# OzoNews

**30 October 2016**

Vol. XVI

## In this issue



UNEP

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. What's Next for the Kigali Deal to Curb Potent Greenhouse Gases?

In the early hours of 15 October 2016, the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer unanimously adopted the Kigali Amendment, paving the way for the reduction of powerful greenhouse gases - hydrofluorocarbons (HFCs).

The world hailed the move as the single largest step made so far towards keeping global warming below two degrees Celsius, a key commitment of the Paris climate accord.

Below, we explain just how important the Kigali Amendment is, how it may impact the world around us and what it will take to get us there.

**Why HFCs?**

HFCs, or hydrofluorocarbons are commonly used in air conditioners, refrigerators, aerosols, foams and other products. They were introduced as substitutes for chlorofluorocarbons (CFCs) and other substances harmful to the ozone layer, which were being phased out under the Montreal Protocol.

But what was meant as a solution to the ozone hole problem, soon became a source of another major global threat, as it turned out that HFCs are powerful greenhouse gases, with a global warming potential thousands of times larger than that of carbon dioxide ($CO_2$).

On a planet where temperature is steadily rising and a rapidly growing middle class can increasingly afford air conditioners and refrigerators, the demand for HFCs is skyrocketing. The consumption of HFCs is estimated to expand by about 10 per cent each year, making it not only one of the most powerful greenhouse gases, but also the fastest growing one.

Limiting the use of HFCs under the Montreal Protocol is expected to prevent the emissions of up to 105 million tonnes of carbon dioxide equivalent of greenhouse gases, helping to avoid up to 0.5 degree Celsius of global temperature rise by 2100.

This seemingly small difference could actually have an immense positive impact on food production, water availability or survival of coral reefs, as shown by a recent study by European scientists.

**Why the Montreal Protocol?**

The Montreal Protocol is the greatest success story of environmental cooperation in history and perhaps the most successful international accord ever signed.

Agreed in 1987, it is, together with the Vienna Convention for the Protection of the Ozone Layer, the first UN treaty to achieve ratification by every country on Earth. It is the unprecedented level of international cooperation that has allowed the protocol to avert what could have been the greatest environmental catastrophe in human history.

Measures taken by the Montreal Protocol have led to a 98 per cent decrease in the production and use of ozone-damaging chemicals, helping the ozone layer to start recovering ahead of schedule, saving an estimated two million people each year by 2030 from skin cancer and slowing down climate change.

**Why is the Montreal Protocol so effective?**

The Montreal Protocol has a number of special mechanisms that ensure its parties meet the agreed targets.

The first of its kind financial mechanism, which includes a Multilateral Fund, ensures that no country is left alone in its struggle to limit the chemicals controlled by the protocol.

In addition, the protocol has a unique non-compliance procedure, which ensures that countries that exceed their quotas can swiftly return on track to achieve the agreed goals. These mechanisms have proven very effective with ozone-depleting substances, allowing countries to consistently meet their phase out targets ahead of schedule.

**How does it work?**

- Financial mechanism

The Multilateral Fund provides financial and technical support for developing countries to comply with their commitments. Since 1991, over $3.4 billion has been provided to developing countries through the fund, to help them to meet their obligations under the protocol.

- Non-compliance regime

The Protocol's unique non-compliance procedure focuses on amicable solutions and assistance rather than naming and shaming or punishment. Past experience shows that parties feel comfortable to report their own non-compliance issues and seek assistance and solutions.

- Assessment Panels

The Protocol's three Assessment Panels regularly provide countries with up-to-date, independent information on scientific, technical, economic and environmental issues, enabling them to take informed and timely decisions on complex matters and base their policies and actions on sound science.

- Exemption mechanisms

The Protocol has developed and used various exemption mechanisms to address the lack of suitable alternatives to ozone-depleting substances. Through this mechanism, the Montreal Protocol ensures that phasing out of ozone- or climate-harming chemicals is not disruptive to societies.

- Non-party trade provisions

They prohibit or restrict countries that have ratified the protocol or its amendments from trading in controlled substances with states that are yet to ratify it. This creates an incentive for countries to promptly join the Protocol and its amendments. The provisions are applied in a flexible way to ensure that all parties adhere to them without compromising their economic performance.

**How will it work?**

Under the Kigali Amendment countries have agreed to add HFCs to the list of controlled substances. They have also approved a timeline for their gradual reduction by 80-85 per cent by the late 2040s.

First reductions by developed countries are expected in 2019. Developing countries will follow with a freeze of HFCs consumption levels in 2024 and in 2028 for some nations.

**What's next?**

Following the unanimous adoption of the Kigali Amendment by all the parties present at the 28th Meeting of Parties to the Montreal Protocol, the next step is its ratification by the parties.

The Kigali Amendment, will enter into force on 1 January 2019, provided that it is ratified by at least 20 parties. If that condition is not met by 2019, the Amendment will become effective 90 days after 20 parties ratify it.

- UNEP News Center, October 2016
- See also: UN Environment, Ozone Secretariat | the MOP 28 website

## 2. New MOP-28 Documents are Now Available from Ozone Secretariat

The advance text of the Kigali Amendment to the Montreal Protocol, the decision related to the amendment phasing down hydrofluorocarbons and a compilation of the decisions adopted by the 28th Meeting of the Parties to the Montreal Protocol on 15 October 2016 in Kigali, Rwanda, have been posted as advance versions on our conference portal and website at the following links:

- Decision XXVIII/1: Further amendment to the Montreal Protocol
- Decision XXVIII/2: Decision related to the amendment phasing down hydrofluorocarbons
- Advance compilation of the decisions adopted by the Twenty-Eighth Meeting of the Parties to the Montreal Protocol

In the coming weeks,

1. The Ozone Secretariat will formally transmit the agreed Amendment to the Montreal Protocol to the UN Secretary General in six official languages.

2. The Secretary General will subsequently send formal notifications and invitations to all Parties to the Montreal Protocol for each of them to ratify the Amendment.

3. Parties will be advised when the process for ratification of the new Amendment is open for their ratification action.

A "Frequently Asked Questions" note will be posted shortly at the Ozone Secretariat website to advise further on the process of ratification.

UN Environment, Ozone Secretariat | the MOP 28 website

## 3. Staying Cool Without Heating Up

Demand is hot for cool air. In certain urban areas of China, where air conditioners were practically unknown 20 years ago, almost every household now has one. Sales in countries like India are growing at over 10 percent a year. Altogether, the world is expected to add 700 million air conditioning units to global stocks by 2030.

All this cooling has health and development benefits – preserving food, increasing productivity, and improving the quality of life for hundreds of millions of people.

But it also comes at a steep cost to the climate. Air conditioning increases electricity use, especially at peak times, and cooling will soon outstrip heating as the primary driver of consumer power demand. Cooling technology also depends on hydrofluorocarbons (HFCs) - potent greenhouse gases that can have several thousand times the warming effect of $CO_2$.

