



# Ozone Layer Protection

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## Highlights

- Ozone hole has changed ocean mix
- Forane 427A trialled at brewer's sites
- New cleaning agent with excellent environmental profile
- Water mist system for maritime applications
- CO<sub>2</sub> as a blowing agent for PU mouldings
- Destruction of MeBr captured on activated carbon



The **Asian and Pacific Centre for Transfer of Technology (APCTT)**, a subsidiary body of ESCAP, was established on 16 July 1977 with the objectives: to assist the members and associate members of ESCAP through strengthening their capabilities to develop and manage national innovation systems; develop, transfer, adapt and apply technology; improve the terms of transfer of technology; and identify and promote the development and transfer of technologies relevant to the region.

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- Research and analysis of trends, conditions and opportunities;
- Advisory services;
- Dissemination of information and good practices;
- Networking and partnership with international organizations and key stakeholders; and
- Training of national personnel, particularly national scientists and policy analysts.



*The shaded areas of the map indicate ESCAP members and associate members*

#### **Cover Photo**

Test set-up in the IKV PU pilot plant using CO<sub>2</sub> as the blowing agent

*(Credit: Institute of Plastics Processing, Germany)*

**VATIS\* Update  
Ozone Layer Protection**

is published 6 times a year to keep the readers up to date of most of the relevant and latest technological developments and events in the field of Ozone Layer Protection. The Update is tailored to policy-makers, industries and technology transfer intermediaries.

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### Arctic ozone layer to recover by end of the century

According to recent measurements, the ozone layer over the North Pole should recover by the end of the century. This is one of the major findings of the European Union (EU) project RECONCILE, completed in February 2013. Researchers from 35 research institutions and universities in 14 countries spent four years investigating the chemical process of ozone depletion. Their findings verified once again that chlorine compounds are indeed responsible for ozone depletion. The scientists used the new insights to improve existing climate models to elicit more reliable predictions on how the ozone layer will develop in future and on the possible consequences of climate change for the stratosphere.

“Even if the ozone layer recovers, climate change could alter the underlying conditions. This is yet another reason to reduce greenhouse gas emissions and stop climate change,” states environmental chemist Dr. Marc von Hobe from Forschungszentrum Julich GmbH, Germany, which coordinated the project. Climate change could alter the temperature, circulation patterns and chemical composition in the stratosphere. This also influences the ozone layer, which in turn has a bearing on temperature. Furthermore, some ventures to mitigate climate change could have a negative impact on the ozone layer. One example is the so-called geo-engineering. The term describes the use of technological means to intervene in the geochemical or biogeochemical processes of Earth.

RECONCILE demonstrated that besides the destruction caused by chlorine, no additional chemical

mechanisms play a decisive role. Analyses of air samples at the University of East Anglia and the University of Frankfurt as part of the project showed a clear fall in stratospheric chlorine. Although these compounds remain in the atmosphere longer than previously thought, the scientists expect the ozone layer to recover by the end of the century.

While investigating polar vortex and associated processes in detail, the RECONCILE researchers unearthed several surprises. For instance, the scientists at Forschungszentrum Julich showed that surface reactions also occur very efficiently on liquid aerosols in the air. “For chlorine chemistry, the formation of polar stratospheric clouds (PSCs) is not as important as the temperature. Theoretically, the reactions can occur anywhere where it is cold enough and sufficient chlorine is present,” explains Mr. Tobias Wegner, who wrote a Ph.D. thesis on aerosol particles and chlorine activation at Forschungszentrum Julich. However, PSCs still play an important role in ozone depletion. Nitrogen compounds, which react with chlorine compounds to stop the ozone depletion process at the end of the winter are bound in PSC particles and plunge downwards because of gravity. PSCs can form much more rapidly and at higher temperatures than earlier thought, the researchers found.

Scientists from the Max-Planck-Institute for Chemistry, Johannes Gutenberg University Mainz and TU Darmstadt discovered an unexpectedly wide range of particles in their samples. These particles presumably descend from higher stratospheric layers into the polar vortex and contain metals, black carbon, silicates and so forth. The origin of these particles is being investigated currently by a group

at Mainz as part of another project. With regard to another point, the scientists were able to put some worries to rest – after the record Arctic winter, there were fears of a dramatic increase in ultraviolet (UV) radiation in the northern hemisphere. “Although we did find elevated values, they were not nearly as high as would be required to considerably increase the risk of skin cancer,” stated Dr. Marc von Hobe.

*Source: [www.sciencedaily.com](http://www.sciencedaily.com)*

### Ozone hole has changed ocean mix

The formation of the ozone hole in the Antarctic has caused changes in the way waters in the southern oceans mix, with possible impacts on climate change, a new study suggests. To trace the movement of ocean waters from the surface into the ocean interior – a process known as ventilation – researchers analysed ocean concentrations of a chemical that was used in hair spray cans, refrigerators and air-conditioning systems before it was phased out in the 1990s because it was destroying the ozone layer.

The study, by an international team that includes Associate Professor Dr. Mark Holzer, a mathematician at University of New South Wales, Australia, has been published. The team found that surface waters are mixing into the subtropical deeper ocean at a higher rate than two decades ago, while the reverse is true for waters closer to Antarctica. Dr. Holzer said the find was consistent with the fact that surface westerly winds in the southern hemisphere, which drive the ventilation of the southern oceans, have strengthened in recent decades. Other studies have attributed this wind intensification to the thinning of the ozone layer.

