OzoNews

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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. Report of the 77th Meeting of the Executive Committee of the Multilateral Fund for the Implementation of Montreal Protocol

Introduction

1. The 77th meeting of the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol was held at the headquarters of the International Civil Aviation Organization, Montreal, Canada, from 28 November to 2 December 2016.

2. The meeting was attended by representatives of the following countries, members of the Executive Committee in accordance with decision XXVII/13 of the Twenty-Seventh Meeting of the Parties to the Montreal Protocol:

(a) Parties not operating under paragraph 1 of Article 5 of the Protocol: Austria (Vice-chair), Belgium, Canada, Germany, Japan, and the United States of America; and

(b) Parties operating under paragraph 1 of Article 5 of the Protocol: Argentina, Cameroon, China, Egypt, India, Jordan, and Mexico (Chair).

3. In accordance with the decisions taken by the Executive Committee at its Second and Eighth meetings, representatives of the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP), both as implementing agency and as Treasurer of the Fund, the United Nations Industrial Development Organization (UNIDO) and the World Bank attended the meeting as observers.

4. The Executive Secretary and staff of the Ozone Secretariat, the President of the Implementation Committee under the Non-Compliance Procedure of the Montreal Protocol and members of the Replenishment Task Force of the Technology and Economic Assessment Panel (TEAP) were also present.

5. Representatives of the Alliance for Responsible Atmospheric Policy, the Environmental Investigation Agency, the Institute for Governance and Sustainable Development, and the Steering Committee of the Kigali Cooling Efficiency Fund (including, the ClimateWorks Foundation, the Hewlett Foundation and the MacArthur Foundation) attended as observers. The Executive Committee agreed, at the start of the meeting, also to allow a representative of the Natural Resource Defence Council to attend as an observer. […]

- Read the Full report
- The Multilateral Fund for the Implementation of the Montreal Protocol

2. 10th Meeting of the Ozone Research Managers to be Held in Geneva, Switzerland, 28 - 30 March 2017. Related documents now available

The UN Environment, Ozone Secretariat is pleased to inform you that the following documents for the forthcoming 10th meeting of the Ozone Research Managers to be held in Geneva, Switzerland, 28 - 30 March 2017 are now available on the meeting portal:

Pre-Session Documents

- Draft Provisional Agenda - To be finalized prior to the meeting.
- National Reports - More reports will be posted as they are received from the parties.

Other relevant documents will be posted on the portal in due course.

Mobile app

The mobile application for the 10th ORM meeting is also available for use. The app contains pre-session documents and general information about the meeting. Kindly download it to receive any updates related to

the meeting.

How to access the app

Step 1: Tap the 'App Store' icon (on Apple iOS devices) or the 'Google play store' icon (on Android devices). You will be prompted to enter your iTunes or Google password and if you don't already have an account, you will need to create one.
Step 2: Search for the 'UNEP Events' app in the store and install it on your device.
Step 3: Open the 'UNEP Events' app and tap the event titled **'10th meeting of the Ozone Research Managers'** to download it.
Step 4: Once the download is complete, the app is available to use. Tap any icon on the app to browse and engage with the content.

The content of the app can also be accessed through any web browser at this link: https://event.crowdcompass.com/orm10

Activities under the Vienna Convention Trust Fund on Research and Systematic Observation
Please also note that additional information related to activities under the Vienna Convention Trust Fund on Research and Systematic Observation is now available on the website of the Ozone Secretariat at the following links:

- http://ozone.unep.org/en/activities-under-vienna-convention-trust-fund-research-and-systematic-observation *(new web page)*
- http://ozone.unep.org/en/advisory-committee-vienna-convention-trust-fund-research-and-systematic-observation *(new web page)*
- http://ozone.unep.org/en/treaties-and-decisions/vienna-convention-protection-ozone-layer *(revised web page)*

The Ozone Secretariat will update these web pages as necessary to further raise awareness about the undertakings of the Montreal Protocol in this important area.

- The UN Environment, Ozone Secretariat, 9 February 2017

3. Sustainable Management of Refrigeration Technologies in Marine and Off-Shore Fisheries Sectors, 6-8 April 2017, Bangkok, Thailand

Pre-registration is now open

Organized by the UN Environment (UNEP), ASHRAE, the International Institute of Refrigeration (IIR), and the United Nations Industrial Development Organisation (UNIDO), with the kind support of the Government of the Kingdom of Thailand and the Department of Industrial Works, the Sustainable Management of Refrigeration Technologies in Marine and Off-Shore Fisheries Sectors Conference takes place April 6-8, 2017, in Bangkok, Thailand.