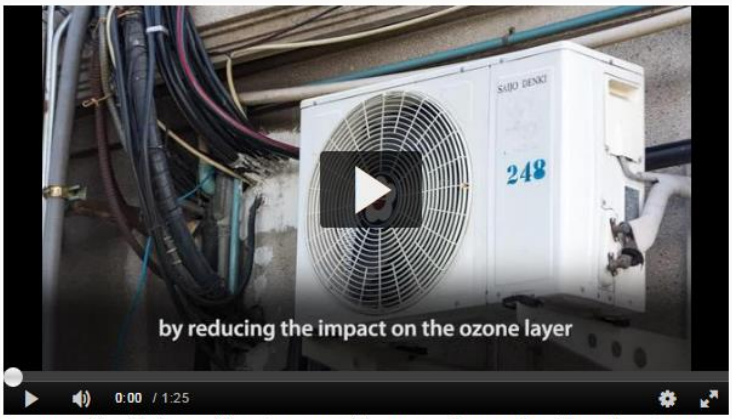
Until now.

On October 15, at a meeting in Kigali, Rwanda, the 197 parties to the Montreal Protocol agreed to an amendment that would phase down the use of HFCs around the world. This single decision could reduce the rise in the global mean temperature by 0.5 degrees Celsius by the end of the century – one of the most significant steps in the fight against climate change, and a major contribution to the goals of the Paris Agreement, which will go into force on November 4.

As an implementing agency of the Montreal Protocol since 1991, the World Bank Group has channelled more than $1 billion in grants so far to phase out the consumption and production of ozone-depleting substances. And as President Jim Yong Kim made clear at this year's Annual Meetings, the Bank Group plans to continue this work – supporting countries as they phase down HFCs and improve energy efficiency.

*"We have developed a support plan that includes ramping up our lending for energy efficiency to accompany the HFC phase-down,"* said **Anna Bjerde, Acting Senior Director of Energy at the World Bank**. *"As part of our Climate Change Action Plan, we expect to do $1 billion in lending by 2020 for energy efficiency in urban areas. This could help support the development of high-efficiency cooling technologies that also use climate-friendly refrigerants."*

This work is already underway. In Thailand, for example, the World Bank has helped a local manufacturer launch a new line of air conditioners that uses a refrigerant that does not deplete the ozone layer and reduces greenhouse gas emissions by a third.




In partnership with the World Bank Group and the Montreal Protocol Multilateral Fund (MLF), Saijo Denki, a Thailand manufacturer, has recently launched a new technology for air conditioners that is friendly to the ozone layer and reduces greenhouse gas emissions.

>> Video Direct link

Efforts to phase down HFCs will build on the Bank Group's successful engagements with countries to end consumption and production of ozone-depleting substances under the Montreal Protocol.

In April 2013, the Government of China and the Bank Group started working with Chinese enterprises to phase

out the production of ozone-destroying hydrochlorofluorocarbons (HCFCs). Five production facilities have been closed down so far – accounting for 16 percent of the country's total HCFC production. As part of this effort, China has also put in place incentives to destroy HFC-23, a greenhouse gas more than 10,000 times more potent than $CO_2$, with a goal of total phase-out by 2020.

*"Going forward, we will target opportunities that deliver a triple win: projects that increase the efficiency of cooling technology, decrease energy consumption, and do away with chemicals that are dangerous to the climate,"* said John Roome, Senior Director for Climate Change at the World Bank. *"And we will increase our financing and technical assistance for this work."*

Beyond committing its own financing, the Bank Group will take four other steps to expand its work in this area:

- Undertake studies to identify where impacts could be the greatest. (For example, one study in Pakistan estimated that a transition to new refrigerants could cut power consumption from air conditioning by 40 percent and reduce greenhouse gas emissions by 8 million tons).
- Integrate technical assistance and policy work with concessional financing
- Deploy new Montreal Protocol financing to help countries
- Share knowledge and practices across countries to accelerate action

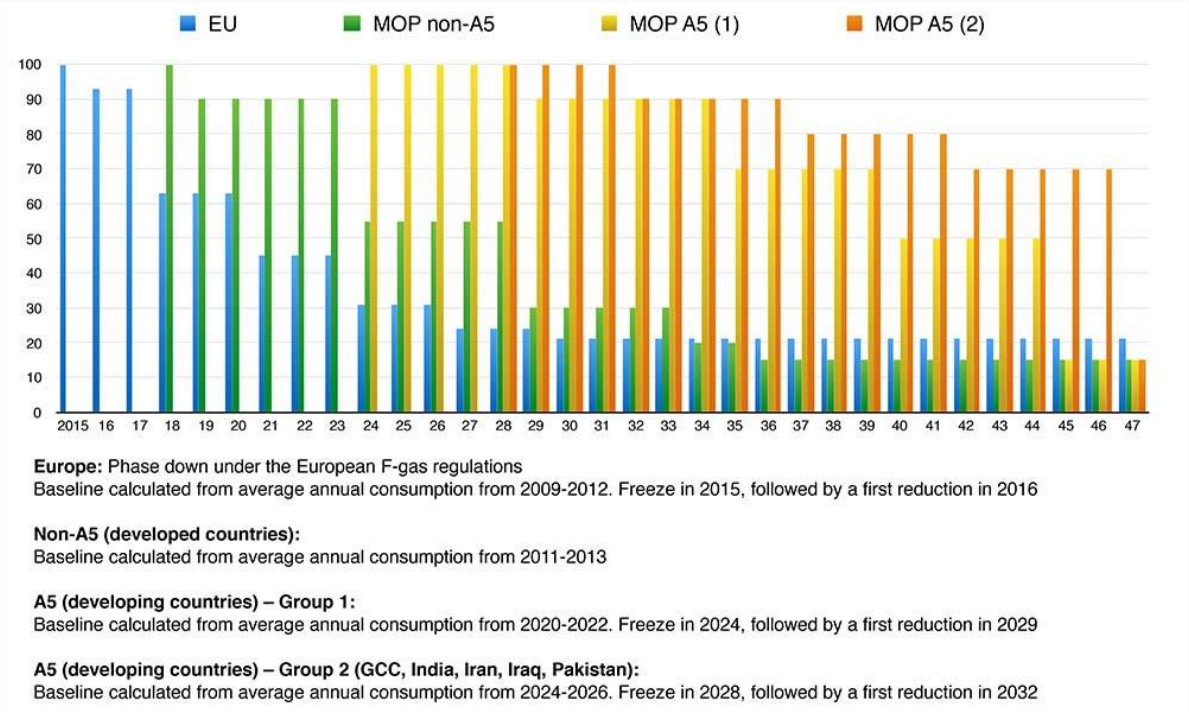
Reaching the Kigali agreement took over half a decade of work, focusing on issues like technology safety and availability, intellectual property rights, and additional financial support. Throughout this process the World Bank worked with both developed and developing countries on key issues, including work to clarify patent expiry dates.