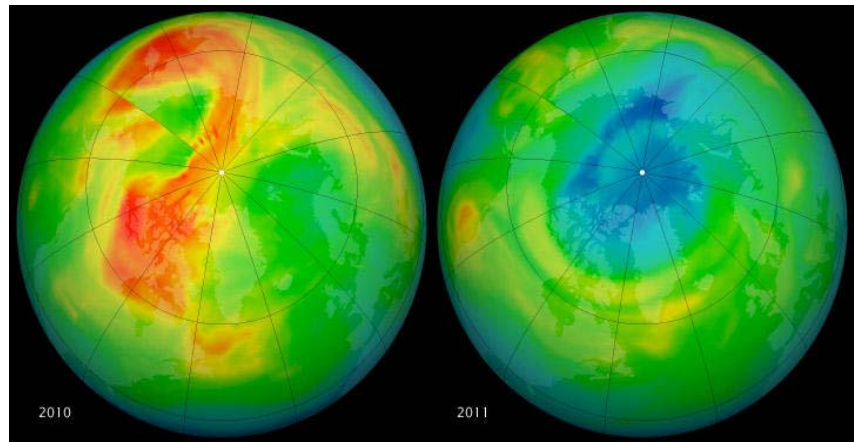


“It is fascinating that changes in the stratosphere have had an effect down to at least 1,500 metres depth in the ocean,” remarked Dr. Holzer, from the School of Mathematics and Statistics in the Faculty of Science. The movement of surface waters into the deeper ocean governs the ocean’s uptake of heat, oxygen and carbon from the atmosphere. “And all of these are potentially important for changes in the global climate. Ventilation is the way the ocean communicates with the atmosphere,” Dr Holzer said. Higher concentrations of the chlorofluorocarbon CFC-12 than predicted for an unchanging ocean were found in deep water from about 25 to 45 degrees south, reflecting an increased influx of surface water to these latitudes in the past 20 years. The study found that the opposite was the case for polar deep waters, where there has been increased upwelling. Dr. Holzer said the use of CFC-12 was an interesting twist: “The very substance that contributed to destroying ozone is now helping us figure out what is happening in the oceans.”

Source: [sciencealert.com.au](http://sciencealert.com.au)

## Causes of the 2011 Arctic ozone hole determined

According to a new study by the United States National Aeronautics and Space Administration (NASA), a combination of extreme cold temperatures, human-made chemicals and a stagnant atmosphere were behind what became known as the Arctic ozone hole of 2011. Even when both poles of the planet undergo ozone losses during the winter, the Arctic’s ozone depletion tends to be milder and shorter-lived than the Antarctic’s. This is because the three key in-



Maps of ozone concentrations over the Arctic: the image on the left shows 19 March 2010 and the one on the right shows the same date in 2011. March 2011 had relatively lower ozone levels.

redients needed for the ozone-destroying chemical reactions – chlorine from human-made chlorofluorocarbons (CFCs), frigid temperatures and sunlight – are not usually present in the Arctic at the same time – the northernmost latitudes are generally not cold enough when the Sun reappears in the sky in early spring. However, in 2011, ozone concentrations in the Arctic atmosphere were about 20 per cent lower than its late winter average. The new study shows that while chlorine in the Arctic stratosphere was the ultimate culprit of the severe ozone loss of winter of 2011, unusually cold and persistent temperatures also spurred ozone destruction. Furthermore, uncommon atmospheric conditions blocked wind-driven transport of ozone from the tropics, halting the seasonal ozone resupply until April.

“You can safely say that 2011 was very atypical: in over 30 years of satellite records, we hadn’t seen any time where it was this cold for this long,” remarked Dr. Susan E. Strahan, an atmospheric scientist at NASA Goddard Space Flight Centre and main author of the new study that was published recently in the *Journal of Geophysical Re-*

*search-Atmospheres*. “Arctic ozone levels were possibly the lowest ever recorded, but they were still significantly higher than the Antarctic’s,” Dr. Strahan observed. “There was about half as much ozone loss as in the Antarctic and the ozone levels remained well above 220 Dobson units, which is the threshold for calling the ozone loss a ‘hole’ in the Antarctic – so the Arctic ozone loss of 2011 did not constitute an ozone hole.” The majority of ozone depletion in the Arctic takes place inside what is called polar vortex – a region of fast-blowing circular winds that intensify in the fall and isolate the air mass within the vortex, keeping it very cold. Most years, atmospheric waves knock the vortex to lower latitudes in the later winter period, where it disintegrates. In comparison, however, the vortex in the Antarctic is remarkably stable and persists until the middle of spring. But in 2011, an unusually quiescent atmosphere allowed the Arctic vortex to remain strong for around four months, maintaining frigid temperatures even after the Sun reappeared in March and promoting the chemical processes that deplete ozone.

Source: [www.sciencedaily.com](http://www.sciencedaily.com)

## Campaign for natural refrigerant gases

Climate campaigns tend to overlook a major contributor to greenhouse gas emissions – synthetic refrigerant gases (fluorinated, or “f-gases”) mostly used in refrigerators and air-conditioners (ACs). These gases could account for 20-40 per cent of all carbon equivalent emissions by 2050. Replacement for f-gases is now available with natural refrigerant-compatible appliances arriving on the market. The impact on global warming by each of the natural refrigerant molecule is 300 times lower than the least harmful f-gas and 1,100 times less harmful than average f-gases. It is critical therefore to accelerate the uptake of ACs using natural refrigerants.

Cleaner and more efficient ACs are starting to be commercialized in India by an Indian manufacturer. Though the new-generation ACs running on natural refrigerants, mostly hydrocarbons (HCs), have a one year payback period for their 10 per cent increase in initial cost and even reduce running costs by at least 20 per cent as compared with best-in-class available ACs, their uptake needs to be helped by a campaign that will make the alternative known in decisive sectors of the economy. Such a campaign started with its first phase being implemented from October 2012 to end of March 2013. The project contains two stages:

- Introduce the issue of greener and more efficient ACs and have it included into the curricula of architecture schools and continuous training workshops; and
- Support and organize purchaser demand for greener apartments with cheaper running costs, and forward this demand to developers and general contractors.