Refrigeration technologies are essential for the cold food chain management both on land and in marine applications. The Montreal Protocol (Protocol) Technology and Economic Assessment Panel (TEAP) reported that 80% of mobile marine refrigerated systems use hydrochlorofluorocarbons-22 (HCFC-22) refrigerants. HCFC-22 is currently being phased-out worldwide under the Montreal Protocol on Substances that Deplete the Ozone Layer.

RAC technology management in the mobile marine and fisheries sector has a critical role in meeting the phase out targets specified by the Meeting of the Parties (MOP) to the Protocol and ensuring sustainable environmental practices in their RAC applications. Refrigeration, freezing, ice making and air-conditioning equipment are fundamental for mobile marine and fishery operations as well as sustaining economic livelihoods.

This international conference will focus on the practices of this industry in the management of existing systems, longer term energy efficient systems, advancement and selection of related refrigeration and air-conditioning (RAC) technologies. In keeping with the ongoing developments of the Montreal Protocol, the conference will address the different aspects, mentioned earlier, in conjunction with eliminating/minimizing the use of either

hydrochlorofluorocarbons (HCFC) or high-GWP hydrofluorocarbons (HFC), as refrigerants, and the relevant obligations under the Montreal Protocol as well as other international policies and governing treaties.

Learn more

On-line pre-registration is now open:

1, Go to page: https://www.ashrae.org/membership--conferences/conferences/ashrae-conferences/marine-2017

2. Scan down and you will see: Registration Application: https://fs12.formsite.com/ashrae/form32/index.html

4. Refrigerants with Low Global Warming Potential

Regulations and overall concern for the environment is driving research to identify effective refrigerant alternatives with low GWP.

With the ratification of the Montreal protocol in 1987, chlorofluorocarbon (CFC) and hydrochlorofluorocarbon (HCFC) refrigerants, such as R11, R12, R22, and R123, have been or will soon be phased out due to their high ozone depleting potential (ODP). Subsequently, the HVAC&R industry turned to hydrofluorocarbon (HFC) refrigerants as substitutes. Due to their zero ODP, HFC refrigerants have gained widespread use since the 1990s in refrigeration, air-conditioning, and heat pump applications, with commonly used HFC refrigerants, including R134a, R410A, R404A, and R407C, among others.

However, many HFC refrigerants have relatively high global warming potentials. The global warming potential (GWP) is a measure of the potency of a greenhouse gas relative to carbon dioxide (where carbon dioxide, by definition, has a GWP value of 1). The HFC refrigerants commonly in use today have GWP values that are thousands of times larger than that of carbon dioxide.

Thus, environmental concerns are driving regulations and the HVAC&R industry towards lower GWP alternatives to HFC refrigerants currently in use. Existing lower GWP refrigerant alternatives include, but are not limited to, hydrocarbons, such as propane (R290) and isobutane (R600a), as well as carbon dioxide (R744), ammonia (R717), and R32. Note that with the exception of carbon dioxide, all of these existing alternatives are either mildly flammable (ASHRAE safety classification 2L for ammonia and R32) or have higher flammability (ASHRAE safety classification 3 for propane and isobutane). In addition to existing alternatives, new lower GWP refrigerant alternatives are currently being developed by refrigerant manufacturers, including hydrofluoro-olefin (HFO) and unsaturated hydrochlorofluorocarbon (HCFO) refrigerants. These next-generation refrigerants and their blends are typically either non-flammable (ASHRAE safety classification 1) or have lower flammability (ASHRAE safety classification A2L).

In an effort to determine the impact of new lower GWP alternative refrigerants on systems, the industry and various research organizations have been investigating the performance of these refrigerants in HVAC&R systems and components. Ideally, alternative lower GWP refrigerants should provide the same, or better, energy performance as current refrigerants, with reduced environmental impact.

