of this webpage you will find links to last year's Ozone Day webpage and to those of the previous years'. Please feel free to browse through them for useful information and ideas. If there is anything specific you require, please contact the nearest OzonAction CAP Regional Office.

We would appreciate very much to receive your Ozone Day planned activities/reports for posting on the OzonAction website. Please send this information through your respective regional OzonAction CAP office or to Ms [Jo Chona](#). Sharing such information is very encouraging, not only to us, but to the whole Montreal Protocol community.

If you require assistance or any specific awareness material for your celebrations, please do not hesitate to contact me or your nearest regional OzonAction CAP office.

I wish to take this opportunity to thank you for your excellent work and look forward to our continued collaboration in protecting our environment.

Yours sincerely,

Shamila Nair-Bedouelle,
Head of OzonAction
UN Environment, Law Division



2. Women in the Refrigeration and Air-conditioning Sector - Call for stories

Deadline extension to 6 September 2018

Please share **your** experiences of working in the RAC sector

From female service technicians to installers, from designers to trainers, from manufactures to RAC

associations, UN Environment OzonAction are looking to highlight your experience.

OzonAction, in cooperation with UN Women, is seeking short 'stories' about women working in the refrigeration and air-conditioning (RAC) sector, explaining their motivations, training and education, the challenges they may have faced, their experience and day to day details of their working lives.

Being aware of the experiences of women working in the RAC sector and the opportunities available can encourage and inspire other women to consider careers in the sector and support girls to seek to follow a career path in this fast growing and important sector.

OzonAction, therefore is launching a global initiative to raise awareness of the opportunities available to women and to highlight the particular experiences and examples of women working in the sector and to recognise their successes.

All the accepted submissions will be compiled into an official publication and outreach to a broad range of stakeholders in the Montreal Protocol and RAC community.

The authors of the two most relevant and interesting submissions will be invited to attend an award ceremony and side event organised by UN Environment OzonAction at an international Montreal Protocol meeting.

**Completed entry forms with descriptions and photos
should be received by 6 September 2018**

How to apply

If you are a woman working in any part of the RAC sector, we encourage you to submit an entry. Please use the standard template provided. We very much welcome that you provide pictures showing you at work to accompany the submission.

Nominations will be reviewed, verified and edited, as required, by an expert panel established by UN Environment. All the accepted submissions will be compiled into an official UN Environment publication, which will be outreach to a broad range of stakeholders in the Montreal Protocol and RAC community.

The authors of the two most relevant and interesting submissions (as decided by the expert panel) will be invited to attend an award ceremony and side event organised by UN Environment OzonAction at an international Montreal Protocol meeting.

Completed submissions, sent by email, based on the standard template (with photos) should be received by the UN Environment regional focal points as soon as possible but **at the latest by 6 September 2018**.

- "Women in the RAC Sector" [flyer](#)

- [Submission Form](#)

For more information please see [OzonAction website](#)

3. How to make air conditioning more sustainable



Better technology could keep people cool—without frying the planet.

What is the single most effective way to reduce greenhouse-gas emissions?

Go vegetarian? Replant the Amazon? Cycle to work? None of the above. The answer is: make air-conditioners radically better. On one calculation, replacing refrigerants that damage the atmosphere would reduce total greenhouse gases by the equivalent of 90bn tonnes of CO₂ by 2050. Making the units more energy-efficient could double that. By contrast, if half the world's population were to give up meat, it would save 66bn tonnes of CO₂. Replanting two-thirds of degraded tropical forests would save 61bn tonnes. A one-third increase in global bicycle journeys would save just 2.3bn tonnes.

Air-conditioning is one of the world's great overlooked industries. Automobiles and air-conditioners were invented at roughly the same time, and both have had a huge impact on where people live and work. Unlike cars, though, air-conditioners have drawn little criticism for their social impact, emissions or energy efficiency. Most hot

countries do not have rules to govern their energy use. There is not even a common English word for “coolth” (the opposite of warmth).

Yet air-conditioning has done more than most things to benefit humankind. Lee Kuan Yew, the first prime minister of Singapore, called it “perhaps one of the signal inventions of history”. It has transformed productivity in the tropics and helped turn southern China into the workshop of the world. In Europe, its spread has pushed down heat-related deaths by a factor of ten since 2003, when 70,000 more people than usual, most of them elderly, died in a heatwave. For children, air-conditioned classrooms and dormitories are associated with better grades at school (see article).

Environmentalists who call air-conditioning “a luxury we cannot afford” have half a point, however. In the next ten years, as many air-conditioners will be installed around the world as were put in between 1902 (when air-conditioning was invented) and 2005. Until energy can be produced without carbon emissions, these extra machines will warm the world. At the moment, therefore, air-conditioners create a vicious cycle. The more the Earth warms, the more people need them. But the more there are, the warmer the world will be.

Too cool for comfort

Cutting the impact of cooling requires three things (beyond turning up the thermostat to make rooms less Arctic). First, air-conditioners must become much more efficient. The most energy-efficient models on the market today consume only about one-third as much electricity as average ones. Minimum energy-performance standards need to be raised, or introduced in countries that lack them altogether, to push the average unit’s performance closer to the standard of the best.

Next, manufacturers should stop using damaging refrigerants. One category of these, hydrofluorocarbons, is over 1,000 times worse than carbon dioxide when it comes to trapping heat in the atmosphere. An international deal to phase out these pollutants, called the Kigali amendment, will come into force in 2019. Foot-draggers should ratify and implement it; America is one country that has not done so.

Last, more could be done to design offices, malls and even cities so they do not need as many air-conditioners in the first place. More buildings should be built with overhanging roofs or balconies for shade, or with natural ventilation. Simply painting roofs white can help keep temperatures down.

Better machines are necessary. But cooling as an overall system needs to be improved if air-conditioning is to fulfil its promise to make people healthier, wealthier and wiser, without too high an environmental cost. Providing indoor sanctuaries of air-conditioned comfort need not come at the expense of an overheating world.

The Economist, Print edition, 25 August 2018

4. The cost of cool

[...] The stifling summer of 2018 in the northern hemisphere has been a banner season for air-conditioners and a reminder of how they have changed the world. Sales in France in the first three weeks of July were 192% higher than in the same period of 2017. In Japan, the government is helping schools install coolers. In Texas, on the orders of a judge, the state government has been putting them into prisons.



At current growth rates, according to the International Energy Agency (IEA), which advises national governments, 1bn air-conditioners will be installed globally in the next ten years. That would increase the world’s stock—1.6bn in 2016—by two-thirds (see chart). If you include refrigerators and systems that cool food, vaccines and data, the stock could be 6bn units in a decade. The growth in cooling will save lives, improve education and create wealth in the world’s hottest countries. But it brings huge environmental risks, warming the planet even as it cools people.

In this research, the results are compared with the results of the thermodynamic behavior of conventional refrigerants R22 and R134a for geothermal heat pumps with horizontal and vertical closed loop ground heat exchangers and also open-loop systems.

Finally, R152a, R600, and R717 were introduced as substitute refrigerants to replace with synthetic refrigerants in the above-mentioned geothermal heat pump systems, resulted in an increase in 2.97–5.8 percent coefficient of performance in the cooling mode which means reducing the operating cost of the system compared to conventional artificial refrigerants.

Authors: *Vahid Saeidi, Mostafa Mafi, and Ali Mohammadi*

Journal of Renewable and Sustainable Energy, Volume 10, Issue 4, 7 August 2018

6. Methyl-substituted α -Cyclodextrin as affinity material for storage, separation, and detection of Trichlorofluoromethane

Abstract

The severely ozone-depleting trichlorofluoromethane [CFC-11] is still appearing in several recycling processes or industrial applications. A simple and selective supramolecular complex formation of per-methylated α -cyclodextrin (1) with the highly volatile trichlorofluoromethane (2) is reported. This interaction moreover leads to thermally stable crystals. Per-methylated α -cyclodextrin is successfully exploited as a reversible and selective adsorption material for liquid and airborne trichlorofluoromethane as well as an affinity material for the chemical sensing and detection of this particular volatile organic component.