The project is being implemented by Noe21 (France), in partnership with Canton and Oak Foundation from Switzerland, Environmental Investigation Agency in the United Kingdom, and Shecco from Belgium, and two Indian environmental non-government organizations – Vasudha Foundation and no2co2. The Energy and Resources Institute (TERI), India, is another local partner. The second phase of the project will carry a local adaptation of the programme to Hyderabad, India, as well as in Viet Nam, another country where the new ACs will be launched. The general object of the project is to minimize, through market forces, the demand for f-gases and to accelerate the phasing in of natural refrigerants. Currently, the Montreal Protocol and the Kyoto Protocol have not been able to plan a needed deadline for the planned phasing out of f-gases. *Contact: Noe21, 19 Quai Charles Page, 1205 Geneva, Switzerland. Tel. + 41 (22) 3295 136; E-mail: info@noe21.org; Website: www.noe21.org.*

*Source: www.noe21.org*

## Technology and policy workshop on HCFC phase-out

The country’s Hydrochlorofluorocarbons Phase-out Management Plan (HPMP) Stage-I to meet the 2013 and 2015 phase-out targets as per the accelerated phase-out schedule of the Montreal Protocol is being implemented in close cooperation with the stakeholders. The phase-out of hydrochlorofluorocarbons (HCFCs) is a challenge, as environment-friendly technical options are still emerging for most of the sectors and sub-sectors. While technically proven, environmentally friendly and economically viable alternatives are available for

some applications in the foam manufacturing sector, options are still emerging for most applications in the refrigeration and air-conditioning (RAC) sector. The Ozone Cell, Ministry of Environment & Forests, Government of India, together with the United Nations Environment Programme (UNEP) – Compliance Assistance Programme (CAP), Regional Office for Asia and Pacific (ROAP), Thailand – organized a technology and policy workshop on “HCFC Phase-out in India: Challenges and Opportunities” to deliberate on various alternatives to HCFCs and the associated technological, environmental and economic challenges and opportunities on 9 April 2013 at the India Habitat Centre, New Delhi.

*Source: www.ozonecell.com*

## Targets for the first stage of HPMP

The successful implementation of Stage I of the Hydrochlorofluorocarbon (HCFC) Phase-out Management Plan (HPMP) for India will limit HCFC consumption levels to the baseline level (average of 2009 and 2010) by 2013 and reduce an additional 10 per cent to meet the 2015 target. To meet this objective, a minimum phase-out of 308.78 ozone depletion potential (ODP) tonnes of HCFC consumption will need to be accomplished. This will be addressed in HPMP Stage-I, via several technology conversions in the polyurethane foams sector. In addition, actions to restrict the growth of HCFC consumption in the servicing sector will need to be implemented. On successful completion, the India HPMP Stage-I will result in sustainable reductions of 160.82 ODP tonnes of HCFC consumption from the baseline by 2015.

*Source: www.ozonecell.com*

### Asia-Pacific nations visit Indonesia for destruction of ODS

To tackle the growing accumulated banks of ozone depleting substances (ODS) in installed and existing ODS-based equipment and products that are slowly leaking into the atmosphere and contributing to ozone depletion as well as climate change, developing countries are seriously exploring ways on how to dispose these gases. As part of these efforts in the Asia-Pacific region, 16 industry and government representatives from Bangladesh, Malaysia, Pakistan, the Philippines, Sri Lanka and Timor Leste undertook a three-day study tour of the Holcim ODS Destruction Facility in Jakarta, Indonesia, from 18 to 20 February 2013. The study tour – facilitated by the United Nations Environment Programme (UNEP) OzonAction Compliance Action Programme (CAP) in Asia-Pacific with technical support of the Government of Japan, and hosted by the National Ozone Unit of Indonesia's Ministry of Environment – was aimed at addressing concerns over the management and safe disposal of ozone depleting chemicals. The activity was a result of network countries' request during the Joint Network Meeting of South Asia and Southeast Asia and the Pacific Ozone Officers in October 2012 in Thailand. During the study tour, the participants also brainstormed and deliberated on how to operate national ODS destruction programmes and even identified the possible options and barriers to success.

Currently, Holcim Indonesia is the only facility among all developing countries in the Asia-Pacific region that is able to destroy ODS. "As of now, Holcim has destroyed 19,000 kg of unwanted ODS from various

sources. Holcim Indonesia is assisting the Ministry of Environment to promote replacement of old ODS-based chiller and refrigeration equipment with more energy efficient ones, and at the same time to collect the ODS for disposal," stated Ms. Emma Rachmawaty, Assistant Deputy Minister for Mitigation and Atmospheric Function Preservation, Indonesia. Holcim Indonesia, the country's third largest cement maker, volunteered to undertake retrofitting in one of its two kilns in West Java to develop the capacity to destroy ODS. Under the cooperation framework between the Ministries of Environment of Japan and Indonesia, engineering work on the ODS destruction facility began in October 2006, supported by technical experts from Sumitomo Osaka Cement, Japan. Modifications to the cement kiln for destruction of ODS has three advantages: the costs involved are relatively small, the modification yields a large destruction capacity and the facility could be used on demand. *Contact: Ms. Anne Fenner, Information Manager, UNEP OzonAction Programme, France. Tel: +33 (1) 4437 1454; E-mail: anne.fenner@unep.org.*

*Source: www.unep.org*

### Maldives engages media for HCFC phase-out

The Government of Maldives will ban imports of HCFC-based equipment beginning 1 July 2014. The Minister of State for Environment and Energy, Mr. Abdul Matheen Mohamed, announced this at the closing of a national media training workshop on ozone and climate held in Male on 28 February 2013. The Minister underlined the need to raise awareness among both consumers and industry about these

regulations and sought the media's cooperation for this.

The "Ozone, Climate and Media: Communicating for Survival" workshop was attended by 22 journalists and broadcasters drawn from the country's print, broadcast and web media. The event, organized by the National Ozone Unit of the Ministry of Environment and Energy in partnership with the United Nations Environment Programme (UNEP) OzonAction and Maldives Broadcasting Commission, aimed to sensitize the media about climate and energy efficiency benefits of hydrochlorofluorocarbon (HCFC) phase-out for the industry as well as households in the Maldives. The Asia-Pacific Institute for Broadcasting Development (AIBD), Commonwealth Broadcasting Association (CBA) and TVE Asia Pacific supported the workshop. *Contact: Ms. Anne Fenner, Information Manager, UNEP OzonAction Programme, France. Tel: +33 (1) 4437 1454; E-mail: anne.fenner@unep.org.*

*Source: www.unep.org*

### German automakers go for CO<sub>2</sub>-based air-conditioning

German carmakers Volkswagen, Daimler, Audi, BMW and Porsche have announced plans to develop carbon dioxide (CO<sub>2</sub>) technology as a more climate-friendly refrigerant system for car air-conditioning. CO<sub>2</sub> as a refrigerant – also known as R-744 – has lower greenhouse gas effects than conventional refrigerants, with a global warming potential (GWP) value of just 1, or 99.3 per cent below the European Union-specified GWP limit of 150. Volkswagen says the technology will be rolled out progressively over its entire fleet of vehicles. German media sources report four other carmakers – Daimler, Audi, BMW



and Porsche – will also be switching to CO<sub>2</sub> technology in mobile air-conditioning systems as an alternative to R-1234yf.