One such effort is the Low GWP Alternative Refrigerants Evaluation Program (Low-GWP AREP), led by the Air-Conditioning, Heating and Refrigeration Institute. The program consists of compressor calorimeter testing, system drop-in testing, soft-optimized system testing, and heat transfer testing. Numerous equipment manufacturers, national laboratories, and academic institutions have performed equipment testing with refrigerants supplied by major refrigerant manufacturers. The results from testing show that, in general, the new alternative refrigerants (many of which are mildly flammable) exhibit similar efficiency and capacity as compared to currently used HFC refrigerants. With minor modifications to system design, it is anticipated that new equipment making use of these new refrigerant alternatives will achieve increased performance.

It should be stressed that GWP is not and should not be the only metric to evaluate a refrigerant's environmental impact. The impact should be evaluated accounting for both the direct emission of refrigerants that escape from HVAC&R products and the indirect emission of CO_2 from the electricity consumed by HVAC&R products over their lifetime. This is called Life Cycle Climate Performance (LCCP). The lower the LCCP is, the less the environmental impact. A low GWP value is only an indication of low impact from direct emission in theory. The product efficiency directly affects the indirect emission. Generally speaking, the direct emission is only a small fraction of the overall LCCP, with indirect emissions accounting for the majority of the overall impact. Therefore, it is very important that lower GWP refrigerants must have performance comparable to or higher than the HFCs currently in use.

Opportunities for using new lower GWP refrigerant alternatives exist both in new and existing equipment. New

equipment can be designed for optimal energy performance using new alternative refrigerants, while incorporating the additional safety features necessary to use A2L and A3 refrigerants. Current regulations allow for use of A2L and A3 refrigerants in small hermetically sealed systems, such as those in self-contained display merchandisers and window air conditioners.

Existing equipment can be retrofit with a new lower GWP alternative provided the alternative has similar properties to the refrigerant being replaced, minimizing system modifications. Such refrigerant retrofits are attractive for reducing environmental impact of systems with large refrigerant charge, such as centralized commercial refrigeration. Since existing systems using HFC refrigerants are not specifically designed to use flammable refrigerants, retrofit is limited to A1 alternatives. Retrofitting with A2L or A3 refrigerants is not permitted.

Timely and cost-effective implementation of flammable refrigerants will be impeded without proper revision of relevant safety codes and standards. While demand for the flammable refrigerants is increasing, current codes and standards adoption processes are relatively slow. In an effort to revise relevant safety codes and standards in a timely manner, joint collaboration between the Air-Conditioning, Heating and Refrigeration Institute (AHRI); American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE); California Air Resources Board; and the U.S. Department of Energy has been initiated.

Research efforts underway or planned include: Benchmarking Risk by Real Life Leaks and Ignitions Testing / Investigation of Hot Surface Ignition Temperature (HSIT) for A2L Refrigerants / Leak Detection of A2L Refrigerants in HVAC&R Equipment / Flammable Refrigerants Post-Ignition Simulations and Risk Assessment Update / Guidelines for Flammable Refrigerant Handling, Transporting, Storing, and Equipment Servicing, Installation, and Dismantling / Servicing and Installing Equipment using Flammable Refrigerants / Assessment of Field-made Mechanical Joints / Investigate the proper basis for setting charge limits of A2L, A2, and A3 refrigerants for various types of products / and Modeling tools for flammability evaluation of low-GWP refrigerant blends.

These projects are being completed under an accelerated timeline so that the results may be included in updates to relevant codes and standards, including ASHRAE Standard 15 and the International Code Council (ICC) International Mechanical Code. It is anticipated that the results of these various projects will be available late in 2017. Significant efforts are being made to accelerate implementation of A2L and A3 alternative refrigerants. It is hoped these efforts will impact the market within the next several years.

- Facility Executive, 10 February 2017, By: Brian Fricke, Ken Schultz, and Xudong Wang

5. HFCs Linger in Ocean Longer than in Atmosphere: report

A recent study shows that HFCs may remain in the oceans for far longer than originally thought.

A joint paper published in the Proceedings of the National Academy of Sciences reveals that HFCs make a larger contribution to rising sea levels than first thought.

Using climate modelling, researchers at the Massachusetts Institute of Technology the study showed that short-lived climate pollutants (SCLPs) like HFCs contribute to thermal expansions in the ocean far longer than originally thought – and long after they have decayed in the atmosphere.

F-gases like CFCs, HCFCs and HFCs are commonly referred to as SCLPs due to their relatively short half-life in the atmosphere. Yet once they have decayed from the atmosphere, the researchers found that they contribute to thermal expansion, causing sea levels to rise.