Since 1991, the Bank Group has supported more than 700 projects under the Montreal Protocol to phase out ozone-depleting substances in refrigeration, air-conditioning and the manufacture of foam products. These projects have phased out more than 300,000 tons of ozone depleting substances, the equivalent of avoiding more than 1.2 billion tons in $CO_2$ emissions.

The World Bank , 17 October 2016

## 4. The Global HFC Phase down – How it Looks

The landmark HFC phase down agreed this weekend is expected to avoid more than 70 billion tonnes of $CO_2$-equivalent HFC emissions. In this graphic we attempt to show how it will all work.




How the global HFC phase down will work under the Montreal Protocol (click on the image to enlarge) ©The Cooling Post 2016

The deal struck under the mechanism of the Montreal Protocol is complicated by the inclusion of an allowance for HCFC usage which is still under a phase-out in most countries. See *Nations agree global phase down of HFCs* for more details.

Included in the graphic is the European phase-down timetable under the F-gas regulations which have been in

existence since 2015. As can be seen, Europe will have reduced its HFC usage by 27% before the other non-A5 countries start the process.

The F-gas final target of a 79% reduction appears to put the European timetable at odds with the final target of an 85% phase down under the three Montreal Protocol agreements. However, being that the EU phase down was based on consumption figures from 2009-2012, the final quantities are expected to comparatively very similar.

The most important observation is that both the Montreal Protocol and European figures are all based on $CO_2$ equivalents. In practice this is designed to encourage the take-up of lower GWP refrigerants. Obviously, as the phase downs kick-in, refrigerant manufacturers will have the incentive of producing far more of the low GWP refrigerants than the higher GWP gases.

This will inevitably lead to higher costs and potential scarcity of the high GWP refrigerants like R404A.

CoolingPost, 16 October 2016

## 5. 2016 Antarctic Ozone Hole Attains Moderate Size, Consistent with Scientific Expectations

The hole in Earth's ozone layer that forms over Antarctica each September grew to about 8.9 million square miles in 2016 before starting to recover, according to scientists from NASA and the National Oceanic and Atmospheric Administration (NOAA) who monitor the annual phenomenon.

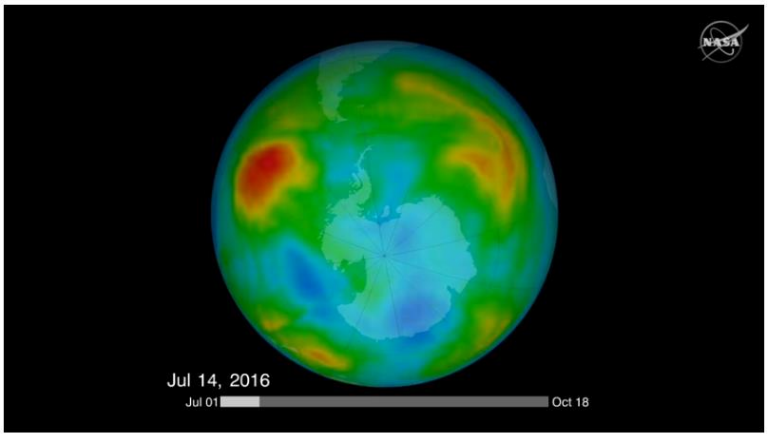
"This year we saw an ozone hole that was just below average size," said Paul A. Newman, chief scientist for Earth Sciences at NASA's Goddard Space Flight Center in Greenbelt, Maryland. "What we're seeing is consistent with our expectation and our understanding of ozone depletion chemistry and stratospheric weather."

At its peak on Sept. 28, 2016, the ozone hole extended across an area nearly three times the size of the continental United States. The average area of the hole observed since 1991 has been roughly 10 million square miles.

In 2015 the ozone hole grew to 10.9 million square miles, 2 million square miles larger than this year, before returning to relatively normal summer levels. Its larger size last year was due to colder-than-average temperatures in the stratosphere that amplified the destruction of ozone by sunlight reacting with chlorine and bromine from man-made chemicals, scientists said. In 2016, warmer stratospheric temperatures constrained the growth of the ozone hole.

Ozone, which occurs naturally in small amounts in the atmosphere, is comprised of three oxygen atoms as opposed to the two that make up the much more abundant molecular oxygen. High in the stratosphere, roughly 6 to 30 miles above the surface, the ozone layer acts like sunscreen, shielding Earth from potentially harmful ultraviolet radiation that can cause skin cancer, cataracts and suppress immune systems, as well as damage plants. Ozone is also one of the primary greenhouse gasses that regulate Earth's temperature.

First detected in 1985, the Antarctic ozone hole forms during the Southern Hemisphere's late winter months of August and September as the sun's rays return after months of polar night. The sunlight initiates catalytic reactions that produce chemically active forms of chlorine and bromine concentrated over the South Pole during winter. These reactions rapidly destroy ozone molecules.




The hole in Earth's ozone layer that forms over Antarctica each September grew to about 8.9 million square miles in 2016 before starting to recover, according to scientists from NASA and the National Oceanic and Atmospheric Administration (NOAA) who ... more

>> Video Direct Link

In addition to the area of the ozone hole, scientists also measure the concentration of ozone that would be found in a column of atmosphere extending from the surface to the edge of space. The most common unit for measuring ozone concentration is the Dobson Unit, which is the number of ozone molecules that would be required to create a layer of pure ozone 0.01 millimeters thick at a temperature of 32 degrees Fahrenheit at an atmospheric pressure equivalent to Earth's surface.

This year, the ozone layer reached a minimum concentration of 114 Dobson Units on Oct. 1, 2016. In 2015, the ozone layer reached a minimum of 101 Dobson units on October 4. During the 1960s, before the Antarctic ozone hole occurred, average ozone concentrations above the South Pole ranged from 260 to 320 Dobson units. This year's Antarctic ozone hole is similar to the 2013 hole which reached 9.3 million square miles. Although warmer than average stratospheric weather conditions reduce ozone depletion, the current ozone hole area is large compared to the 1980s, when the depletion of the ozone layer above Antarctica was first detected. This is because levels of ozone-depleting substances remain high enough to produce significant ozone loss.

NASA and NOAA monitor ozone levels via three complementary instrumental methods.

NASA's Aura satellite and NASA-NOAA Suomi National Polar-orbiting Partnership satellite measure ozone from space. The Aura satellite's Microwave Limb Sounder data are used to estimate chlorine levels.

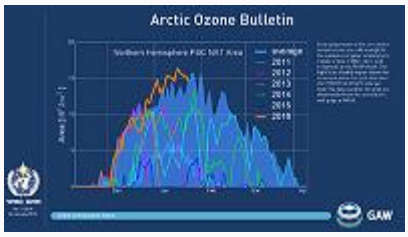
NOAA scientists monitor the thickness of the ozone layer and its vertical distribution above at the South Pole station by regular releasing weather balloons carrying ozone-measuring "sondes" and with an instrument called a Dobson spectrophotometer.