R-1234yf was developed by Honeywell and DuPont as a more environmentally friendly refrigerant and an alternative to R-134a, which is being phased out by 2017 in the European Union. However, in September 2012, Daimler announced that it would stop using R-1234yf because of safety issues. In some head-on collision test scenarios, the refrigerant burst into flames, Daimler stated. According to SAE International, Honeywell and DuPont have defended the product, arguing there are other inflammable materials under the hood of a car and that R-1234yf was not inflammable in similar testing conditions.

Source:  
[www.environmentalleader.com](http://www.environmentalleader.com)

## Pakistan heightens HCFC phase-out campaign in industry

A workshop on “HCFC Phase-out and Alternatives” concluded on 13 February 2013 in Lahore, Pakistan. Organized by the Ozone Cell of the Ministry of Climate Change of Pakistan in collaboration with the Compliance Assistance Programme (CAP) of the United Nations Environment Programme (UNEP) Regional Office for Asia and the Pacific (ROAP) and the Pakistan Heating, Ventilation and Air-conditioning and Refrigeration (HVACR) Society, the workshop was attended by representatives of refrigeration industry, users of commercial refrigeration, environmentalists, the academia and the media.

The workshop presentations covered various technical aspects of phase-out of hydrochlorofluorocarbons (HCFCs) and possible alter-

natives such as natural refrigerants (ammonia, carbon dioxide and hydrocarbons). “Pakistan is working on many fronts for the HCFC phase-out. The Ministry of Climate Change considers HCFC phase-out as the major activity in the foreseeable future and requires a coordinated effort by the government, industry and consumers,” said Mr. Asif Khan, Ozone Officer of Ozone Cell, Ministry of Climate Change, Pakistan.

The HCFC Phase-out Management Plan (HPMP) of Pakistan being implemented by the Ozone Cell initially targets the foam sector to phase out HCFC-141b utilized in foam blowing applications. A quota system has been introduced to restrict imports of HCFCs into the country, as Pakistan does not produce these ozone-depleting chemicals. Through the HPMP, Pakistan received technical and financial assistance from the Multilateral Fund (MLF) for the Implementation of the Montreal Protocol to assist the industry in its transition to non-HCFC-based technologies. The United Nations Industrial Development Organization (UNIDO) is the lead implementing agency for this project and UNEP is the cooperating agency. *Contact: Mr. Atul Bagai, Senior Regional Network Coordinator, OzonAction Programme, UNEP Regional Office for Asia and Pacific, Bangkok, Thailand. Tel: +66 (2) 2881 662; Fax: +66 (2) 2883 041; E-mail: atul.bagai@unep.org.*

Source: [www.unep.org](http://www.unep.org)

## China's leading air-conditioner firms switch over to R290

In China's first technology roadmap for the home appliance industry, replacing hydrochlorofluorocarbons (HCFCs) with new refrigerants will

be the main task of China's air-conditioning (AC) industry in the future. China's AC industry passed its development peak and has now entered a period of constant growth. In recent years, the pressure of rising labour and raw materials cost, excessive production capacity and intensified inflation have made reducing costs and improving core competitiveness to become the main tasks of most Chinese AC companies. Consequently, the country's large AC companies are gradually shifting their attention to adopting newer technologies to be profitable again. As the amount of R290 (propane) needed in refrigeration system is 30 to 40 per cent less than R22, many companies bet on propane as the future of the industry.

This year, China's two leading AC manufacturers – Gree and Midea – have released their research and application results of alternative refrigerant products. Gree announced the completion of the world's first hydrocarbon refrigerant R290 split-type AC demonstration production line. Midea's key products using R290 have passed quality testing and manufacturing standards, and are ready for commercialization. Both companies have exhibited their new R290 products at major international trade shows. Midea has even become an official Montreal Protocol Implementation Demonstration Project funded by United Nations Multilateral Fund (MLF). The company has developed R290 compressor representative models adopting the latest DC inverter technology. It has also developed DC inverter AC with energy efficient grade level 1.

Besides big AC companies, industrial associations are also encouraging hydrocarbon technologies. The China Household Electrical Appliances Association (CHEAA)



has issued China's first technology roadmap for the home appliance industry with a focus on replacing HCFCs with new refrigerants. By 2015, the roadmap plans to reduce the consumption of HCFC-22 by 10 per cent from the averages of 2009 and 2010. More importantly, it aims to realize the industrialization of hydrocarbon technology and complete the replacement of HCFC-141b among companies that produce refrigerators, freezers and electric water heaters. The roadmap calls upon the industry to widely adopt low global warming potential (GWP) refrigerants and blowing agents, such as R290 and carbon dioxide (CO<sub>2</sub>). By 2020, the use of R744 (CO<sub>2</sub>) as natural refrigerant in production of freezer will meet requirements of "Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment" (RoHS). Overall, the roadmap aims to increase refrigerator energy efficiency by 20 per cent by 2015, and by another 15 per cent by 2020.

Source: [www.hydrocarbons21.com](http://www.hydrocarbons21.com)

## Call to ban HCFC that is entering Europe by sea

A call to close European ports to containers using one of the world's most harmful ozone-eating hydrochlorofluorocarbon (HCFC) gas has been issued by Maersk, the world's largest container shipping company, and by WWF, Europe's largest conservation group. HCFC-141b is slated for phase-out by the Montreal Protocol and listed as a controlled substance under the European Union's 2009 regulation on ozone depleting substances (ODS). HCFC-141b has a global warming potential (GWP) 725 times higher than carbon dioxide (CO<sub>2</sub>). When used in polyurethane foam to insu-

late containers, it will emit 27 times more CO<sub>2</sub> over its lifecycle than HFC-free alternatives. Because the European Union's law allows containers a three months stay in Europe's waters before being considered permanently "placed on the market", Maersk and WWF claim that the spirit of the law is being flouted. "The European legislation is helping maintain market demand for HCFC-141b despite its stated objective of doing the opposite," said Mr. Erik Høgh-Sørensen, a spokesperson for Maersk, which has developed an HCFC-free container alternative called Supotech – an environment-friendly but more expensive product.