The report seeks to demonstrate what would have happened if the Montreal Protocol had not come into force by surmising that without it, a considerable amount of additional sea level rise would have occurred (approximately 14cm by 2050). It also noted an ongoing link between HFCs and thermal expansion for up to 500 years.

This modelling highlights the critical importance of earlier actions if future warming and sea-level rises are to be limited. The report demonstrates that climate mitigation measures, like the phase down of ozone depleting substances, need to be prioritised to protect the oceans just as much as they are needed to protect the atmosphere.

Climate change is often linked to air pollution, but it has a dramatic impact on the oceans of the world too. Oceans help to mitigate climate change, reducing the amount of CO_2 in the atmosphere by storing carbon atoms. Continued global warming causes thermal expansion and sea level rises at a faster rate than oceans can keep up

with.

Fijian President Voreqe Bainimarama, who will preside over COP23 climate talks in Bonn, Germany on 6-17 November 2017, recently drew attention to the effect of rising sea levels on low-lying areas – highlighting the recent devastation caused by tropical cyclone Winston .

- Ammonia21, 6 Februar 2017, By Ermenegilda Boccabella
- Proceedings of the National Academy of Sciences of the United States of America (payment required)

6. How to Keep Cool without Costing the Earth

ABOUT 6% of the electricity generated in America is used to power air-conditioning systems that cool homes and offices. As countries such as Brazil, China and India grow richer, they will surely do likewise. Not only is that expensive for customers, it also raises emissions of greenhouse gases in the form both of carbon dioxide from burning power-station fuel and of the hydrofluorocarbons air conditioners use as refrigerants.

As they describe in a paper in this week's *Science*, Ronggui Yang and Xiaobo Yin of the University of Colorado, in Boulder, have a possible alternative to all this. They have invented a film that can cool buildings without the use of refrigerants and, remarkably, without drawing any power to do so. Better yet, this film can be made using standard roll-to-roll manufacturing methods at a cost of around 50 cents a square metre.

The new film works by a process called radiative cooling. This takes advantage of that fact that Earth's atmosphere allows certain wavelengths of heat-carrying infrared radiation to escape into space unimpeded. Convert unwanted heat into infrared of the correct wavelength, then, and you can dump it into the cosmos with no come back.

Dr Yang and Dr Yin are not the first to try to cool buildings in this way. Shanhui Fan and his colleagues at Stanford University, in California, demonstrated a device that used the principle in 2014. Their material, though, consisted of seven alternating layers of hafnium dioxide and silicon dioxide of varying thicknesses, laid onto a wafer made of silicon. This would be difficult and expensive to manufacture in bulk.

Dr Yang's and Dr Yin's film, by contrast, was made of polymethylpentene, a commercially available, transparent plastic sold under the brand name TPX. Into this they mixed tiny glass beads. They then drew the result out into sheets about 50 millionths of a metre (microns) thick, and silvered those sheets on one side. When laid out on a roof, the silver side is underneath. Incident sunlight is thus reflected back through the plastic, which stops it heating the building below.

Preventing something warming up is not, though, the same as cooling it. The key to doing this is the glass beads. Temperature maintenance is not a static process. All objects both absorb and emit heat all the time, and the emissions are generally in the form of infrared radiation. In the case of the beads, the wavelength of this radiation is determined by their diameter. Handily, those with a diameter of about eight microns emit predominantly at wavelengths which pass straight through the infrared "window" in the atmosphere. Since the source of the heat that turns into this infrared is, in part, the building below, the effect is to cool the building.

That cooling effect, 93 watts per square metre in direct sunlight, and more at night, is potent. The team estimates that 20 square metres of their film, placed atop an average American house, would be enough to keep the internal temperature at 20°C on a day when it was 37°C outside.

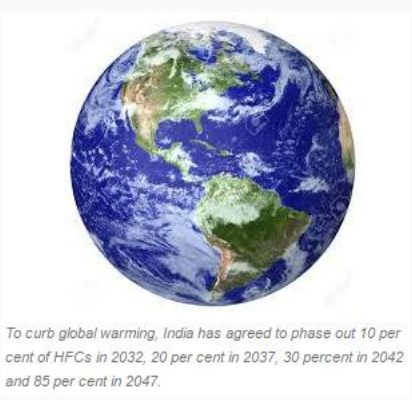
To regulate the amount of cooling, any practical system involving the film would probably need water pipes to carry heat to it from the building's interior. Manipulating the flow rate through these pipes as the outside temperature varied would keep the building's temperature steady. Unlike the cooling system itself, these pumps would need power to operate. But not much of it. Other than that, all the work is done by the huge temperature difference, about 290°C, between the surface of the Earth and that of outer space.