"Our weather balloon measurements showed that the ozone minimum was a bit less and the rate of ozone loss a bit slower than we've typically seen," said Bryan Johnson, a NOAA atmospheric chemist and project leader. "This is what we would expect to see in years to come as a result of the Montreal Protocol and international efforts to control ozone depleting chemicals."

In 1987, the Montreal Protocol on Substances that Deplete the Ozone Layer began regulating ozone-depleting compounds, which are slowly declining. Scientists expect the ozone hole to recover back to 1980 levels around 2070.

Phys.org, 26 October 2016, By Audrey Haar

## 6. WMO Antarctic Ozone Bulletin no. 2, 2016 is Now Available




The Secretariat of the World Meteorological Organization, in collaboration with the European Ozone Research Coordinating Unit, issues annual bulletins containing information on the development of the Arctic ozone layer over the course of each winter. The bulletins are based on data provided by WMO Members that operate atmospheric monitoring stations in the Arctic and satellites to observe ozone and related parameters globally.

**Executive Summary**

Stratospheric temperatures over Antarctica have been below the PSC type I threshold of 194.6 K since 17 May and below the PSC type II threshold of 187.8 K since 12 June. The daily minimum temperatures at the 50 hPa level were close to the 1979-2015 average from April to mid-July. From mid-July until the end of August the minimum temperature was somewhat lower than the long term mean. From late August until present it has been close to or slightly below the long term mean. From mid-October the minimum temperature is forecast to increase rapidly.

The average temperature at 50 hPa over the 60-90°S region was oscillating around the long term mean from April until mid-August, after which it has been above the long term mean.

At 10 hPa, the 60-90°S mean temperature was oscillating around the long term mean during the early April to the late July time period. In August, September and so far in October the mean temperature has been oscillating around the long term mean.

Since the onset of NAT temperatures in mid-May, the NAT area was oscillating around the long term mean from May through August. In early September the NAT area decreased somewhat more rapidly than the long term mean but near the end of the month a cold spell led to a rapid increase in the NAT area before it went down again. In October the NAT area has been near the average. On 30$^{th}$ July the NAT area reached a maximum for the season with 27.7 million km$^2$, which is a bit lower than the 28.2 million km$^2$ reached in 2015, but higher than the maximum reached in other recent years.

The NAT volume has been below the long term mean during most of the winter and spring, except for a period from early July to mid-August, when it was close to the long term mean. In September the NAT volume was below the long term mean, but towards the end of the month it increased for a few days before going down again. The maximum NAT volume for the season was reached on 29 July with 310 million $km^3$. This is the highest daily maximum since 2008, when 325 million km3 was recorded.

During the whole period from May until present, the 45-day mean of the heat flux at 100 hPa has been larger than or close to the 1979-2015 average. In early-mid September it was, on a couple of days, close to the long term maximum for those dates. This is an indication of a disturbed vortex.

At the 45.4 hPa level (altitude of ~18.5-19.5 km) the vortex was almost entirely depleted of hydrochloric acid (HCl), one of the reservoir gases that can be transformed to active chlorine, during August and early September. By 5 October HCl has recovered and is more abundant inside than outside the vortex.

Certain parts of the vortex contained more than 3.8 ppb of active chlorine (ClO + 2Cl2O2) in August and into early September. By early October there is almost no active chlorine left.

Satellite observations show that the area where total ozone is less than 220 DU ("ozone hole area") has been significantly above zero since 7 August. This is a relatively early onset of ozone depletion and about ten days earlier than in 2015. The ozone hole area reached it maximum for 2016 on 28 September with 23.1 million $km^2$, whereas it reached 28.2 million km2 on 2 October 2015. The date of the onset of ozone depletion varies considerably from one year to the next, depending on the position of the polar vortex and availability of sunshine after the polar night. In 2016, the vortex has been relatively perturbed and shifted somewhat away from the South Pole. This can explain the relatively early onset of ozone depletion in 2016.

Measurements with ground based instruments and with balloon sondes show clear signs of ozone depletion at all sites. In this issue data are reported from the following stations: Arrival Heights, Belgrano, Davis, Dôme Concordia, Dumont d'Urville, Halley, Kerguelen, Macquarie Island, Marambio, Mirny, Neumayer, Novolazarevskaya, Río Gallegos, Rothera, San Martín, South Pole, Syowa, Ushuaia, Vernadsky, Vostok and Zhongshan.

Balloon soundings show that stations deep inside the vortex, such as Belgrano, Neumayer and the South Pole have experienced somewhat less ozone depletion in the 14-21 km altitude range this year as compared to 2015. Stations on the vortex edge or mostly outside the vortex, such as Marambio and Ushuaia, have experienced more ozone depletion in this altitude range this year as compared to 2015. This can be explained by the fact that, despite somewhat less ozone depletion deep inside the polar vortex, the vortex has been more perturbed and made more frequent excursions into regions that are usually outside of the vortex.

WMO and the scientific community will use ozone observations from the ground, from balloons and from satellites together with meteorological data and modelling results to keep a close eye on the development during the coming weeks and months.

- Contact: Dr. Geir O. Braathen, Scientific Officer, Atmospheric Environment Research Division (AER), Research Department (RES), World Meteorological Organization
- Read / Download WMO Antarctic Ozone Bulletins

# ASIA PACIFIC

## 7. Bangladesh Takes the First Steps for Stage 2

Bangladesh Ministry of the Environment took the first steps for developing the Stage 2 strategy for HCFC phase out. This assumes more importance because of the recently concluded Kigali amendment. The UNDP led Stage 2 with the cooperating Agency UNEP will assist the country to not only meet their 2020 and 2025 control measures but also strategize how to address HFC phase down as well.

For developing the non-investment component for Stage 2 the first stakeholder workshop was organized on 1 October 2016 in Dhaka. It was attended by most of the key stakeholders like Central Procurement Technical Unit, Bangladesh Standards and Testing Institute (BSTI), BRAMA, Bangladesh Korea Technical Institute, Bangladesh Frozen Food Exporters Association in addition to representatives of large and small industries,

equipment importers Association, and various units of the Ministry of Environment. UNDP also participated in the workshop. Interesting discussions took place and many key issues were discussed. Some of the key issues included imposing ban on imports of HCFC based equipment by 2018 and encouraging imports of R 290 and R 32 based equipment, considering subsidies and fiscal incentives for encouraging alternatives in 2017, Capacity building of customs to be continued but another new stakeholder to be included as part of enforcement chain, namely the Border Guard, Food chain to be made aware of alternative, strengthen infrastructure and capacity to handle flammable refrigerants, Capacity building for green procurement as part of the Public Procurement Act of 2006 and its Rules 2008, adoption of ISO standards for flammable refrigerant.