Industry sources say that 85 per cent of the world's two million shipping containers use HCFC-141b. These are mostly made in China which, as an 'Article 5' developing country, was exempted from the original Montreal Protocol ban on HCFCs. Maersk says that HCFC-containing refrigerated containers are used in European waters before being scrapped, sometimes within the European Union's jurisdiction. "There is a ban in place but the (European) Commission seems unwilling to implement or enforce its own regulation," said Mr. John Nordbo, Head of Conservation for WWF Denmark, a charge that the European Commission has denied. Mr. Philip Owen, who heads the Commission's Transport and Ozone Unit has written to Maersk stating that it "is the responsibility of member state authorities to ensure that the relevant legislation is properly enforced and any illegal disposal of spent equipment is adequately sanctioned".

Maersk, however, views this as inconsistent with Article 24 of the European Union's regulation which empowers regular review of the law's exemptions – and allows new

proposals – when "technically and economically feasible alternatives to the use of controlled substances become available." Maersk fully switched over to Supotech in 2010, one year after the regulation was passed. But Commission sources say that the company has misread the law. "There is no derogation in place," a European Union official said, adding that "Article 24 is for new substances, not HCFC-141b." Maersk freely admits to having a horse in the race but maintains that it should not be punished for being a first mover in the green tech race.

Source: [www.euractiv.com](http://www.euractiv.com)

## Fiji to set up ODS laboratory

Fiji will soon have its own laboratory to test and analyse ozone depleting substances (ODS). Mr. Jope Davetanivalu, Director of Environment, said that the department has sought funding for a feasibility study for the establishment of an Ozone Depleting Substances Laboratory. The purpose of setting up the laboratory is to assist Fiji in the analysis and testing of ODS in the country itself, rather than sending the ODS outside Fiji to expensive places, Mr. Davetanivalu says.

Source: [www.fbc.com.fj](http://www.fbc.com.fj)

### Risk Assessment of Illegal Trade in HCFCs

The report provides an assessment of the current and future risk of illegal trade in HCFCs with particular focus on developing countries. For more information, please contact:

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Fax: +33 (1) 4437 1474  
E-mail: [unep.tie@unep.org](mailto:unep.tie@unep.org)

## CFC-free centrifugal compressors

Danfoss Turbocor Compressors Inc. (DTC), the United States, has expanded its line of oil-free, magnetic bearing variable-speed centrifugal compressors includes. The new line is free of chlorofluorocarbons (CFCs) and uses HFC-134a. Also, high energy efficiency means reduced greenhouse gas emissions. The compressors use solid-state electronics, with no lubrication and no metal-to-metal contact of rotating components. The soft start module, which is standard on each DTC compressor, significantly reduces the in-rush current at start-up, and provides advantages to line power systems and reduces thermal stress on the stator. The new developments include:

- 380 V TT350 compressor specifically targeted for fast growing markets such as Brazil, China, India and Russia;
- A 575 V version of the TT400 compressor for Canadian market; and
- Newly commercialized TG310 compressors, which use Honeywell's HFO-1234ze refrigerant with ultra-low global warming potential (GWP) and zero ozone depletion potential (ODP).

*Contact: Danfoss Turbocor Compressors Inc., 1769 E. Paul Dirac Drive, Tallahassee, Florida 32310, United States of America. Tel: +1 (850) 504 4800; Fax: +1 (850) 504 0280.*

*Source: www.danfoss.com*

## R-407F approved for use in scroll compressors

Honeywell, based in the United States, has announced that its R-

407F refrigerant, branded Genetron Performax LT, has been approved by Emerson Climate Technologies, the United States, for use in its Copeland scroll compressors (ZB & ZF Range) for low- and medium-temperature refrigeration applications. R-407F is also approved for the latest Copeland stream compressors. "Genetron Performax LT preserves superheat more effectively than R-407A, R-427A, MO99 and R-422B. Preserving superheat prevents flood-back issues, which protects compressors and extends their life," said Mr. Robert Kebby, Marketing Manager for the refrigerants business of Honeywell Fluorine Products in Europe, Middle East, Africa and India.

Performax LT refrigerant is specifically designed to replace R-22 and provides similar performance to R-22 in refrigeration, but needs fewer equipment modifications, has lower global warming potential and offers improved capacity and efficiency versus most popular low- and medium-temperature refrigerants, the firm claimed. The combination of these factors reportedly provides for the lowest total carbon dioxide footprint with a non-ozone depleting refrigerant. R-407F can also be used as an R-404A medium- and low-temperature retrofit refrigerant, providing similar/better capacity and improved efficiency, while cutting GWP by more than half.

*Source: www.racplus.com*

## Environment-friendly blast chiller

Precision Refrigeration Ltd., the United Kingdom, has developed what it believes to be the most environment-friendly blast chiller in the food service market. The Eco Chiller runs on the new HFO refrigerant R-1234ze (Solstice ze) that boasts of ultra-low global warming

potential (GWP) and zero ozone depletion potential (ODP). The new refrigerant has a GWP of just 6, as compared with R-404A's GWP of 3,922. At the same time, the new blast chiller uses Precision's specially developed control technology to reduce the amount of power required, so that it can operate from a single standard 13 A socket, unlike other systems which require at least 16 A connections. The new unit also features the latest EC energy saving fan technology that converts the AC supply to DC to cut the fan's power consumption by up to 30 per cent.