This article appeared in the Science and technology section of The Economist, print edition, under the headline "A film worth watching"

- The Economist, Science and technology, 11 February 2017

ASIA PACIFIC

7. India has Agreed to Freeze Production of Hydrofluorocarbons in 2028: Govt



To curb global warming, India has agreed to phase out 10 per cent of HFCs in 2032, 20 per cent in 2037, 30 percent in 2042 and 85 per cent in 2047.

NEW DELHI: Aiming to curb global warming and facilitate enough carbon space for growth of domestic industry and the economy, India has agreed to freeze production and consumption of Hydrofluorocarbons (HFCs) in 2028 and start reducing it from 2032 onwards.

This was agreed in the 28th meeting of parties to Montreal protocol held in October 2016 in Kigali, Rwanda, said a statement by Environment Minister Anil Madhav Dave in the Rajya Sabha, which was tabled in the House by Minister of State for Home Affairs Kiren Rijiju.

The Kigali meeting adopted an amendment to the Montreal Protocol which is historic and aimed at phasing down HFCs that contribute to global warming.

Highlighting the outcome of the meeting, Dave said: "I am happy to inform the House that India has been able to secure an agreement that provides adequate space for growth of our economy, while providing adequate time for industry to shift to sustainable alternatives in the interest of environment." As per the agreement reached in Kigali, he said: "India will freeze its manufacturing and consumption of HFCs in 2028 and start reducing it from 2032 to 2047 with reference to the base line years 2024, 2025 and 2026".

India has agreed to phase out 10 per cent of HFCs in 2032, 20 per cent in 2037, 30 percent in 2042 and 85 per cent in 2047, he said, adding that the freeze year was subject of technology review and could be further deferred to 2030.

"The agreement facilitates adequate carbon space for growth on domestic industries while minimizing the cost to the economy during the transition period," he said.

Since the Montreal protocol had no arrangement till date to incentivise improvement in energy efficiency in case of use of new refrigerant, it was "agreed in Kigali that multilateral funds under the Montreal protocol will pay for maintaining or increasing energy efficiency with new technology."

The funding for R&D and servicing sector in developing countries has also been included in agreed solutions on finance, he added.

As per the agreement, the developed countries would reduce the production and consumption of HFCs by 70 per cent in 2029.

"India represents only around 2 per cent of the global production and consumption of HFCs but our manufacturing and consumption sector is expected to grow at a rapid pace in future. Our challenge, therefore, was to secure international agreement on a regulatory regime that served the global expectations and yet protect our national interest," he said.

Stating that HFCs do not deplete the ozone layer but have high global warming potential, Dave said the amendment to Montreal Protocol has helped create a global regime of regulatory actions and financial support for treating this set of chemicals in the same manner as was accorded to other Ozone Depleting substances in the past.

- The Economic Times, 6 February 2017

LATIN AMERICA AND CARIBBEAN

8. SCM Frigo Behind Chile's first CO_2 Plant

CHILE: Beijer Ref's Italian manufacturing subsidiary SCM Frigo has supplied the equipment for Chile's first ever transcritical CO_2 supermarket refrigeration system.

The 5,300m² Jumbo store in Chile's southern city of Valdivia, which opened its doors on January 12, has become a showcase for sustainability. In addition to the incorporation of Chile's first transcritical CO_2 system, the store uses LED lighting throughout and includes a BMS systems for the intelligent control of all building system.

The project was implemented by the Ministry of Environment's Ozone Unit and was funded by the Climate and Clean Air Coalition (CCAC) and support from the United Nations Development Programme (UNDP).

The two SCM Frigo units, are designed for a total capacity of almost 400kW for medium temperature refrigeration and 100kW for the low-temperature requirement. They serve a total of 115 MT/LT cabinets and 30 cold rooms.

Hailing the installation as an opportunity to promote the technology in the country, Claudia Paratori, coordinator of the Ozone Unit said: "This project will connect the different actors in the cold chain supermarket sector and promote the adoption of this technology and help minimise the introduction of HFC-based systems in Chile."