Read the full text

Authors: *Dimitrij Rylvlin Maiko Girschikofsky Dieter Schollmeyer Ralf Hellmann Siegfried R. Waldvogel*

Wiley Online Library, 12 August 2018

COMMUNICATION Global
Challenge

Methyl-Substituted α -Cyclodextrin as Affinity Material for Storage, Separation, and Detection of Trichlorofluoromethane

Dimitrij Rylvlin, Maiko Girschikofsky, Dieter Schollmeyer, Ralf Hellmann, and Siegfried R. Waldvogel*

The severely ozone-depleting trichlorofluoromethane is still appearing in several recycling processes or industrial applications. A simple and selective supramolecular complex formation of per-methylated α -cyclodextrin (1) with the highly volatile trichlorofluoromethane (2) is reported. This interaction moreover leads to thermally stable crystals. Per-methylated α -cyclodextrin is successfully exploited as a reversible and selective adsorption material for liquid and airborne trichlorofluoromethane as well as an affinity material for the chemical sensing and detection of this particular volatile organic component.

During the past century, chlorofluorocarbons (CFCs) were widely used as refrigerants, propellants, and solvents for various applications. However, growing concerns about their ozone depletion potential and global warming effects led to their phase-out by the Montreal Convention under the auspices of the United Nations Environment Programme. CFC-11 and CFC-12 are the most common CFCs used in refrigeration systems. CFC-11 is a particularly hazardous substance due to its high volatility and its ability to adsorb on various surfaces. This interaction moreover leads to thermally stable crystals. Per-methylated α -cyclodextrin is successfully exploited as a reversible and selective adsorption material for liquid and airborne trichlorofluoromethane as well as an affinity material for the chemical sensing and detection of this particular volatile organic component.

Abstract text continues with detailed description of the research findings, including the synthesis of per-methylated α -cyclodextrin, its characterization, and its application in the detection and separation of trichlorofluoromethane. The text discusses the supramolecular complex formation and the resulting thermally stable crystals.

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Asia Pacific

7. Brunei technicians undergo RAC course

The Department of Environment, Parks and Recreation (JASTRe), United Nations Environment Programme (UNEP), and IBTE Jefri Bolkiah Campus organised a workshop to train Institute of Brunei Technical Education (IBTE) technicians on good practices in servicing refrigeration and air-conditioning (RAC) systems.

Held from August 15-16 at IBTE Jefri Bolkiah Campus, Kuala Belait, the workshop was the 18th held in the country.

Over 16 technicians were briefed on the environmental and human health impact, as well as safety and handling issues of RAC units on the first day of the training.

On the second day, participants were assessed theoretically and practically to check their understanding of the material that they were trained on during the course.

The workshop served as a national focal point event for discussion of issues relating to the Montreal Protocol, such as substances that deplete the ozone layer and global warming.

The workshop gave technicians the opportunity to get hands-on practice in the installation and servicing of refrigeration and air-conditioning units, and also educated them on the impact of refrigerants categorised as containing ozone-depleting substances and greenhouse chemicals.

The project was part of Brunei Darussalam's Hydrochlorofluorocarbons Phase-out Management Plan (HPMP) project under the Montreal Protocol.

Facilitating the two-day course was a master trainer from IBTE.

So far, more than 200 technicians from various refrigeration and air-conditioning service companies in Brunei Darussalam have undergone this HPMP project training.

Similar courses will be conducted throughout 2018 in all four districts to cater to RAC technicians from registered RAC service companies that haven't followed the course yet.

Borneo Bulletin, 20 August 2018, By: Daniel Lim



8. Air conditioner without refrigerant: This Filipina, 19, could revolutionise your AC

Switzerland-based inventors' group recognizes Filipina student's AirDisc AC after 10 institutions conferred her awards.

An air-conditioner without a refrigerant. That's what a 19-year-old Filipina student has developed, and with patent applications filed, that could potentially revolutionise the way homes and buildings are cooled — without the use of hydrofluorocarbons (HFCs) as cooling agent.

Maria Yzabell Angel Palma (also known as Yza), from Bicol, Philippines, was recently recognised by the International Federation of Inventors' Association (IFIA) for inventing her "AirDisc". Palma, whose invention had also been recognised by Asian (Chinese, Korea and Taiwanese) entities, claims she had patent application filed for AirDisc. Along with her father, Bernardo, a mechanical engineer, Palma is reportedly finalising a commercial prototype and is open to manufacturing partnerships.

High school invention

Philippine media reports state that the 19-year-old from Naga City, 408km south of Manila, was a Grade 10 student at the elite Philippine Science High School (PSHS) Bicol campus in 2016 when she "accidentally" came up with her revolutionary AC invention that uses a disc-shaped compressor. PSHS has 14 other campuses around the country.



Instead of using a cooling medium, Palma's AC uses low compression and a high volume of air molecules as refrigerant replacement.

The first modern electrical air conditioning unit was invented by Willis Haviland Carrier in Buffalo in 1902. Current air-conditioning systems use piston or rotary compressors to pump with the harmful hydrofluorocarbons.

Now, Palma has been recognised for her feat by the International Federation of Inventors' Association (IFIA), which invited her to Switzerland in February — but she failed to attend the event because she was then graduating.

IFIA learnt about Palma after 10 foreign organisations, including Asean awards bodies, recognised her for the AirDisc Air Conditioning Technology. Palma said she and her father had already completed the application with the Virginia-based US Patent and Trademarks Office. Palma is an incoming mechanical engineering freshman student at the De La Salle University (DLSU) in Manila.

'Accidental'

The AirDisc technology discovery came as an “accident”, she told local media.

She was then working on an eco-friendly oven for her research subject when she was in Grade 10. The energy-efficient oven technology was dubbed the "AirWave Oven".

While further developing the AirWave oven in which she was using copper tubes, Palma said it resulted in emitting cold air at the end of the tubes. “So I thought why not just develop something from this?” she recalled. The heart of the green AC is the centrifugal compressor, explained Palma.

The compressor uses rotating concentric air tanks with air inlets that continuously take in enough air molecules from a room for compression.

As the heat generated from air compression is separated, the compressed air molecules with less heat are allowed to expand: This process effectively and continuously lowers the room temperature.

Palma said she and her father are now looking for partners that will commercially manufacture the AirDisc air conditioner.

The father-and-daughter team recently completed patent applications in the Philippines as well as with the United States Patent and Trademarks Office (USPTO), local media reports said.

The reason why they applied with the US agency, she explained, is that they ultimately plan to bring the AirDisc to the US — and the rest of the world.

Patent treaty

She explained that the US and the Philippines are among 152 “contracting states” of the Patent Cooperation Treaty, which took effect in 1978, that assists the world's inventors and innovators seeking international patent protection for their inventions.

Asked about her invention's potential, the young inventor said she was excited about her AirDisc technology to become the future of airconditioning for homes and offices — not just in the Philippines but in other countries.

One advantage of AirDisc is that it only uses 350 watts of power, about a quarter of the 1,200 watts needed by traditional airconditioners with the same cooling output.

Low power

Palma said the prototype they will manufacture commercially was further improved, needing only 150 watts for a 0.5 horsepower unit.

“The prototype I researched on used 350 watts but the commercial prototype that will be available in the market will only be 150 watts,” she told Philippine Star.

Because it does not need freon for cooling, AirDisc AC does away with harmful emissions into the atmosphere. HFCs are often used in air-conditioning as refrigerants in place of older chlorofluorocarbons such as R-12 and hydrofluorocarbons such as R-21.

But experts point to HFC, an organic compound composed of hydrogen, fluorine and carbon, as a potent greenhouse gas. As a result, their manufacture and use became increasingly regulated in recent years.

AirDisc is seen as a timely answer to the United Nation's Kigali mandate to phase out HFCs as chemical refrigerants.

Scientists claim that a kilo of HFC is equal to roughly 20,000 kilos of CO₂ greenhouse gas. [...]