The new blast chiller's insulation is Precision's Envirofoam, which is based on vegetable oils rather than petrochemicals – appropriate for the food service industry. It has an ODP of zero and a GWP close to zero. Envirofoam actually requires less energy to produce than conventional polyurethane foams, while it's insulating properties and strength equal those of conventional foams. The control is either by time, or food temperature using the internal food probe. When the cycle is ended, the unit switches automatically to standard chiller. *Contact: Precision Refrigeration Ltd., Stephenson Way, Thetford, Norfolk IP24 3RU, United Kingdom. Tel: +44 (1842) 753994; Fax: +44 (1842) 766 636.*

*Source: www.precision-refrigeration.co.uk*

## Forane 427A trialled at brewer's sites

Successful trials at various sites of the United Kingdom-based brewer SAB Miller plc has led to African Oxygen Ltd. (Afrox), South Africa, now supplying the refrigerant gas Forane 427A to the brewer's sites in six countries – Botswana, Swaziland, Tanzania, Uganda, Ghana

and Zambia. Ultimately, all SAB Miller sites will run with this gas. Forane 427A is a non-toxic, non-inflammable, zero ozone depleting potential (ODP) refrigerant. This 100 per cent blend of hydrofluorocarbons (HFCs) achieves optimal performance close to that of the refrigerant R-22, but without a long and costly circuit rinse due to its high tolerance towards residual oil. Forane 427A is a simplified retrofit solution for existing R-22 direct expansion installations in a large range of applications. It can be used to retrofit low-temperature air-conditioning installations and refrigeration equipment.

The conversion to Forane 427A from R-22 was carried out by first recovering the precharged refrigerant from the new split air-conditioning units, removing the compressors from the units and draining the oil from the compressors. The compressors were flushed to remove all remaining oil using a cleaning solvent. Next, the compressors were charged with new polyol ester synthetic oil (POE) and reinstalled into the air-conditioning units. The units were then charged with an amount of Forane 427A refrigerant equivalent to the R-22 initial charge. Afrox has the equipment to clean the removed R-22 product, and it ensures that the HCFCs are not released into the atmosphere.

Source: [www.cbn.co.za](http://www.cbn.co.za)

## New HFO blend substitute for R-410A

Honeywell has launched its new Solstice L-41 low GWP refrigerant alternative to R-410A in residential and light commercial air-conditioning and heat pump applications. Solstice L41 is said to offer a 75 per cent reduction in GWP when compared with R-410A's global warming potential (GWP) of 2,088.

In addition, Solstice L-41 offers excellent energy efficiency, is cost-effective and can be used in existing equipment designs with minimal changes. A GWP of under 500 and a classification of A2L (mildly inflammable) are claimed. Solstice L-41 is a blend of R-1234ze, which was first introduced in 2008 and has since been proven and commercialized for chillers, insulating foam and aerosol applications.

Source: [www.acr-news.com](http://www.acr-news.com)

## R290 hydrocarbon refrigerant

Oz-Chill 22a (R290) from Ozo-Chill, Australia, is a hydrocarbon-based refrigerant blended from environmentally safe hydrocarbons and is a direct replacement and retrofit refrigerant option for replacing R22, R404 and R407. Oz-Chill 22a operates at much lower head pressures and offers improved cooling properties and performance compared to R22, says the company.

Compared with R22, Oz-Chill 22a claims the following benefits:

- Lower running costs offered will help save of up to 30 per cent;
- Oz-Chill 22a possesses similar volumetric refrigerating effects to R22, and can be used effectively in refrigeration systems without any major retrofitting;
- It is compatible with most common refrigerant materials including R22 metal components, synthetic and mineral (ester and PAG) lubricants, compressors, seals, hoses, gaskets and o-rings;
- Oz-Chill 22a only needs approximately 30 to 40 per cent of the R22 charge, due to the efficiency of the blend;
- It is a natural, organic, non-ozone depleting refrigerant that is fully compliant with the Montreal Protocol; and

- Oz-Chill 22a does not become caustic when contaminated with moisture or oxygen, and is non-toxic and non-carcinogenic with an auto-ignition temperature above 467.2°C.

Contact: Oz-Chill, PO Box 835, Balcatta WA 6914, Australia. E-mail: [info@oz-chill.com](mailto:info@oz-chill.com).

Source: [www.oz-chill.com](http://www.oz-chill.com)

## Refrigerant for low-temperature refrigeration systems

ISCEON® MO99™ (R-438A) from DuPont, with its headquarters in the United States, is a versatile R-22 replacement refrigerant for use in medium- and low-temperature refrigeration systems. The hydrofluorocarbon (HFC) refrigerant is said to combine R-22 pressure-enthalpy characteristics with mineral oil compatibility and can be used over a wide range of evaporator temperatures. ISCEON MO99 has been designed to match the pressure, temperature, enthalpy and mass flow properties of R-22 closely, for a seamless R-22 replacement. Its global warming potential (GWP) is 42 per cent lower than that of R-404A.

ISCEON MO99 matches R-22 in terms of capacity and efficiency in most systems, but with a significantly lower discharge temperature, which may prolong life of the compressor. It is compatible with traditional and new lubricants, providing quick, cost-effective R-22 replacements and can be topped off during service without removing the entire refrigerant charges. For most R-22 systems, a retrofit to ISCEON MO99 will need only R-22 recovery, replacement of critical seals and charge of refrigerant.

Source: [www2.dupont.com](http://www2.dupont.com)



## New cleaning agent with excellent environmental profile

DuPont, the United States, has developed a new range of fluids based on new fluorinated chemistry under its brand name Vertrel® for special applications, such as precision cleaning, heat transfer (cooling) and carrier fluid (greases, lubricants, oils). The range exceeds stringent environmental standards while maintaining high performance levels. DuPont markets these new fluids as cost-effective alternatives for perfluorocarbons (PFCs), perfluoropolyethers (PFPEs), hydrofluorocarbons (HFCs) and hydrofluoroethers (HFEs).

Vertrel Sion™ azeotrope is a binary azeotropic mixture, which offers a higher solvency precision cleaning agent that is non-inflammable and safe and has a low environmental impact for industrial cleaning applications such as vapour phase degreasing. The solvent is based on new extremely low (<1) global warming potential (GWP) hydrofluoroolefin (HFO) chemistry. Apart from providing powerful cleaning performance (Kb >100) with low cycle times, Vertrel Sion also has a very favourable toxicity profile. It is recyclable and reusable, and has a low boiling point (47°C), making it a fast-drying solvent.