The project aims to highlight ways to reduce greenhouse gas emissions and introduce environmentally friendly technology. It also has economic benefits with approximately 20% in energy savings.

"After the adoption of the Kigali Amendment and the entry into force of the Paris agreement, nations and the industry must move quickly to seize the immediate opportunities at hand to avoid the growth of HFCs and realise energy efficiency gains of technology change in the refrigeration sector," added Jacques Van Engel, director of the Montreal Protocol/Chemicals Unit, UNDP.

"Since sustainability is our challenge, we are proud to be part of this team contributing to the goal," said SCM Frigo managing director Nicola Pignatelli.

- CoolingPost, 6 February 2017

NORTH AMERICA

9. US EPA Revised Section 608 Refrigerant Management Regulations

EPA is updating the safe handling requirements under Section 608 that currently apply to ozone depleting refrigerants and extending them to substitutes like hydrofluorocarbons (HFCs). These changes strengthen the existing program, in particular by requiring a number of industry best practices. This action reduces climate-damaging emissions from air conditioning and refrigeration equipment. EPA estimates that the annual emissions reductions from this rule will be approximately 7.3 million metric tons of carbon dioxide equivalent ($MMTCO_2eq$) and 114 ozone-depletion weighted metric tons (ODP tons).

Key Documents

- Update to the Refrigerant Management Requirements Under the Clean Air Act
- The docket for the rule can be found here.
- A webinar providing an overview of the rule can be found here.

Rule Summary

This rule makes the following changes to the existing requirements under Section 608.

1) Extends the requirements of the Refrigerant Management Program to cover substitute refrigerants, such as HFCs. Note that EPA has previously exempted some substitutes from the Section 608 venting prohibition through previous rules. Such substitutes are also exempt from the requirements of this rule.

- This fact sheet describes the requirements of the existing Section 608 Refrigerant Management Program. Fact sheets on how the rule affects the Program are found at the bottom of this page.

2) Lowers the leak rate thresholds that trigger the duty to repair refrigeration and air-conditioning equipment containing 50 or more pounds of refrigerant.

- Lowers from 35% to 30% for industrial process refrigeration (IPR)
- Lowers from 35% to 20% for commercial refrigeration equipment
- Lowers from 15% to 10% for comfort cooling equipment

3) Requires quarterly/annual leak inspections or continuous monitoring devices for refrigeration and air-conditioning equipment that have exceeded the threshold leak rate

4) Requires owners/operators to submit reports to EPA if systems containing 50 or more pounds of refrigerant leak 125% or more of their full charge in one calendar year.

5) Extends the sales restriction to HFCs and other non-exempt substitutes, with the exception of small cans (containing 2 pounds or less) of non-exempt substitutes (e.g., primarily HFC-134a) for motor vehicle air conditioner servicing. These small cans can continue to be sold without technician certification so long as the small cans have a self-sealing valve to reduce refrigerant releases.

6) Requires technicians to keep a record of refrigerant recovered during system disposal from systems with a charge size from 5–50 lbs.

- US EPA, February 2017

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

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

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

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

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

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

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

2. Use Conference Code: 202 343 9185#

- Web: http://www2.epa.gov/greenchill

EUROPE & CENTRAL ASIA

11. Proposal for a Council Decision on the Conclusion of the Agreement to Amend the Montreal Protocol on Substances that Deplete the Ozone Layer Adopted in Kigali

Council of the European Union: Proposal for a Council Decision on the conclusion of the agreement to amend the Montreal Protocol on substances that deplete the ozone layer adopted in Kigali, Brussels, 3 February 2017

Proposal for a

COUNCIL DECISION

on the conclusion of the agreement to amend the Montreal Protocol on substances that deplete the ozone layer adopted in Kigali

THE COUNCIL OF THE EUROPEAN UNION, Having regard to the Treaty on the Functioning of the European Union, and in particular Article 192(1) in conjunction with Article 218(6)(a) thereof, Having regard to the proposal from the European Commission, Having regard to the consent of the European Parliament, Whereas:

(1) At the 28th meeting of the Parties to the Montreal Protocol on substances that deplete the ozone layer ('the Montreal Protocol'), which took place in Kigali, Rwanda, from 10th to 15th October 2016, the text of an amendment to that Protocol ('the Kigali amendment') was adopted, adding a stepwise reduction of the consumption and production of hydrofluorocarbons to the control measures of the Montreal Protocol.