The AirDisc has won gold medals from the World Inventors Contest 2017 in South Korea, the International Invention Innovation Competition 2017 in Canada, and the International Intellectual Property Invention, Innovation and Technology Exposition Thailand 2018. [...]

Science Secretary Fortunato dela Peña said they are ready to provide Palma with technology and financial support to further develop the AirDisc.

Gulf News Web Report, 7 August 2018

Europe & Central Asia

9. Latvia 43rd country to Ratify the Kigali amendment

To date the number of countries to have ratified the Kigali amendment to phase down HFC refrigerants has reached 43 following the signature of Latvia.

The Kigali amendment to phase down HFCs will enter into force on January 1, 2019.

Status of Kigali amendment [Ratification](#).

United Nations Treaty Collection, 17 August 2018



10. The Air conditioning and Refrigeration European Association (AREA) replies to consultation on ozone-depleting regulation

AREA has replied to a public consultation on the review of the ozone-depleting substances (ODS) Regulation. AREA is generally supportive of the Regulation, which has proven to be efficient in reducing consumption of ozone-depleting substances and encouraging their replacement by alternatives (HFCs and natural refrigerants).

AREA however points out that the situation is not uniform across the EU, notably as regards recovery & destruction.

Some countries are also more exposed to refrigerant smuggling, an issue that is becoming increasingly of a concern in the context of the HFC phase-down too.

AREA, 21 August 2018



11. Italy controls illegal refrigerant traffic

The controls have started and with them the first criminal complaints. In Ceprano they convicted a twenty-eight year-old owner of a spare parts business that had sold on the Internet twelve R134 cylinders for the recharging of car air-conditioners.

The Carabinieri of the Ceprano Station, in collaboration with the Carabinieri Ecological Operating Unit of Rome, noted the absence of the requirements and documentation that would make the sale regular.

Similar controls are taking place throughout Italy as part of the investigative activity requested by the Ministry of the Environment for the verification of the management and use of fluorinated greenhouse gases.

It reminded that traders are subject to complaint, but also technicians who purchase illegally.



(Original in *Italian*, inhouse translation)

Industria & Formazione, 25 August 2018

12. EUSAS-Euralarm conference by Airbus showcases fire detection & security in the aviation sector



EUSAS and Euralarm, hosted by Airbus, recently organised their second joint conference, which was this year on the topic of aviation safety and security. It showed once again the importance of technological development for an industry endeavoured to protect lives with a particular relevance to the aeronautics and air transport sectors. [...]

Airbus, the biggest aeronautics and space company in Europe and a worldwide leader in the sector, was the host of a series of lectures and presentations on fire detection, fire suppression, evacuation and security in the aviation sector. This event was jointly organised by the European Society for Automatic Alarm Systems (EUSAS), a group connecting academia and industry, and Euralarm, which represents the European fire safety and security industry.

Fire detection technologies

The event addressed the special challenges of fire detection and extinguishing in airplanes, airports and in the aviation industry. From the depleting extinguishing agent reserves worldwide, to the large number and sheer size of airport buildings and hangars, which require specific solutions on top of traditional fire detection technologies. Furthermore, are the financial and time constraints for compliance testing in an industry where efficiency and safety are a must. [...]

Green fire suppression system

Another issue for the industry is the replacement of Halon, a gas that has a high global-warming factor and attacks the ozone layer in our atmosphere. This fire suppression agent is used in cargo compartments, as well as for turbine fire due to its favourable characteristics. The production of Halon has now been discontinued and stocks of recuperated gas are rapidly declining.

While Terry Simpson and Edda Liu from UTC Aerospace Systems presented the overall current progress on the replacement of Halon for fire extinguishing and suppression, Dr. Jan Boris Philipp, from Diehl Aviation, in Germany, presented an alternative green fire suppression system manufactured by his company. [...]

SourceSecurity, 23 August 2018

Latin America and Caribbean

13. Jamaica gets help ratifying deal to combat HFCs



Jamaica is being helped on the road to the ratification of the Kigali Amendment that requires the gradual phase down in the production and use of the hydrofluorocarbons (HFCs), which are known to fuel global warming.

This is courtesy of the 18-month project being implemented by the United Nations Development Programme (UNDP), with funding from the Multilateral Fund for the Implementation of the Montreal Protocol of which the Kigali Amendment forms a part.

HFCs have been used in foam production, refrigeration and other processes as alternatives to chlorofluorocarbons (CFCs), which are harmful to the ozone layer that protects life on earth from the ill effects of the ultraviolet rays of the sun.

"While not themselves ozone-depleting substances, HFCs are greenhouse gases which can have high or very high global warming potentials," reveals the OzonAction fact sheet produced from the 28th Meeting of the Parties to the Montreal Protocol in October 2016 in Kigali, Rawanda.

It was from that meeting that countries emerged with the deal - referred to as the Kigali Amendment - that includes, among other things, specific targets and a schedule to replace HFCs with more planet-friendly alternatives, as well as an agreement for rich countries to help to bankroll the transition of poor countries to safer alternative products.

Paris Agreement

The deal struck is seen by some as a significant collective global effort towards "holding the increase in the global average temperature to well below two degrees Celsius above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 degrees Celsius above pre-industrial levels, recognising that this would significantly reduce the risks and impacts of climate change", as provided for under the historic Paris Agreement.

That agreement - reached in 2015 and since ratified by some 179 countries, including Jamaica - involved parties to the United Nations Framework Convention on Climate Change and responds to climate change threats, including global warming but also rising sea levels and more extreme weather events, among other things.

According to information out of the UNDP, the objectives of its Jamaica project - dubbed 'Implementing Enabling Activities for the Ratification of the Kigali Amendment' - are to support the Government in the implementation of actions to allow for "the seamless" ratification of the Kigali Amendment and to identify legislation and/or policies to be reinforced or modified in support of early ratification.

To those ends, the project is to review legislative and policy framework in support of the ratification process; identify gaps, if any; and conduct a baseline assessment to determine the amount of HFCs being imported into the country annually and the labelling of products entering the country with HFCs.

The UNDP project will also take account of international best practices; identify gaps locally and make recommendations; as well as take on capacity building in reporting to the Multilateral Fund in CO₂ versus tonnes, and in the identification of products containing HFCs.

[The Gleaner, 2 August 2018](#)

North America

14. Hydrofluoroolefins a low GWP solution to F-gases, to witness a CAGR of 20.8% during 2017 – 2023



The global hydrofluoroolefins (HFOs) market is expected to grow at a CAGR [Compound annual growth rate] of 20.8% during 2017 – 2023 to reach USD 5,784.3 Million by 2023. Factors propelling the growth of HFOs market include exceptionally low GWP compared with HFCs and HCFCs, few facility modifications required to transition from HCFCs, EU regulations phasing out HFO from other fluorinated greenhouse gases, and low to mild flammability.

The report segments the hydrofluoroolefins (HFOs) market by Product (HFO-1234ze, HFO-1234yf, HFO-1233zd, HFO-1336mzz, and Others), by Application (Commercial Refrigeration, Domestic Refrigeration, Foam Blowing Agents, Aerosol Propellants, Mobile Air-Conditioning Systems, Precision Solvent Cleaners, and Others), and by Region (North America, Europe, Asia-Pacific, Middle East and Africa, and South America). The report studies the global hydrofluoroolefins (HFOs) market over the forecast period (2017-2023).

Hydrofluoroolefins (HFOs) are unsaturated organic compounds comprising of hydrogen, fluorine and carbon. Unlike traditional hydrofluorocarbons (HFCs) and chlorofluorocarbons (CFCs), which are saturated, HFOs are olefins, otherwise known as alkenes. HFOs are being developed as "fourth generation" refrigerants with extremely low global-warming potential which is 0.1% of HFCs. HFO products have short atmospheric lifetimes and are categorized as having zero ODP (Ozone Depletion Potential) and low GWP (Global Warming Potential), providing a more environmentally friendly alternative to CFCs, HCFCs and HFCs.