This strategy will be developed by the middle of 2017 and UNDP has already hired experts to initiate a national level survey.

Contact:

Jacques Van Engel, Director of the Montreal Protocol / Chemicals Unit, UNDP

Atul Bagai, Senior Regional Coordinator, Compliance Assistance Programme, OzonAction Programme, UN Environment Asia and Pacific Office

# LATIN AMERICA AND CARIBBEAN

## 8. Avanços nos sistemas de refrigeração para supermercados marcam o primeiro dia do Mercofrio 2016 (Brasil)

A 10 a edição do Congresso Internacional de Ar Condicionado, Refrigeração, Aquecimento e Ventilação – Mercofrio, promovido pela ASBRAV – Associação Sul Brasileira de Refrigeração, Ar Condicionado, Aquecimento e Ventilação começou na terça-feira (13/09), na Fiergs, em Porto Alegre, com uma grande e atraente novidade. Trata-se do Seminário de Refrigeração para Supermercados, iniciativa que contou com o apoio da Associação Gaúcha de Supermercados (AGAS) e reuniu renomados especialistas da área para promover e disseminar o conhecimento, por meio de palestras com foco em inovação, eficiência energética, boas práticas e fluidos refrigerantes. […]


A questão ambiental

O primeiro período do turno da tarde do Seminário de Refrigeração para Supermercados trouxe como assunto principal a questão ambiental, focando temas como redução de vazamentos de HCFC-22, soluções atuais para retrofit e instalações de $CO_2$ para empreendimentos supermercadistas.

A consultora da agência alemã GIZ / PROKLIMA – Deutsche Gesellschaft für Internationale Zusammenarbeit – GmbH, Stefanie von Heinemann, falou das ações no setor de serviços de refrigeração comercial em supermercados para a redução dos vazamentos de HCFC-22. Entre as propostas apresentadas, está a continuidade dos treinamentos de técnicos em refrigeração comercial e ar condicionado em todo o país; a maior conscientização das empresas do setor sobre a importância de reduzir o uso dos HCFCs; e a divulgação e treinamento sobre novas tecnologias alternativas, com menor impacto ao meio ambiente (zero PDO e baixo GWP).

Segundo Stefanie, o HCFC-22 está com os dias contados, uma vez que em 2020, o Brasil, cumprindo o Protocolo de Montreal, reduzirá em 35% a importação deste fluído, que vem caindo de uso, especialmente em novas lojas, com a implementação do Programa Brasileiro de Eliminação dos HCFCs (PBH). Em 2040, a eliminação dos HCFCs será total.

– Hoje os novos empreendimentos varejistas, especialmente os supermercados, já procuram usar outros

fluidos refrigerantes, como o $CO_2$ e os hidrocarbonetos, além dos chamados blends (misturas). Mesmo as lojas que continuam a utilizar sistemas refrigerados com HCFC-22, que ainda são maioria, estão atentas à sustentabilidade de suas operações no varejo. Hoje, elas investem na capacitação dos técnicos de manutenção e em processos que evitem vazamentos deste gás na atmosfera, o que ainda reduz custos – afirmou a palestrante do GIZ / PROKLIMA.

Após a fala de Stefanie Von Heinemann, foi a vez do professor Paulo Napoli, representante da empresa francesa Arkema, abordar a questão referente as soluções atuais para retrofit. Napoli destacou a importância de se substituir o fluido R-22, um elemento muito utilizado para refrigeração de temperatura baixa e média e sistemas de ar condicionado pelo Forane R-427. O fluido produzido pela Arkema mistura gases refrigerantes HFC não azeotrópica, com grau zero de destruição da camada de ozônio, sendo um retrofit recomendado para os sistemas R-22 utilizados em AC, LT e MT.

– O Forane R427A é um dos fluidos refrigerantes com GWP mais baixos dentre os principais retrofits R-22 atuais. Também oferece a similaridade mais próxima ao R-22 em termos de desempenho, bem como em relação as taxas de vazão de massa e as pressões de operação tanto em ar condicionado quanto em refrigeração. Mas o seu maior benefício, efetivamente, é não danificar a camada de ozônio, algo que é imprescindível para a preservação do meio ambiente – disse Paulo Napoli.

Ainda navegando pelo tema da preservação ambiental, coube ao diretor da SPM Engenharia, Carlos Guilherme Süffert, falar sobre "Instalações de $CO_2$ para Supermercados – Uma Outra Forma de Analisar", onde destacou que o dióxido de carbono, por ser um refrigerante natural, se apresenta como alternativa valiosa aos refrigerantes sintéticos em várias aplicações de sistemas de refrigeração.

De acordo com Carlos Guilherme, foram desenvolvidas novas tecnologias e aplicações nos vários setores do mercado de refrigeração para tornar viável o uso do $CO_2$, que graças as suas características satisfatórias em matéria de preservação ambiental tem sido visto como um excelente fluido refrigerante para aplicação em sistema cascata para média e baixa temperatura de evaporação nas instalações frigoríficas de supermercados.

– Em comparação com outros sistemas convencionais, a grande capacidade volumétrica de refrigeração do $CO_2$ permite uma boa redução do custo de compressores, da tubulação e da carga refrigerante do sistema frigorífico – afirmou Süffert.

ASBRAV, September 2016

# NORTH AMERICA

## 9. Builder: Freeze Date for Coolants: 2019

As manufacturers and air conditioners and refrigerators cut over from HFCs to post-HFC coolants, who'll pay the bill, and who'll remain sustainably successful?

Disruptive innovation works in mysterious ways.

A climate agreement this past weekend in Rwanda--an extension of the 29-year-old Montreal Protocol that banned the use of ozone-layer depleting chlorofluorocarbons--will force a world-wide phase-out of chemicals in gas form known as hydrofluorocarbons, coolants used in air conditioners and refrigerators. Everywhere.

The housing connection is profound, impacting among the biggest brands in consumer appliances, HVAC systems, and insulation. On another level, however, there's an object lesson for builders and developers on the design, development, distribution, and construction side of things when it comes to disruptive innovation, its sources and causes.

HFCs--doing business under names like R-134a, R-410A, and R-404A--are a No. 1-type offender among gases that accelerate global warming. Offending trappers of greenhouse gases are benchmarked with a measure called a Global Warming Potential or GWP, with Carbon Dioxide as the baseline index. $CO_2$ has a GWP of 1 while the HFC R-134a has a GWP of 1,320.

The freeze date in the United States, an inflection point at which manufacturers have to stop increasing the use of HFCs as refrigerants and start increasing the use of climate-friendly ones, is 2019. And the United States Department of Environmental Protection Agency has set 2021 as a deadline for new non-HFC coolants

in new AC and refrigerator units.