(2) A stepwise reduction of the consumption and production of hydrofluorocarbons is necessary to reduce the contribution of those substances to climate change and to prevent their unlimited introduction, in particular in developing countries.

(3) The Kigali amendment is a necessary contribution to the implementation of the Paris Agreement as regards its objective to keep the global temperature increase well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1,5°C above pre-industrial levels.

(4) The Kigali amendment should be approved on behalf of the Union,

HAS ADOPTED THIS DECISION:

Article 1 The amendment to the Montreal Protocol on substances that deplete the ozone layer, adopted in Kigali on 15 October 2016, is hereby approved on behalf of the Union. The text of the amendment is attached to this Decision.

Article 2 The President of the Council shall designate the person or persons empowered to proceed, on behalf of the Union, to the deposit of the instrument of approval with the Secretary-General of the United Nations provided for in Articles 13(1) and 20 of the Vienna Convention for the protection of the ozone layer in order to express the consent of the Union to be bound by the agreement.

Article 3 This Decision shall enter into force on the date following that of its adoption. […]

- The Council of the European Union, 2 February 2017

12. 'Safe Management of Ammonia Refrigeration Systems Seminar' (UK)

The Food Storage and Distribution Federation (FSDF) and the British Frozen Food Federation (BFFF), together with HVAC&R industry experts and end users, will hold a Safe Management of Ammonia Refrigeration Systems seminar to improve safety for those in the UK who work with ammonia.

This event will provide suppliers, end users, consultants and engineering contractors of ammonia refrigeration

systems with guidance. It will also help clarify their legal responsibilities.

FSDF Chief Executive Chris Sturman said, "over the last three years, the FSDF has been taking a lead role, together with the Health and Safety Executive and ACRIB (an HVAC&R industry body), in producing revised Codes of Practice and educating businesses [on…] health and safety aspects of ammonia refrigeration system design and operation".

Ammonia safety is a high priority in the UK. "Following the tragic incident at the Northampton brewery last year, we recognise we have an even greater responsibility to contribute to and clarify guidelines for industry professionals, to ensure competence and regulatory compliance," Sturman said.

The key topics of the seminar include: legislation and implications of non-compliance; HSE's strategy and concerns; why ammonia is a good refrigerant; safe management of ammonia; and emergency arrangements.

It will be held at the Belton Woods Hotel in Grantham, UK on 16 May 2017. Click here to find out more.

- Ammonia21, 9 February 2017, By: Charlotte McLaughlin

FEATURED

OZONE SECRETARIAT

- - Twenty-Eighth Meeting of the Parties.
- - Resumed 38th meeting of the Open-ended Working Group.
- - 57th meeting of the Implementation Committee.

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

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

- Browse through the Ozone Secretariat "In Focus" to learn about latest updates.
- Click here for Montreal Protocol Meetings Dates and Venues
- Methyl Bromide Technical Options Committee 2014 Assessment Report
- 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 77th Meeting of the Executive Committee, 28 November - 2 December 2016, Montreal, Canada

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

Learn more

OZONACTION

UN Environment, OzonAction highlights

OzonAction Factsheets:

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

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

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

OzonAction Factsheet: Tools Commonly used by Refrigeration and Air-Conditioning Technicians

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

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

Now available in the Android Play Store and Apple Store/iTunes.

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

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

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

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

Regional News Drops

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

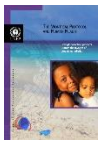
The NOUs were asked about their success stories, alternative refrigerants selected and their personal messages for national ozone celebrations…

Click here to access the News Drops

OzonAction Recent Publications:

Lower-GWP Alternatives in Commercial and Transport Refrigeration: An expanded compilation of propane, 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

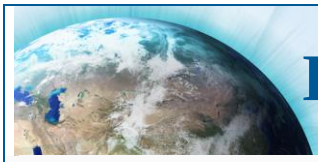
Guide on Good Practices: Phasing out HCFCs in the Refrigeration and Air-conditioning Servicing Sector

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

2017

ATMOsphere Japan 2017, 20 February 2017, Tokyo, Japan

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

SuperSmart free training & workshops at EuroShop and ISH - The two world-leading events for the food retail industry (EuroShop); and the building, energy,

renewable energy and air-conditioning sectors (ISH), are approaching quickly. Reason enough for the SuperSmart team to be on-site and offer free-of-charge opportunities for you to get trained, learn about our project and its targets, and add your voice to make Europe's supermarkets smarter. SuperSmart training at EuroShop: Energy-efficient food retail stores, at Euroshop, 6 March, Düsseldorf, Germany, 2-3 pm / 3-4 pm / 4-5 pm - you may select the session(s) you are interested in EuroShop Hall 13, room 13.2

Contact Nina Masson, Chief Strategy Advisor / Special Projects at info@supersmart-supermarket.org

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

ATMOsphere America 2017, 5-7 June 2017, San Diego, USA. Interactive workshops bringingtogether decision makers from industry and government to change the future of natural refrigerants.