Key Findings of the Global Hydrofluoroolefins (HFOs) Market

On the basis of product, HFO-1234yf was dominating the hydrofluoroolefins (HFOs) market, in 2016 and is anticipated to dominate the market, throughout the forecast period. The growth of this segment is attributed to its high acceptance in foam blowing and as a refrigerant in mobile air conditioning and industrial refrigeration

On the basis of application, foam blowing was holding the largest share of global hydrofluoroolefins market, in 2016 and is expected to remain the largest market, throughout the forecast period. Polyurethane foam produced using HFOs as blowing agent is widely used in automobile and construction sectors in the form of flexible and rigid foams is driving the growth of the HFO market

Mobile air-conditioning is expected to be the fastest growing application of hydrofluoroolefins, over the forecast period. The growth in the aforementioned segment is primarily attributed to EPA's Significant New Alternative Policy (SNAP) program

Geographically, North America was holding the largest market share for hydrofluoroolefins (HFOs), in 2016 and is anticipated to dominate the market, throughout the forecast period. Growth of hydrofluoroolefins (HFOs) market in this region is attributed to the stringent environmental regulations leading to replacement of HFCs and HCFCs [...]

Hydrofluoroolefins (HFOs)- Market Insight

Hydrofluoroolefins are unsaturated hydrocarbons that are fast replacing HFC and other fluorinated compounds. The environmental regulations are phasing out the use of HFC and HCFC. HFOs with low global warming potential (GWP), low ozone depletion potential (ODP) and low volatile organic compound (VOC) is a suitable substitute of HFC and HCFC. One of the main commercial interest of the regulatory bodies in HFO is that it breaks down to trifluoroacetic acid (TFA) in atmosphere. TFA is flushed out from the atmosphere into the aqueous environment, where it is already present in small quantity, thus making HFO an exception from other fluorinated gasses. The increasing use of HFO in refrigeration, mobile air conditioning and foam are attracting the investors to generate business from HFO market. Moreover, environmental issues have made these industries to transit from HCFC to HFO. The companies are now taking lead in manufacturing HFO grades.[...]

Hydrofluoroolefins (HFOs) Market- Regional Insight

North America was holding the largest market share of hydrofluoroolefins (HFOs) market, in 2016 and is anticipated to continue holding the major market share, throughout the forecast period. The introduction and adoption of environmental regulations to control the global warming, such as Significant New Alternatives Policy (SNAP) Program of EPA is boosting the demand for HFOs in the region. Europe was holding the second largest market share of global HFOs market, in 2016. European countries have already started to phase out HFCs from automobile and other industries for HVAC applications. The European Directive on Mobile Air-Conditioning Systems (MACs) introduced a gradual ban on these gases in passenger cars is boosting the demand for HFOs in the region. Asia-Pacific market for HFOs is expected to grow at a significant rate, during the forecast period. Additionally, Asia-Pacific is a major market for HFOs as blowing agents. The growing automotive industry and increasing construction activities in the emerging economies are expected to foster the market growth of HFOs in the region. [...]

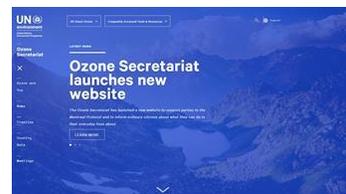
Energias Market Research, 17 August 2018

Featured



OZONE SECRETARIAT

Visit the **NEW** Ozone Secretariat [website](#)



"Keep Cool and Carry On", Theme for World Ozone Day 2018

The theme is accompanied by the tagline: The Montreal Protocol

The theme for this year's World Ozone Day is a motivational rallying call urging all of us to carry on with the exemplary work of protecting the ozone layer and the climate under the Montreal Protocol.

The theme has two connotations – that our work of protecting the ozone layer also protects climate and that the Montreal Protocol is a “cool” treaty, as exemplified by its outstanding success.

Ozone Secretariat is inviting people to join in keeping our planet cool and celebrating the Montreal Protocol's success in protecting the ozone layer and its contribution to combating climate warming by phasing out nearly 100% of controlled ozone-depleting substances that are also potent global-warming gases.

The Montreal Protocol is poised to contribute even more to the fight against global warming through the Kigali Amendment, which will enter into force on 1 January 2019.

The theme and tagline of this year's World Ozone Day in all the six official UN languages are posted on our [website](#) for wider dissemination.

To support your World Ozone Day communication activities, the Secretariat has developed two posters in all the six official UN languages. Please download them from our [website](#) for dissemination in your commemorative activities.

As in previous years, the United Nations Secretary-General's message for World Ozone Day and other materials will be shared prior to the day for further dissemination.

UN Environment, [Ozone Secretariat](#), May 2018



- [40th Meeting of the Open-ended Working Group of the Parties to the Montreal Protocol](#), 11-14 July 2018, Vienna, Austria

The documents for the forthcoming 40th meeting of the Open-ended Working Group of the Parties to the Montreal Protocol (11 to 14 July 2018, Vienna), and the associated workshop on energy efficiency opportunities while phasing-down hydrofluorocarbons (9 and 10 July 2018) are available on the meeting portal and mobile app.

Read/download OEWG40 [Summary](#)
[OEWG-40 Daily coverage by IISD](#)

- Click [here](#) for Montreal Protocol upcoming Meetings Dates and Venues

The UN Environment Assessment Panels

The Assessment Panels have been vital components of ozone protection since the Montreal Protocol was first established. They support parties with scientific, technological and financial information in order to reach decisions about ozone layer protection and they play a critical role in ensuring the Protocol achieves its mandate.

The Assessment Panels were first agreed in 1988 to assess various direct and indirect impacts on the ozone layer. The original three panels are:

[The Technology and Economic Assessment Panel](#)

[The Scientific Assessment Panel](#)

[The Environmental Effects Assessment Panel](#)

In the past there were 4 main panels. The Panels for Technology and Economic Assessments were merged in 1990 into one Panel, now called the Technology and Economic Assessment Panel.

Why are the three current panels important to ozone layer protection? Each carries out assessment in its respective field. Every four years, the key findings of all panels are consolidated in a synthesis report.



THE MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL

- [Adjusted Prorated 2018-2020 business plan of the Multilateral Fund \(16 August 2018\)](#)
- [81st meeting of the Executive Committee, Montreal, Canada, 18 to 22 June 2018](#)
- [Reports of projects demonstrating alternatives to HCFC technologies \(updated 81st meeting\)](#)
- [2018 Executive Committee Primer](#)

[Learn more](#)