What's happened here is that the Kigali meeting initiative has separated the market for air conditioners, refrigerators and other products into two types of incumbent, mostly successful companies.

One type will start investing in new research, supply chain sourcing, product design and engineering, and manufacturing processes to meet the new deadlines, which have the weight of law behind them. That's going to be expensive, and the question among some industry observers is who will bear that cost.

Wall Street Journal staffers Andrew Tangel and Ted Mann note that appliance manufacturers are already on the hook to meet tougher energy-use hurdles, and are asking for more time before the "freeze date" on HFCs because the 2021 deadline will mean they'll have to re-tool twice. Here, they quote Joe McGuire, chief executive of the Association of Home Appliance Manufacturers:

"Meeting the 2021 refrigerator deadline, instead of the 2024 date the industry proposed, could collectively cost manufacturers an additional $230 million, he added."

The other "type" of company is already "there," or capable of producing its product lines with coolant gases other than HFCs. They've been investing in understanding and producing alternative coolants, such as hydrofluoro-olefin (HFO)-based refrigerants. Honeywell, with its Solstice line of HFO coolants, and DuPont spin-off company Chemours-which is breaking ground as we speak on a $230 million plant investment in Ingleside, Tx, to produce its Opteon HFO portfolio--are among the first out of the gate in a big way.

So, it happens that the companies that have raced ahead in the development of HFC alternative coolants were also among the most enthusiastic backers of the rule change. They understand that this demand-driven "discontinuity"--a globally mandated cutover to a new portfolio of HFO and other chemical coolants--gives them a period of competitive advantage over those who will only now get started with their R&D.

New York Times staffers Hiroko Tabuchi and Danny Hakim write:

“They learned that without a rule change, their new products couldn’t compete,” said David Doniger, director of the Climate and Clean Air Program at the Natural Resources Defense Council, based in New York. “They woke up and said, ‘The science is real.’”

“We wanted them restricted for purely environmental reasons. The companies wanted them restricted for many other reasons,” including profit, Mr. Doniger said. “But the point is that they had a certain common interest with the international community.”

The chemical industry’s response stands in stark contrast to the foot-dragging, and in many cases the outright obstruction of climate regulations, by the big oil companies.

So, just like that, the 1987 Montreal Protocol has the clout and the teeth to serve as a global supply chain pivot point around a fundamental set of chemical ingredients used ubiquitously.

The fact that the moment--far from unexpected--has come and has created a gulf between companies who have anticipated it and invested in transformations that comply with or exceed its imperatives, applies to other areas closer to home.

Code and law around the safety--for people and the planet--of materials and what they add up to are ever-so-gradually catching up to where they need to protect humans from themselves and their nearer-term self-interests. It's only a matter of time before environmental law applies and gets enforced to attempt to protect future generations, and future capacity to generate healthy life on the planet.

And here we see fine examples of organizations who push for rule-changes that alter their own business models toward the interests of both the future health of people and the planet and the nearer-term profit opportunity for their stakeholders.

As Jacob Atalla, vp of sustainability at KB Home reminded us recently, Abraham Lincoln said, "The best way to predict your future is to create it."

Highland Community News, 19 October 2016, By John McManus

# WEST ASIA

## 10. Vocational Training Qualifies the Refrigeration and Air Conditioning Sector Technicians and Trainers (Oman)

**التدريب المهني يؤهل لقطاع التبريد والتكييف**

نظمت وزارة القوى العاملة ممثلة بمركز المعايير والاختبارات المهنية وبالتعاون مع كل من وزارة البيئة والشؤون المناخية وبرنامج الأمم المتحدة للبيئة برنامجا تدريبيا لتأهيل الفنيين والمدربين على الممارسات الجيدة في تقديم الخدمات في قطاع التبريد والتكييف، وذلك اعتبار من يوم الأحد الماضي وحتى بعد غد بمركز التدريب المهني بالسيب. ويأتي هذا البرنامج تلبية لمتطلبات برنامج الأمم المتحدة لحماية طبقة الأوزون فيما يتعلق بقطاع الخدمة والصيانة لأنظمة التبريد والتكييف وبما يتوافق مع متطلبات بروتوكول مونتريال.

وأكد الدكتور محمد بن مصطفى النجار، مدير مركز المعايير والاختبارات المهنية بوزارة القوى العاملة على أن البرنامج يأتي في إطار التعاون والتنسيق بين فريق المساعدة على الامتثال للبروتوكول التابع لبرنامج الأمم المتحدة للبيئة في غرب آسيا، مع كل من وزارة البيئة والشؤون المناخية (وحدة الأوزون الوطني) ووزارة القوى العاملة بالسلطنة، بهدف بناء القدرات الوطنية ورفع مستوى الأداء لتمكين السلطنة من الوفاء بالتزاماتها تجاه بروتوكول مونتريال حول الممارسات الجيدة في تقديم الخدمات وللتخلص من المواد المستنفذة لطبقة الأوزون، وتحديدا مركبات الكربون الكلورية الفلورية في قطاع خدمات التبريد وتكييف الهواء. كما نوه الدكتورسالم بن عامر السناني خبير تنمية الموارد البشرية بمركز المعايير والاختبارات المهنية بوزارة القوى العاملة إلى انضمام السلطنة إلى اتفاقية فينا لحماية طبقة الأوزون وبروتوكول مونتريال بشأن المواد المستنفذة لطبقة الأوزون عام 1997، وصدور لائحة حماية طبقة الأوزون من قبل وزارة البيئة والشؤون المناخية بالسلطنة في (11-11-2013م) وفق القرار الوزاري (2013/107م) والتي نصت المادة (23) على أن يخضع الفنيون المختصون بتصليح وصيانة أجهزة الثلاجات والمكيفات ومعدات الوقاية من الحريق أو القائمين بأعمال استرجاع المواد المستنفذة لطبقة الأوزون وإعادة استخدامها لاختبار فني تجربة جهة الاختصاص قبل مزاولتهم المهنة، وبناء عليه يتولى المركز مسؤولية تقييم وترخيص العاملين في هذا القطاع بما يتناسب مع المعايير التي يقرها البروتوكول، حيث يأتي هذا البرنامج التدريبي كأحد الخطوات المهمة في تعزيز هذه المعايير وتدريب المشاركين عليها.

Oman Daily, 28 October 2016

# EUROPE & CENTRAL ASIA

## 11. Don't Take the Risk ... Harsh Penalties for Illegal Recycling and Release of Refrigerants into the Atmosphere

*Soria, Spain - 28 September 2016*: The owner of a recycling company has been sentenced to two years' imprisonment after pleading guilty to the illegal handling of electronic and toxic waste and releasing ozone-depleting and global warming refrigerants into the atmosphere. The man was also ordered to pay a daily fee during an eight-month period and received a three-year ban from working in the recycling industry.

The sentence came about thanks to an investigation by the Environmental Protection Unit of the Civil Guards (SEPRONA) – previously recognized by UN Environment with an award.