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

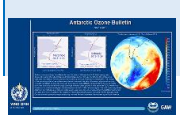
9th International Conference on Compressors and Coolants, 6-8 September 2017, Bratislava, Slovakia

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

READING

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

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



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

monitoring stations in the southern hemisphere and satellites to observe ozone globally.

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

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

AREA Guidance on minimum requirements for contractors' training & certification on low GWP Refrigerants - AREA has updated its Guidance on minimum requirements for contractors' training & certification on low GWP Refrigerants.

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

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

Primer on Hydrofluorocarbons, Fast action under the Montreal Protocol can limit growth of HFCs, prevent up to 100 billion tonnes of 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

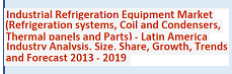
Geothermal Heating and Cooling: Design of Ground-Source Heat Pump Systems- ASHRAE

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)

Chlorofluorocarbon Market: Global Industry Analysis and Forecast 2015 to 2021

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

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

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

The Importance of Ambition in the 2016 HFC Phase-Down Agreement. Download the full report here

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

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

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

January Edition of Accelerate America! By shecco

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

Read/Download pdf version | E-book

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

MISCELLANEOUS

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

- Immediate and permanent access to the latest research and to IJR archive
- Access the latest articles as soon as they become available online.
- Browse, search and read each one of the nearly 4,500 papers since Volume 1, Issue 1.
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The International Institute of Refrigeration, January 2017

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

GIZ first Cool Training 2017 will take place from 27 March to 7 April 2017 in Maintal, Germany. This two-week Cool Training deals with the safe application of the natural refrigerants propane, CO_2, and ammonia. It is composed of 30% theoretical and 70% practical work. It is carried out in cooperation with the Bundesfachschule Kälte Klima Technik (BFS) in Maintal, an international vocational training center in Germany that specializes on cooling technologies. Participants are required to have extensive experience in the RAC field and the capability to act as a multiplier of the acquired knowledge in the training. Furthermore, the training requires that participants are physically fit and able to work in English.

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

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

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

TRAINING AVAILABILITY - The UEE32211 Certificate III in Air-conditioning and Refrigeration is conducted at the APTC Suva Campus in Fiji.

COURSE DURATION - Course duration is 22 weeks full time including a 1 week mid semester break. Students will attend classes for a minimum of 5 days per week. Training will be delivered face to face. Training will be delivered in English incorporating language, literacy and numeracy (LLN) support and a work skills facilitation program. Additional out-of-hours study time will be required.

ENTRY REQUIREMENTS - Applicants must be a citizen of a Pacific Island Forum country. Individuals are required to have a minimum equivalent of one year full time recent industry experience and hold a relevant local qualification. Applicants will be asked to complete the Literacy and Numeracy Assessment and Vocational

Knowledge Assessment. Applicants may apply for recognition of prior learning. For further information visit: http://www.aptc.edu.au/index.php/recognition of-prior-learning.

COURSE FEE - The course fee is FJD 3,500. The fee includes personal protective equipment, stationery and uniform. The Australian Government subsidises the cost of the course including materials and consumables. Course fees are subject to change without prior notification.

For current fees visit: http://www.aptc.edu.au/index.php/course-fees

**Courses offered, course dates and fees may vary depending upon student and industry demand*.

The recently launched new ASHRAE Technology Portal gives ASHRAE members an easy, fast method of connecting to the latest information generated by ASHRAE's research program. It serves a central body of knowledge for ASHRAE technology and research products. It provides access to more than 1,700 Journal articles published since 1997 and more than 600 final reports from ASHRAE research projects.

1st Meeting of the Intersessional Process for Considering the Strategic Approach to International Chemicals Management (SAICM) and the Sound Management of Chemicals and Waste Beyond 2020

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

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