OZONACTION

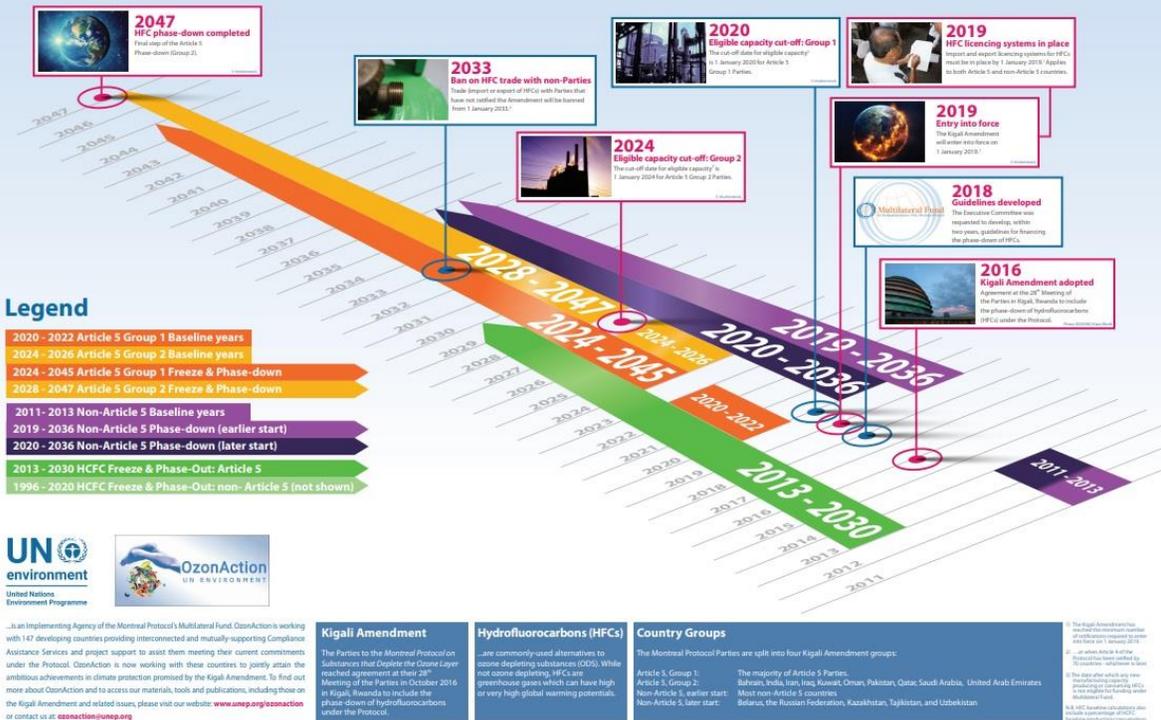


To assist countries in planning and organising their **Ozone Day activities on 16 September**, OzonAction prepared the following list of material which may be downloaded and used in raising awareness to the general public and to the Montreal Protocol family.

OzonAction is keen on highlighting your country's activities on the occasion of the **2018 International Ozone Day celebrations**. Please send us the related information/photos to [email](#).

Take this opportunity to share your innovative and inspiring events with the world!

The Path from Kigali: HFC Phase-Down Timeline



The Path from Kigali: HFC Phase-Down Timeline

This timeline, produced by OzonAction, highlights key hydrofluorocarbons (HFCs) phase-down dates.

Click [here](#) to download the timeline

RAC Videos

New videos available on the OzonAction RAC video application

A series of new videos has just been released on the Refrigeration and Air-conditioning Technician Video Series application, with a focus on working with flammable refrigerants ...

50,000 downloads and counting!

To install, search for "RAC Video" in the Google Playstore or Apple IOS store, or scan the QR code.



GWP-ODP Calculator Smartphone Application

The application allow you to easily convert ODP, CO₂-eq and metric quantities of refrigerants and other chemicals.

- Helps in understanding and reporting under the Montreal Protocol (and future commitments under the Kigali Amendment)
- The calculator will automatically perform the conversion between metric tonnes, ODP tonnes and/or CO₂-equivalent tonnes (or kg) and display the corresponding converted values
- The app includes both single component substances and refrigerant blends
- The components of a mixture and their relative proportions (metric, ODP, CO₂-eq) are also displayed.

Available for free from the Apple IOS store and Google PlayStore. Search for "GWP ODP CALC" in the Playstore to install!

Download it Now!



OzonAction Smartphone Application WhatGas? Quickly search for the information you need

- Chemical name
- Chemical formula
- Chemical type

- ASHRAE designation
- Trade names
- HS code
- CAS number
- UN number
- Montreal Protocol Annex and Control measures
- Ozone depleting potential (ODP)
- Global warming potential (GWP)
- Blend components
- Toxicity and flammability class
- Main uses



OzonAction Smartphone Application WhatGas?
Available for **free** in the Google Play and Apple IOS Store
Scan the QR code or search for “UNEP”, “OzonAction” or “WhatGas?”



[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 28th 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](#)

OzonAction Factsheets



Update on New Refrigerants Designations and Safety Classifications

June 2018

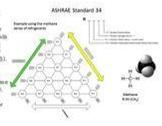
The purpose of this fact sheet is to provide an update on ASHRAE standards for refrigerants and to introduce the new refrigerants that have been assigned an A1 or A2L number over the last few years and introduced into the international market.

Standard 34
ASHRAE Standard 34, Designation and Safety Classification of Refrigerants, establishes a simple means of referring to common refrigerants other than by their chemical name, formula, or trade name. ASHRAE assigns numbers and safety classifications to the refrigerants based on toxicity and flammability data submitted by the refrigerant's producer.

ASHRAE's Numbering System
Refrigerants are numbered with an R-, followed by the ASHRAE assigned number.

Some (molecules with the same chemical formula as another molecule but with a different chemical structure) are identified with a lower case letter after the number (for example, R-134a). Refrigerants sharing the same pure components, but with different proportions are identified with an upper case letter after the number (for example, R-404A, R-404B).

Refrigerants having the form 70 have an asterisk (denotes two or more refrigerants whose liquid phase and vapor phase always have different compositions) while those with the form 80 are azeotropic (denotes refrigerants whose liquid phase and vapor phase have the same composition at a specific pressure).



NEW >>> UN Environment-ASHRAE Factsheet Update on New Refrigerants Designations and Safety Classifications



OzonAction Series of Fact Sheets relevant to the Kigali Amendment

In October 2016 the Parties to the Montreal Protocol adopted the Kigali Amendment. This brings the production and consumption of hydrofluorocarbons (HFC) under the control of the Protocol and offers to significantly contribute to the fight against climate change via the Amendment. OzonAction has prepared a series of fact sheets to provide information to National ozone Officers, relevant stakeholders, and end users on what changes and challenges the new Amendment brings as well as how to address these in order to meet and comply with the new phase-out target.

Below is the list of the fact sheet (HS) Kigali Fact Sheets. Click on the titles to read or download the document.

- OzonAction Kigali Fact Sheet No. 1 Introduction to the Kigali Amendment
- OzonAction Kigali Fact Sheet No. 2 Current Use of ODS and HFCs
- OzonAction Kigali Fact Sheet No. 3 HFC-32, 125 and The Benefit of HFCs
- OzonAction Kigali Fact Sheet No. 4 Low GWP Fluids and Technologies
- OzonAction Kigali Fact Sheet No. 5 HFC Alternatives and Transition Technologies
- OzonAction Kigali Fact Sheet No. 6 Next Steps: HFC Phase-down Overview
- OzonAction Kigali Fact Sheet No. 7 Next Steps: Legislation and Administration
- OzonAction Kigali Fact Sheet No. 8 Next Steps: Stakeholder Engagement
- OzonAction Kigali Fact Sheet No. 9 Technical Issues: Heat Recovery Compressors
- OzonAction Kigali Fact Sheet No. 10 Technical Issues: Circularity
- OzonAction Kigali Fact Sheet No. 11 Basics to Good Design Implementation
- OzonAction Kigali Fact Sheet No. 12 Implementation with Other Ozone Matters
- OzonAction Kigali Fact Sheet No. 13 Basics of Heat Audit
- OzonAction Kigali Fact Sheet No. 14 Storage and Refill Issues

Click [here](#) to access OzoneAction Series of Fact Sheets relevant to the Kigali Amendment.



HS Nomenclature (HS Codes) for HCFCs and Certain Other Ozone Depleting Substances Post-Kigali Update

INTRODUCTION

In recent years, trade patterns in ozone depleting substances (ODS) have shifted with the complete phase-out of chlorofluorocarbons (CFC) as of 1st January 2010 (except for a few exempt uses), the phase-out of hydrochlorofluorocarbons (HCFC) phase-out in 2010 and the increased trade hydrofluorocarbons (HFC) codes in the most commonly used HFCs, and at the same time existing technical alternatives as replacement alternatives.

To better facilitate monitoring of trade in ODS, the Parties to the Montreal Protocol requested the World Customs Organization (WCO) to revise the Harmonized System (HS) nomenclature and coding system, also known as the Harmonized System (HS) codes for HCFCs. This resulted in amending heading 2912 of Chapter 29 with the objective of assigning specific 6-digit HS codes to the five most commonly used HCFCs, and at the same time existing technical alternatives as replacement alternatives.

HS codes previously assigned to CFCs. This amendment entered into force on 1 January 2012. With the 2016 Kigali Amendment to the Montreal Protocol to phase down HFCs, it is expected that a large number of the HS will assign separate HS codes to the most commonly traded HFCs and includes containing HFCs.