The illegal activity had been taking place since July 2013. As a result of the investigation, 600 electronic

items including 203 refrigerators were confiscated at the demand of the specialized Public Prosecutor. The investigation also found that over 40 kg of mercury compounds had been dumped into the soil, and that the chlorofluorocarbon (CFC) refrigerants R11 and R12 had been released into the atmosphere, accounting for at least 331 tonnes of carbon dioxide equivalents. Other toxic substances such as lead, cadmium and zinc were also found on the company's premises.

In January 2015, the representative of the Public Prosecutor´s Office for the Protection of the Environment in Soria discovered significant amounts of electronic waste, along with other toxic substances, on the premises of the recycling company, near Soria. SEPRONA discovered that the company was only authorized to recycle non-dangerous waste, not electronic or toxic waste. Scientific support for the investigation was provided by the technical unit of the Public Prosecutor´s Office.

This decision by Soria's Criminal Court is the most recent in a series of similar decisions by Spanish Courts on the illegal release of CFCs into the atmosphere. In October 2016, the Public Prosecutor´s Office submitted another case to the Court in Madrid, in which 60 kg of hydrochlorofluorocarbon R22 – another ozone-depleting and global warming refrigerant – had been offered for sale online. A one and a half year prison sentence and a daily fee during an 18-month period were demanded.

Earlier this year, the Public Prosecutor Office for the Protection of the Environment and SEPRONA received UN Environment's Ozone Protection Award for Customs & Enforcement Officers for their commitment and persistence in combating environmental crime. It is the second time that they received this award.

- UN Environment OzonAction, October 2016

## 12. European Commission Funds Ozone Secretariat Activities Related to HFCs

*Ozone Secretariat Executive Secretary Tina Birmpili (right) and the EU's Head of Delegation Philip Owen sign the agreement.*
Photo by IISD/ENB | Kiara Worth

To mark the opening of the 28th Meeting of the Parties to the Montreal Protocol in Kigali, the Ozone Secretariat, Executive Secretary, Tina Birmpili, and the EU's Head of Delegation, Philip Owen, signed an agreement for a financial contribution of €250,000 from the Commission to the Secretariat's activities related to hydrofluorocarbons (HFCs) up to the end of 2017.

The funding will allow:

- The preparation of briefing papers to enable Parties to hold informed discussions on any decisions they make on HFCs.
- Developing country (Article 5) Parties' participation in Montreal Protocol meetings.
- 2017 communication campaign to raise awareness on HFC issues as well as for the celebration of the 30th anniversary of the Montreal Protocol.

From the start, the European Union has promoted an HFC amendment of the Montreal Protocol. With this funding the European Commission continues its support towards efforts to phase down HFCs, which will contribute to mitigating climate change.

Executive Secretary of the Ozone Secretariat, Tina Birmpili, stated that "this contribution to the Secretariat facilitates important work on HFCs. It also demonstrates a sincere commitment by the European Commission to ensure a transparent and inclusive process."

- Ozone Secretariat, 10 October 2016

# FEATURED

## OZONE SECRETARIAT

**28th Meeting of the Parties to the Montreal Protocol**

Resumed meeting of the thirty-eighth Open-ended Working Group of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer and Twenty-Eighth Meeting of the Parties Kigali, Rwanda, 8 October and 10-14 October 2016

Click here to access MOP 28 documents, General information …etc.

The theme for the 2016 International Day for the Preservation of the Ozone Layer to be marked on 16 September is: ***Ozone and climate: Restored by a world united.*** The theme is complemented by the tagline: ***Working towards reducing global-warming HFCs under the Montreal Protocol.*** Download the theme and tagline in the six official UN languages

The theme for this year's International Ozone Day recognizes the collective efforts of the parties to the Vienna Convention and the Montreal Protocol towards the restoration of the ozone layer over the past three decades and the global commitment to combat climate change. As a result of concerted international efforts, the ozone layer is healing itself and is expected to recover by the middle of this century. In addition, the Montreal Protocol has significantly contributed to the mitigation of climate change by averting the emission of more than 135 billion tonnes of carbon dioxide equivalent into the atmosphere by simply phasing out ozone-depleting substances…More

- Browse through the Ozone Secretariat "In Focus" to learn about latest updates.

- Resumed 38th Meeting of the Open-ended Working Group of the Parties to the Montreal Protocol, Vienna, Austria, 18 - 21 July 2016
- Third Extraordinary Meeting of the Parties to the Montreal Protocol, Vienna, Austria, 22 – 23 July 2016
- 56th Meeting of the Implementation Committee Under the Non-Compliance Procedure of the Montreal Protocol, Vienna, Austria, 24 July 2016
- Click here for more Montreal Protocol Meetings Dates and Venues

- Methyl Bromide Technical Options Committee 2014 Assessment Report
- Medical Technical Options Committee 2014 Assessment Report

Progress & Quadrennial Assessment Reports:

- Environmental Effect Assessment Panel (EEAP)
- Scientific Assessment Panel (SAP)
- Technology and Economic Assessment Panel (TEAP)

Halon Technical Options Committee Reports:

- Halons Technical Options Committee 2014 Assessment Report (Volume 1)
- Halons Technical Options Committee 2014 Supplementary Report #1 - Civil Aviation (Volume 2)
- Halons Technical Options Committee 2014 Supplementary Report #2 - Global Halon 1211, 1301, and 2402 Banking (Volume 3)
- Technical Note #1- Revision 4 - Fire Protection Alternatives to Halon - 2014

- Technical Note #2 - Revision 2 - Halon Emission Reduction Strategies - 2014
- Technical Note #3 - Revision 2 - Explosion Protection - Halon Use and Alternatives - 2014
- Technical Note #4 - Recommend Practices for Recycling Halon and Halocarbon Alternatives - 2014
- Technical Note #5 - Halon Destruction - 2014

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

**Report of the 76th Meeting of the Executive Committee**, 9 - 13 May 2016 in Montreal.

The Executive Committee decided to continue convening two meetings per year from 2015 onwards with the possibility of holding an additional brief meeting, if required, between those meetings to consider project proposals.

On this basis the second meeting in 2016 could be scheduled to take place in November/December 2016 taking into account decision XXVII/1 of the Parties (MOP) to the Montreal Protocol, in which it was decided inter alia to hold a series of Open-ended Working Group (OEWG) and other meetings, including an Extraordinary Meeting of Parties in 2016.

Learn more

## OZONACTION

UNEP, OzonAction highlights

New **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 "UNEP OzonAction" and install the application, or scan the 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.


**NEW! 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.

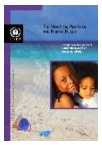
Click here to access the News Drops

**OzonAction Recent Publications:**

**Lower-GWP Alternatives in Commercial and Transport Refrigeration: An expanded compilation of propane, $CO_2$, 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, $CO_2$ and HFO Case Studies.