Two other Vertrel speciality fluids based on the new chemistry – Sinera™ and Suprion™ – are also being launched. Vertrel Sinera is for heat transfer and test fluid applications and has a GWP below 10, making it an ideal replacement product for semiconductor fabrication plants and manufacturers of displays (flat panel displays, fibre optics and lens) looking to move away from PFCs and PFPEs with high GWP. Vertrel Suprion is tai-

lored for optimal performance in carrier fluid applications and can carry a range of functional materials with appropriate drying speeds, which contribute to very efficient deposition of lubricants and repellent materials, while having a GWP more than 30 times lower than the nearest rival in use today. *Contact: Mr. Horst Ulrich Reimer, DuPont PR Manager, Chemicals & Fluoroproducts, Frankfurt Am Main Area, Germany. Tel: +49 (6102) 181297; E-mail: horst-ulrich.reimer@dupont.com.*

*Source: us.vocuspr.com*

## Solvents for photolithographic patterning

Orthogonal Inc., the United States, has patented improved solvents and photoresists for the photolithographic patterning of organic electronic devices, systems comprising combinations of these solvents and photoresists, and methods for the use of these systems of solvents and photoresists to pattern various organic electronic materials.

In one embodiment, the invention relates to a composition comprising a copolymer of a monomer having at least one fluoro-containing group and a monomer consisting of at least one acid-hydrolysable ester-containing group, where the copolymer has a content of fluoro-containing groups that provides sufficient solubility in an orthogonal solvent. The orthogonal solvent may be a halogen-containing orthogonal solvent, such as a hydrofluoroether (HFE) selected from the group consisting of Novec™ 7100, 7200, 7300, 7400, 7500 and 7600.

The halogen-containing orthogonal solvent may also have additional non-halogen-containing solvent or

solvents such as isopropyl alcohol. The copolymer in the composition may have a bulk fluorine content of 30-50 per cent (preferably 37-45 per cent) weight/weight. *Contact: Orthogonal Inc., 95, Brown Road, Ithaca, NY, 14850, United States of America.*

*Source: www.sumobrain.com*

## Azeotropic methyl perfluoropentene compositions

E.I. Du Pont de Nemours and Co., the United States, has obtained a patent on azeotropic compositions comprising methyl perfluoropentene ethers for cleaning applications. The azeotropic composition comprises methylperfluoropentene ethers (MPPE) and at least one of methanol, ethanol, 2-propanol, hexane, heptane, trans-1, 2-dichloroethylene, ethyl formate, methyl formate, HFE-7100, HFE-7200 and 1-bromopropane or combinations thereof. The invention also provides a method for removing residue from a surface of an article comprising: contacting the article with a composition comprising an azeotropic or azeotrope-like solvent of above composition; and then recovering the surface from the composition. The patent also covers a method for depositing a fluoro-lubricant onto a surface of an article comprising: combining a fluoro-lubricant and a solvent, thereby forming a mixture, wherein the azeotropic solvent has the above-mentioned composition; contacting the mixture with the surface of the article; and evaporating the solvent from the surface of the article to form a fluoro-lubricant coating on the surface. *Contact: E.I. Du Pont de Nemours and Co., 1007, Market Street, Wilmington, Delaware, 19899, United States of America.*

*Source: www.sumobrain.com*



## New environmentally friendly cleaning specifications

NAVSOLVE™, developed by the Naval Air Warfare Centre Aircraft Division, the United States, is an effective, environmentally friendly cleaning solvent that meets or exceeds recent specifications on volatile organic compounds (VOC) and hazardous air pollutants (HAP). Navsolve incorporates the advantages of a solvent-based cleaner while offering the low-VOC/HAP-free benefits of water-based or semi-aqueous cleaners.

In response to the new environmental regulations for solvents, a new specification, MIL-PRF-32295, titled "Cleaner, Non-aqueous, Low-VOC, HAP-free" was developed to provide environmentally friendly cleaners to Department of Defence agencies. MIL-PRF-32295 states that a solvent must contain below 25 g/l of VOCs, be free of HAPs, be effective on grease and oil, not contain ozone depleting substances, be non-toxic and compatible with metals and non-metals and, most important of all, be safe to use. Furthermore, the Aerospace National Emission Standards for Hazardous Air Pollutants require that immersion-cleaning solvents have vapour pressures less than 7 mm Hg and wipe cleaning solvents have vapour pressures less than 45 mm Hg.

The MIL-PRF-32295 specification classifies low vapour pressure solvents as Type I (less than 7 mm Hg) and moderate vapour pressure solvents as Type II (less than 45 mm Hg). Although a few other commercially available solvents meet the Type I specification for MIL-PRF-32295, Navsolve is the only product meets both Types I and II specifications for MIL-PRF-32295.

Navsolve delivers the high performance of high-VOC cleaners, while meeting the new restricted environmental regulations in California State. *Contact: FLC Management Support Office, 950 North Kings Hwy., Suite 105, Cherry Hill, NJ 08034, United States of America. Tel: +1 (856) 6677 727; Fax: +1 (856) 6678 009; E-mail: flcmso@federallabs.org.*

Source: [www.federallabs.org](http://www.federallabs.org)

## Aqueous cleaner for electronic assemblies



*Kyzen Corporation's award-winning cleaner solution*

In the United States, Kyzen Corporation has won a 2013 National Procurement Institute (NPI) award in the category of Cleaning Materials for its Aquanox® A4639 electronic assembly aqueous solution. Aquanox® A4639 is an engineered aqueous cleaning fluid that has proven effective on a wide range of soils including the latest lead-free no clean formulations at low operating temperatures and concentrations. A4639 was designed for use in batch spray systems and provides exceptional cleaning results and protection of metallic surfaces with minimal monitoring and no sump-side additives. The easy-to-control fluid protects solder joints from chemical attacks and is effective on B-side misprints. The biodegradable aqueous solution

does not contain any chlorofluorocarbon (CFC) or any hazardous air pollutant (HAP). *Contact: Kyzen Corporation, 430 Harding Industrial Drive, Nashville, TN 37211, United States of America. Tel: +1 (615) 8310 888; Fax: +1 (615) 8310 889.*

Source: [www.kyzen.com](http://www.kyzen.com)

## Tertiary butyl acetate solvent

TBAc™ from Lyondell Chemical Company, the United States, is a tertiary butyl acetate, urethane-grade solvent exempt of volatile organic compounds (VOCs) and hazardous air pollutants (HAPs). The low-toxicity solvent is soluble in water to the extent of 0.8 per cent at 23°C. It has excellent solvency for a variety of substances including nitrocellulose, acrylic, alkyd, polyester and urethane resins. TBAc solvent is a substitute for a variety of HAP and VOC solvents such as esters, ketones, xylene, toluene and hydrocarbons.