HS Classification for ODS (2912)

Under the HS 2012 HCFCs and certain other ODS are to be classified in the HS as follows:

Chapter 29. Organic chemicals

29.03 Halogenated derivatives of hydrocarbons.

[...] 2903.71 -- Chlorofluoromethane (= HCFC-22)
 2903.72 -- Dichlorofluoromethane (= HCFC-125, which has been banned)
 2903.73 -- Chlorotrifluoromethane (= HCFC-113, which has been banned)
 2903.74 -- Chlorofluoroethanes (= HCFC-142, covers 3 isomers, including the most popular HCFC-142b)
 2903.75 -- Dichlorodifluoroethanes (= HCFC-123, covers 9 isomers, including the most popular HCFC-123a and HCFC-123b)
 [...] 2903.79 -- Other in all remaining HCFCs and a number of other halogenated derivatives of acyclic hydrocarbons containing two or more different halogens, including inter alia the following ozone depleting substances controlled by the Montreal Protocol: hydrochlorofluorocarbons (HCFCs) and bromochlorofluoromethane (BCFM)

Overview is presented a correlation table showing the previous HS classification of ODS until 31 December 2011 (HS 2007) and the revised classification which were applicable from 1 January 2012 (HS 2012). Information is also provided on the current HS codes for ODS-containing mixtures (see table page 2)

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

UNEP

The Kigali Amendment to the Montreal Protocol: HFC Phase-down

28th Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer

INTRODUCTION

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

HFCs are commonly used alternatives to ozone-depleting substances (ODS), while not ozone-depleting, substances themselves. HFCs are greenhouse gases which can have high or very high global warming potentials (GWPs) ranging from about 12 to 14,800.

OVERVIEW OF AMENDMENT

The Kigali Amendment acts to the Montreal Protocol to phase-down of the production and consumption of HFCs. The main features of the amendment are the following:

- The Kigali Amendment will enter into force on 1 January 2019, provided that it is ratified by at least 20 Parties to the Montreal Protocol (or 90 per cent of the total HFC production).
- There are two groups of Article 5 Parties with different baselines and phase-down schedules (see chart and graph on page 2).
- Some Article 5 Parties have different baseline calculations and different initial phase-down rates from the main group of Article 5 Parties (see chart and graph on page 2).
- A new Annex F has been added to the Protocol. This lists the HFCs separated into two groups:
 - Annex F, Group 1: all HFCs (except HFC-125 and HFC-134a)
 - Annex F, Group 2: HFC-125

The phase-down of HFCs under the Montreal Protocol has been under negotiation by the Parties since 2009 and the successful agreement on the Kigali Amendment (Decision XXXV/1 and accompanying Decision XXXV/2) continues the historic legacy of the Montreal Protocol.

This fact sheet summarises and highlights the main elements of the Amendment of particular interest to countries operating under Article 5 of the Protocol (Article 5 Parties).

Global warming potential values have been added to the Protocol text for HFCs and selected HCFCs and CFCs (see page 6).

Production, consumption, imports, exports and emissions as well as consumption baselines of HFCs shall be reported in carbon dioxide (CO₂) equivalents.

Baselines are to be calculated from both HFC and HCFC production/consumption.

There is an exemption for high ambient impact and export trading systems for HFCs (see page 3).

Imports and exports trading systems for HFCs must be in place by 1 January 2019.

Trade and Parties that have not ratified the Amendment ("non-Parties") will be banned from 1 January 2023.

The Executive Committee shall establish, within two years, guidelines for trading systems for HFCs.

A timeline of the HFC phase-down is provided on page 4.

The Kigali Amendment to the Montreal Protocol: HFC Phase-down - The phase-down of HFCs under the Montreal Protocol on Substances that Deplete the Ozone Layer has been under negotiation by the Parties since 2009 and the successful agreement on the Kigali Amendment at the 28th Meeting of the Parties on 15 October 2016 in Kigali, Rwanda to phase-down hydrofluoro-carbons (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).

UNEP

Refrigerant Blends: Calculating Global Warming Potentials

Post-Kigali Update

INTRODUCTION

The number of single component refrigerants with different thermodynamic properties suitable for different types of equipment is limited. Growing demand for refrigerant use, accompanied by dwindling applications has led to continued search for suitable refrigerant blends. A number of such blends have been developed by mixing two or more single component refrigerants in different proportions. The resulting blends have entirely different properties from that of its components.

While it is common to use the term "blend" in the context of the Montreal Protocol, it is important to note that the term "mixture" is also used to describe refrigerants which are composed of more than one component. The terminology mixture is specifically used in the Working Group on Observation and Coding Systems, also known as the Harmonized System (HS) codes.

TYPES OF REFRIGERANT BLENDS

A refrigerant blend or mixture of refrigerants is made up of two or more single component refrigerants. These blends can be of two types: Azeotropic and Zeotropic.

Azeotropic blends

These blends behave like a single component refrigerant. It has the same boiling point, a constant temperature at its critical pressure, and the same critical temperature. These blends are assigned numbers for ASHRAE codes in the 500 series, e.g. R502.

Zeotropic blends

These blends boil and condense through a range of temperatures at a given pressure. This range of temperatures is called the "temperature glide". Zeotropic blends are assigned ASHRAE codes in the 400 series, e.g. R404A, R404A, etc.

GWPs values for some common refrigerants

Substance	GWPs value
CFC-12	10 900
HCFC-22	1 810
HCFC-124	810
HFC-134a	2 030
HFC-152a	140
HFC-125	2 650
HFC-135	3 000
HFC-143a	1 430
HFC-124zev	<1
HFC-124zev	<1
R-290 (Propane)	3

Global warming potential (GWP) is a measure which enables comparison of the global warming effects of different gases. It compares the amount of heat trapped by a certain mass of a gas to the amount of heat trapped by a similar mass of carbon dioxide over a specific period of time. Carbon dioxide was chosen by the Intergovernmental Panel on Climate Change (IPCC) as the reference gas and its GWP is taken as 1.

Following the 2016 Kigali Amendment, the Montreal Protocol has adopted standard reporting values for GWP of HFCs. The ASHRAE codes and GWP values which have been incorporated into the text of the Protocol are Annexes A, C and F.

It is also important to note that a GWP value can include a range to reflect the uncertainty of the value. For example, the GWP value for HFC-125 according to the 2011 IPCC Scientific Assessment of Climate Change is 2650 ± 100, i.e. between 1160 and 2420.

Table 1 (above) provides some sample GWP values. Examples of HFCs, HCFCs and CFCs that have been selected for the GWP values are provided in the Annexes of the Montreal Protocol. The GWP values are derived from the scientific literature and are based on the GWP values of the different sources of values.

Refrigerant Blends: Calculating Global Warming Potentials (post-Kigali update)

UNEP

Global Warming Potential (GWP) of Refrigerants: Why are Particular Values Used?

Post-Kigali Update

INTRODUCTION

Ever since the Montreal Protocol agreed to phase out hydrofluorocarbons (HFCs), there has been an increasing interest within the Protocol on ozone issues. Decision XXXV/1, taken in 2016, to amend the Protocol to accelerate the phase-out of HFCs, includes language to improve the environmental protection. It also mentions that improved environmental records, in particular, include on the use of low global warming potential (GWP) refrigerants, which focus on substitutes and alternatives that minimize their impacts on the environment, including on the climate, taking into account global-warming potential (GWP).

In 2016, the Montreal Protocol was amended to phase-down the production and consumption of hydrofluorocarbons (HFCs) which are commonly used alternatives to ozone-depleting substances.

WHAT IS GWP?

Global warming potential (GWP) is a measure of the relative global warming effects of different gases. It assigns a value to the amount of heat trapped by a certain mass of a gas relative to the amount of heat trapped by a similar mass of carbon dioxide over a specific period of time. Carbon dioxide was chosen by the Intergovernmental Panel on Climate Change (IPCC) as the reference gas and its GWP is taken as 1.