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



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

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

**SAFE USE OF HCFC ALTERNATIVES IN REFRIGERATION AND AIR CONDITIONING** - An Overview for Developing Countries - Many of the alternative refrigerants to hydrochlorofluorocarbons (HCFCs) have particular characteristics in terms of toxicity, flammability and high pressure which are different from those used previously. It is therefore important that the refrigeration and air-conditioning industry adapts to both the technical and safety issues concerning these refrigerants. This publication provides an overview of the alternatives, their general characteristics and their application in the context of the safety issues. It provides guidance for National Ozone Units (NOUs) and other interested parties in developing countries on how they can advise and assist their national stakeholders in the selection and implementation of alternative refrigerants. Read/Download

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

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

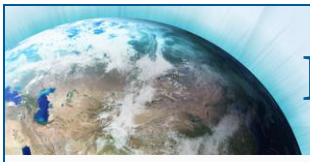
Guide on Good Practices: Phasing out HCFCs in the Refrigeration and Air-conditioning Servicing Sector

Phasing out HCFCs in Small and Medium-sized Foam Enterprises

Demonstrating the feasibility of R-290 based AC manufacturing: China's Midea and Meizhi case

Low-GWP Alternative for Small Rigid PU Foam Enterprises

**Learn more** about OzonAction publications



# EVENTS

## 2016

**International District Cooling Conference 2016**, 13 - 15 November 2016, Dubai, United Arab Emirates

**47th International HVAC&R Congress and Exhibition**, 30 Nov – 2 Dec 2016, Belgrade, Serbia

## 2017

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

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

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

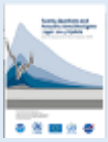
**5th IIR International Conference on Thermophysical Properties and Transfer Processes of Refrigerant**, 23-26 April 2017, Seoul, South Korea

**7th Conference on Ammonia and $CO_2$ Refrigeration Technologies**, 11-13 May 2017, Ohrid, Macedonia

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

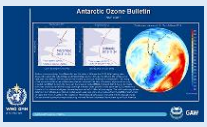
**9th International Conference on Compressors and Coolants**, 6-8 September 2017, Bratislava, Slovakia

# 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 $CO_2$-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 Grabiel. 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

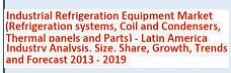
Geothermal Heating and Cooling: Design of Ground-Source Heat Pump Systems-ASHRAE

Principles of Heating, Ventilating and Air-Conditioning, 7th Ed. ASHRAE


A first edition, the IIR guide "$CO_2$ as a Refrigerant" highlights the application of carbon dioxide in supermarkets, industrial freezers, refrigerated transport, and cold stores as well as ice rinks, chillers, air conditioning systems, data centers and heat pumps. This guide is for design and development engineers needing instruction and inspiration as well as non-technical experts seeking background information on a specific topic. Publication, IIR Technical Guide, 2014.


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


Organic Bromine Compounds—another threat to the ozone layer




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)

R444B tops high ambient R22 drop-in test


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

Refrigeration on Fishing Vessels

Global Market for Natural Refrigerants to Reach 1,408.20 Million by 2020, Growing at CAGR of 11.0% by 2020

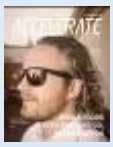
ASHRAE 2016 Handbook Focuses on HVAC Systems and Equipment…

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

**The Importance of Ambition in the 2016 HFC Phase-Down Agreement** - Following the adoption of the Dubai Pathway on HFCs, Parties to the Montreal Protocol are set to negotiate and adopt an HFC amendment in 2016, the first major test of the Paris Climate Agreement and global commitment to "pursue efforts to limit the [average global] temperature increase to 1.5 degrees Celsius." The level of climate ambition in the agreed HFC phase-down will be crucial in determining whether or not Montreal Protocol passes the test. In preparation for the next installment of Montreal Protocol meetings, known as the Open Ended Working Group, set for July 2016 in Vienna, the Environmental Investigation Agency (EIA) has produced a briefing, The Importance of Ambition in the 2016 HFC Phase-Down Agreement. Download the full report here.

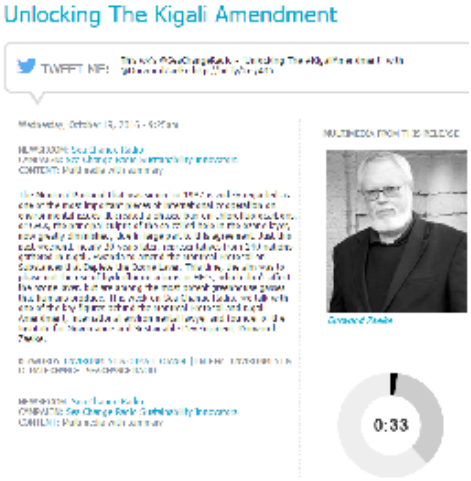
Update on the Illegal Trade in Ozone-Depleting Substances – The Environmental Investigation Agency (EIA) briefing to the 38th meeting of the Open-Ended Working Group of Parties to the Montreal Protocol, in Vienna, Austria, from July 18-21, 2016.

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



October Edition of Accelerate America! By shecco

# MISCELLANEOUS




**Unlocking the Kigali Amendment** - Sea Change Radio talk with Durwood Zaelke one of the key figures behind the Montreal Protocol and Kigali Amendment, international environmental lawyer and founder of the Institute for Governance and Sustainable Development.

Wednesday, 19 October 2016 - 9:25am on Sea Change Radio

The Montreal Protocol that was signed in 1987 is widely regarded as one of the most important pieces of international cooperation on environmental issues. It created a phased ban on chlorofluoro-carbons, or CFCs, the principal culprit of the so-called hole in the ozone layer, now greatly diminished, due in large part to this agreement. Just this past weekend, nearly 30 years later, representatives from 140 nations gathered in Kigali, Rwanda to amend the Montreal Protocol on Substances that Deplete the Ozone Layer. This time, the aim was to phase out the use of hydrofluorocarbons or HFCs, which don't affect the ozone layer, but are among the most potent greenhouse gasses that humans produce.

>> Click here to listen to the radio talk

The International Institute of Refrigeration (IIR) is delighted to announce **IIR new Working Group on Careers in Refrigeration "CaRe"**, chaired by Dr Catarina Marques. Learn more

**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



## Follow OzonAction on:

http://www.facebook.com/ozonaction

http://www.slideshare.net/ozonaction

http://twitter.com/ozonaction

http://www.youtube.com/ozonaction

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.

**Prepared by:** Samira Korban-de Gobert, OzonAction

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

If you wish to submit articles, invite new subscribers, please contact:

Mrs. Samira Korban-de Gobert,

Tel. (+33) 1 44.37.14.52, samira.degobert@unep.org

To unsubscribe, send a blank message to samira.degobert@unep.org with 'unsubscribe OzoNews' as the subject.