WHY ARE THERE DIFFERENT SETS OF GWP VALUES?

Calculations of global warming potential (GWP) values of refrigerants is a complex issue. For the great majority of cases there are a number of different values of GWP for each specific refrigerant. This is due to a number of reasons, including the following:

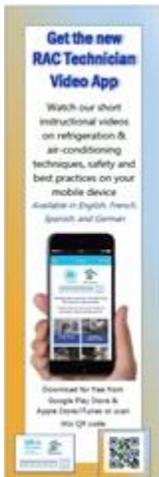
- There is a variety of sources from which the GWP values could be obtained.
- GWP values are periodically updated, based on the most recent research and scientific understanding of the climate system.
- GWP values are calculated over different time horizons. Typically GWP values are reported over a 100 year time horizon, although 20 year and 5 year horizons are also reported. GWP values are also commonly provided.

The higher the GWP value, the more that particular gas warms the Earth compared to carbon dioxide. GWP values for ozone-depleting substances can range, for example, from about 1 to 14,800. The GWP of commonly used HFCs can range from 12 to 14,800.

Global Warming Potential (GWP) of Refrigerants: Why are Particular Values Used? (post-Kigali update).



Tools Commonly used by Refrigeration and Air-Conditioning Technicians



OzonAction Multimedia Video Application: Refrigeration and Air-conditioning Technician Video Series - 50,000 download to date - 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.

New videos on flammable refrigerants just added!

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



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

Available in the [Android Play Store](#) and [Apple Store/iTunes](#).
(Just search for "OzonAction", or scan this QR code)



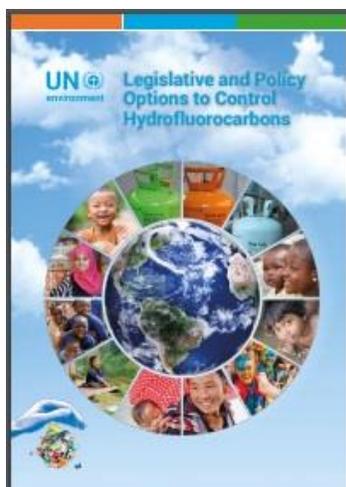
OzonApp eDocs+ launched in Android Play Store and Apple Store.

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.



OzonApp eDocs+ available in the [Android Play Store](#) and [Apple Store/iTunes](#).
(Just search for “OzonAction”, or scan this QR code)

Publications



Legislative and Policy Options to Control Hydrofluorocarbons

In order to follow and facilitate the HFC phase-down schedules contained in the Kigali Amendment, the Parties, including both developed and developing countries, will have to implement certain measures.

This booklet contains a recommended set of legislative and policy options which the developing (Article 5) countries may wish to consider for implementation. It is intended to be a guide/tool for countries.

Events

2018

- [1st IIR International Conference on the Application of HFO Refrigerants](#). 2-5 September 2018, Austin Court Conference Centre, Birmingham, United Kingdom.
- [The Future of HVAC Conference 2018](#), 12–13 September, Melbourne, Australia.
- [3rd IIR Conference on Cold Application in Life Sciences 2018](#), 12-14 September 2018, St. Petersburg, Russia

- [3rd IIR Conference on Cold Application in Life Sciences 2018](#), 12-14 September 2018, St. Petersburg, Russia
- [8th International Conference on Magnetic Refrigeration at Room Temperature \(Thermag VIII\)](#), 16-20 September 2018, Darmstadt, Germany
- [FREE Natural Refrigerant Workshop - Mapping the Future of Refrigerants](#). Join the NASRC and Efficiency Vermont for a FREE workshop that will provide an in-depth overview of natural refrigerant options and how the industry's "mega-trends" will influence those options in new and existing stores. 3 October 2018, 9AM - 5PM / Burlington, Vermont. Register [here](#)
- [Healthcare ColDays](#), 15 November 2018, Lyon, France,

See other [IIR upcoming events](#)

2019

25th IIR International Congress of Refrigeration - From August 24-30, 2019, Montreal (Canada), birthplace of the 1987 Montreal Protocol, will host the 25th IIR International Congress of Refrigeration – ICR 2019.

The international meeting will provide, among others, the ideal platform to take stock of the historic Kigali Amendment to the Montreal Protocol, which will enter into force in January 2019, bringing about a global phase-down of hydrofluorocarbons (HFCs).

Covering all fields of refrigeration, ICR 2019 is expected to surpass the success of previous congresses, and will be a unique opportunity for researchers and engineers from all over the world to meet, exchange and publish the results of their research. With nearly 1,000 abstracts received, the 25th event in the series is set to welcome its largest audience to date.

The congress will be organised under the theme "Refrigeration for Human Health and Future Prosperity" and will focus on the current global issues at the centre of international concern, including food security, health, energy saving and energy efficiency, the reduction of global warming and the protection of the ozone layer.

Click [here](#) for more information / [International Institute of Refrigeration](#)

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.

Lead Author:
 Michaela I. Hegglin
 Coauthors:
 David W. Fahey, Mack McFarland, Stephen A. Montzka, Eric R. Nash



[Primer on Hydrofluorocarbons \(HFCs\)](#) - IGSD -11 January 2018

Summary:
 Fast action under the Montreal Protocol can limit growth of hydrofluorocarbons (HFCs), prevent 100 to 200 billion tonnes of CO₂-eq by 2050, and avoid up to 0.5°C of warming by 2100.

Lead authors:
 Durwood Zaelke, Nathan Borgford-Parnell, and Stephen O. Andersen.
 Contributing authors:
 Kristin Campbell, Xiaopu Sun, Dennis Clare, Claire Phillips, Stela Herschmann, Yuzhe Peng Ling, Alex Milgroom, and Nancy J. Sherman.



The [IIR International Dictionary of Refrigeration](#) Available in 11 languages, the complete version of the International Institute of Refrigeration (IIR) International Dictionary of Refrigeration is now freely accessible online.

The IIR International Dictionary of Refrigeration offers researchers, industrialist or administrations the practical resources required to produce content related to refrigeration technologies in multiple languages. This online tool allows you to find definitions, in English and French, of scientific and technical terms, as well as identify terms in the language of your choice and find corresponding translations in the 10 other languages. The dictionary provides term searches in Arabic, Chinese, Dutch, English, French, German, Italian, Japanese, Norwegian, Russian and Spanish.

- The dictionary in numbers:
- more than 4,300 terms in English and French, including 800 synonyms,
 - around 3,500 definitions in English and French,
 - approximately 7,800 terms, synonyms and definitions
 - content in 11 languages.

This international tool is the result of the work of nearly 200 experts, members of the IIR network, from around 30 countries throughout the world.

The dictionary's content covers all areas of refrigeration such as:

- basic principles (thermodynamics, transfer of heat and mass ...)
- production of refrigeration (refrigerated systems, refrigerants...)
- refrigerated installations
- methods of chilling, refrigeration and freezing
- storage, transport and distribution
- refrigeration applications for perishable products and the agro-food industry
- air conditioning
- heat pumps
- cryogenics
- environment

Access the International Dictionary of Refrigeration on the IIR [website](#)



Letter to the Editor

Refrigerants: There is still no vision for sustainable solutions

Risto Ciconkov

Refrigerants: There is still no vision for sustainable solutions

by Risto Ciconkov

Letter to the Editor, International Journal of Refrigeration

Abstract and highlights

Optimization, monitoring, and maintenance of cooling technology

This Knowledge Brief from the Kigali Cooling Efficiency Program, outlines the need for maintaining and servicing of cooling technology. It estimates that better optimization, monitoring, and maintenance of cooling equipment the potential to save 30Gt of CO₂ emissions by 2050.

THE NEED FOR COOLING EFFICIENCY
Cooling is essential to health, prosperity, and the environment, underpinning many of the Sustainable Development Goals. Yet currently, most cooling is energy intensive and highly polluting. Continued fast cooling is looming, so there is an urgent need to not only cut pollution from existing cooling but to ensure future cooling needs are met sustainably.

COOLING ACCOUNTS FOR ~ 7% GHG EMISSIONS
Use of cooling technologies causes substantial global GHG emissions of between 3.8¹ and 4.1² GtCO₂e p.a. (~1% global emissions). The operational costs of refrigeration are estimated that cooling consumes 152% of global electricity (2,300 TWh p.a. based on 2012 consumption). Reduced emissions from efficiency to power cooling technologies causes 62% of cooling emissions³. The amount of global GHG emissions from cooling equipment is projected to grow between 2000 and 2050 as developing nations gain access to energy and new technologies. It is estimated that improving the efficiency of cooling equipment between now and 2050 can avoid the amount of approximately 80Gt CO₂e.

OPTIMIZATION, MONITORING, & MAINTENANCE CAN REDUCE TOTAL COOLING GHG EMISSIONS BY 14%
Regarding the optimization, monitoring, and maintenance of cooling equipment results in increased energy use, lower cooling performance, and obsolete equipment. Effective optimization, monitoring, and maintenance of cooling equipment could deliver substantial electricity savings of up to 20% (CO₂ 10%), probably if equipment has not been maintained for a long time, leading to emissions savings of up to 3.5Gt CO₂e p.a.

The global stock of room air conditioners is expected to grow from 800 million in 2015 to 2.3 billion units in 2050 (Green Energy Ministerial, 2015).

CARBON TRUST **ASRAE**

1. 3.8 GtCO₂e p.a. based on 2012 consumption. 2. 4.1 GtCO₂e p.a. based on 2012 consumption. 3. 62% of cooling emissions.

“**Optimization, monitoring, and maintenance of cooling technology**” outlines the need for maintaining and servicing of cooling technology. It estimates that better optimization, monitoring, and maintenance of cooling equipment the potential to save 30Gt of CO₂ emissions by 2050.

Cooling as a Service (CaaS) **KIGALI**
INNOVATION FOR A BETTER WORLD

This brief presents a new approach to cooling – Cooling as a Service. This approach can benefit companies, governments and society at large and is based on the servitization concept which is rapidly penetrating other marketplaces.

WHAT IS CaaS?
 The standard business model of delivering cooling typically involves the manufacturer, sale, use, and disposal of equipment. Higher production volumes generally support more sales and more profit. As a result, manufacturers can have a strong incentive to continually focus on maximizing the energy and emissions use of cooling products. Alternative business models are possible – and can promote much more energy and resource efficient technologies.

CaaS in its purest sense involves the customer paying for the cooling they receive rather than the physical product or infrastructure that delivers the cooling. Examples of the CaaS model include direct cooling, where customers do not own the cooling infrastructure, and pay per service (PPS) models, where technology providers create and maintain the cooling equipment, and recover costs through periodic payments made by the customer. These payments are fixed each period for the cooling service delivered (for example, dollars per tonne of refrigeration or cubic metres of cooled air), and are based on actual usage. The payment is not dependent on the savings achieved as PaaS models but depends on service as a function of actual usage. This makes it easier and more transparent for the client, as broader usage customers may also receive some ESGC models as a form of CaaS as they also can involve a series of ongoing service agreements and avoid the upfront capital costs of cooling equipment.

WHY IS CaaS IMPORTANT?
 At the global scale, the anticipated explosion of demand for cooling in developing countries (due to more population, and as infrastructure and planetary warming increases, will lead to a high escalation of energy and resource use for cooling. The FAO projects that global annual energy use from space conditioning will rise from 1.1 EJ in 2010 to 2.0 EJ in 2050 under a business as usual (BAU) scenario (FAO, 2016). There is an urgent need to reduce the energy intensity and air pollution from cooling, and to ensure efficient cooling systems are available to all those who need them.

CaaS models benefit customers through lower energy and maintenance costs, the absence of upfront capital commitments, reduced working capital, and a transparent and predictable pricing structure. The model effectively turns capital expenses into operational expenses for clients, freeing up capital for other investment priorities. The model also reduces the potential technology risk for the client, as they are not required to invest in the technology directly, and are not exposed to equipment failure.

CaaS gives technology providers a stronger incentive to increase their own profits by reducing their product's operating costs through innovation, helping companies split incentives between manufacturers and clients. Some cooling technology providers are already offering CaaS, to differentiate themselves in the marketplace and compete against low quality, inefficient and low cost cooling solutions.

CaaS can also increase the likelihood that cooling equipment is effectively repaired and maintained, lowering the risk of unplanned breakdowns and cooling efficiency drops. Program maintenance can deliver electricity savings up to 20% (IEA, 2016).



“Cooling as a Service (CaaS)” presents a new service approach to cooling, which can benefit companies, governments and society at large and is based on the servitization concept which is rapidly penetrating other marketplaces.

Miscellaneous



I am in the Montreal Protocol Who's Who... Why Aren't You?

The United Nations 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 30th Anniversary of the Montreal Protocol celebration.

The new website was launched during the 29th 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 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**

We look forward to receiving your 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 an important contribution to the Montreal Protocol success and ozone layer protection.

- View the «Montreal Protocol Who's Who» **introductory video**
- Contact : **Samira Korban-de Gobert**, UN Environment, OzonAction

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

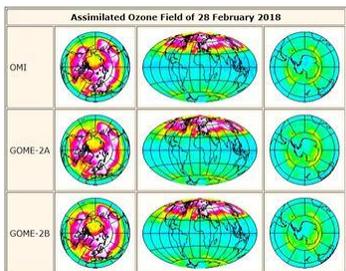


New *International Journal of Refrigeration* service for IIR members - As of January 2017, not only will IIR members continue to receive the hard copy of the journal but IIR membership will now also give members access to the complete archives of the International Journal of Refrigeration (IJR) online. 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.
 - Unlimited access to seminal contributions to the field of refrigeration dating back to 1978.
 - Keep up-to-date with subscriptions to customized e-alerts on New Volumes, Topics and saved Searches.
- Enhanced content and functions
- Easily export references, citations and abstracts.
 - Print, download or share articles with colleagues or peers.
 - See which papers, published in Elsevier or elsewhere, have cited any selected article.
 - Consult the research highlights overview of articles in volumes from 2012 onwards.
- 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



TEMIS -- Near-real time global ozone field. The in near-real time delivered total ozone columns, derived from satellite observations, are input to a data assimilation program which provides global ozone fields for today and a forecast for the coming days.



The International Institute of Refrigeration supports World Refrigeration Day - As the only independent intergovernmental organisation in the field of refrigeration, the International Institute of Refrigeration (IIR) joins associations and companies worldwide to support the initiative of an official World

Refrigeration Day on 26 June every year. The annual World Refrigeration Day, to be launched on 26 June 2019, aims to raise awareness among the wider public about the importance of refrigeration technologies in everyday life.

Refrigeration is essentially a question of temperature and, as such, it only seems natural to celebrate the field on the birthday of the pioneer at the origin of the international unit of temperature, Lord Kelvin (Sir William Thomson) – born 26 June 1824.

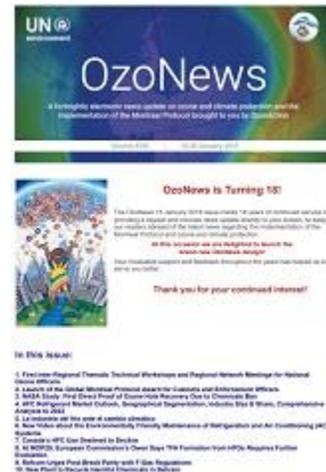
With increasing global stakes at hand, over the past years refrigeration has come to take a leading role at the heart of international affairs.

The inauguration of a World Refrigeration Day would not only be an ideal way to recognise the many historical achievements of the industry, but also a means to anticipate and overcome together the challenges we face. ... Click [here](#) for more information.



The World Meteorological Organization (WMO) 2019 Calendar Competition
WMO is holding a photo competition for its 2019 calendar. The theme is **“The Sun, the Earth and the Weather”** – which is also the theme of World Meteorological Day on 23 March 2019. [Learn more](#)

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