The TBAc solvent has a density of 0.8599 g/ml (at 25°C), a viscosity of less than 1.2 (at 20°C), vapour pressure of 31 mm Hg (at 20°C) and a dielectric constant of 1.94 (at 20°C). It has a flash point of 4.4°C and a boiling point of 98°C. The solvent finds use in industrial coating formulations, packaging inks and pressure-sensitive adhesives, in solvent-based cleaning (including metal degreasing and specialized equipment cleansing), in photoresist formulations used in semiconductor processing, and for cleaning and degreasing circuit boards and removing solder flux. *Contact: Lyondell Chemical Company, 1221 McKinney Street, Suite 700, Houston, TX 77010, United States of America. Tel: +1 (713) 652 7200; Fax: +1 (713) 652 4151.*

Source: [www.lyondell.com](http://www.lyondell.com)

## Water mist system for maritime applications

Autronica Fire and Security AS, Norway, offers a new water mist system that comes with features like low weight, easy installation and high-tech design. FlexiFOG® micro-accommodation water mist system can be integrated into a single-supplier fire detection and suppression system. It can provide total flooding and local protection with one single pump package. FlexiFOG® is reported to offer the following advantages:

- Less power and water – The pump pressure of the system is only 20 per cent of similar high-pressure systems, and together with its low water consumption, power consumption is reduced by more than 50 per cent;
- Weighs less – The design on a medium-sized ferry with approximately 1,500 nozzles enables a weight reduction of around 2 t;
- Less space – The back-up tank for one minute operation covering 280 m<sup>2</sup> will be reduced more than 70 per cent compared with traditional sprinkler systems;
- Less visible – The nozzle can be flush-mounted, measuring only 8 mm below the ceiling, in client-specified colours to adapt to any surrounding environment; and
- Costs less – Use of a press fittings pipe system reduces the installation cost by approximately 25 per cent when compared with traditional piping, besides the cost benefits offered by a smaller tank.

*Contact: Autronica Fire and Security AS, Haakon VII's Gate 4, Trondheim, 7483 Norway. Tel: +47 (73) 582 500; Fax: +47 (73) 582 501.*

*Source: www.thebigredguide.com*

## Water mist for fire fighting in tunnels

Aquasys Technik GmbH, Austria, has designed and developed an effective water mist system for efficient fire fighting in tunnels. Upon detection of a fire in the tunnel, the system produces water mist in the affected part of the tunnel. The small water droplets evaporate fast leading to an enormous cooling effect. Additionally, the water mist acts like a countless number of reflectors, thereby drastically minimize heat flux radiation. Because of using pure water, the water fog is harmless for human beings and the environment and therefore can be operated during the evacuation procedures of the tunnel. Any fire safety equipment in tunnels must:

- Prevent the fire from spreading;
- Enable access for the fire brigade to the scene of the fire; and
- Protect the tunnel structure.

The Aquasys system fulfils these requirements, as demonstrated in several full-scale fire tests under observation of reputed and independent institutes for fire protection and safety.

*Source: www.firesafetysearch.com*

## New water-based fire extinguishant and fire fighting apparatus

Japan Fire Protect Co. Ltd., Japan, has obtained a United States patent for a method of manufacturing a fire-extinguishing agent and a fire extinguishing apparatus. The fire-extinguishing agent is made by dissolving 55-65 g of diammonium hydrogen phosphate in 300-350 ml of hot water at 70°-90°C to, then dissolving 6-8 g of ammonium sulphate in the prepared solution, dissolving 170-190 g of potassium

carbonate in the resultant solution and adding to it 25-35 ml of the undiluted solution of an aqueous film-forming foam fire extinguishant. The quantity of the fire-extinguishing agent is then adjusted to 600 ml. A throw-type fire extinguisher having a total weight of 700 g to 800 g is produced by charging a container with 600 ml of the fire-extinguishing agent.

*Source: www.freepatentsonline.com*

## Total flooding fire suppression units

Firetrace International, the United States, offers its range of 360 psi engineered total flooding fire suppression systems. The total flooding systems use only "clean" fire suppressing agents such as 3M™ Novec™ 1230 Fire Protection Fluid and DuPont™ FM-200®. Clean fire suppressing agents are totally safe to use in enclosed areas, and are non-conductive and non-corrosive. They disperse as a colourless and odourless gas that leaves no residue, requires no clean-up and has virtually no measurable impact on the environment. Firetrace total flooding cylinders are available in eight capacities in fill volumes that range from 4 kg to 590 kg, which can be combined to create fire suppression systems of an appropriate size. The cylinders can be underfilled in 0.5 kg increments to meet the exact quantity of the agent required. Dispersion nozzles come in various discharge patterns for pipe sizes ranging from ½ in to 2½ in. The systems can be activated either manually, or automatically by mechanical, pneumatic or electrical activation. *Contact: Firetrace International, 8435 N 90th St., Scottsdale, Arizona, AZ 85258, United States of America. Tel: +1 (480) 607 1218.*

*Source: www.datacenterworld.com*

## CO<sub>2</sub> as a blowing agent for PU mouldings



Test set-up in the IKV polyurethane pilot plant

In Germany, the Institute of Plastics Processing (IKV) at RWTH Aachen University is developing a new foaming technology for the production of foamed polyurethane (PU) mouldings. As the blowing agent, the new technology employs carbon dioxide (CO<sub>2</sub>), regarded as the most promising environment-friendly alternative to chemical foaming with water, which results in hard and brittle PU segments. However, the use of large amounts of CO<sub>2</sub> as the blowing agent has been slowed by the lack of control of the foaming process – an issue that the new process has solved. Initial tests have shown that the process results in PU of densities much lower than that were possible until now. To achieve controlled expansion of the reaction mix, a gas counter-pressure is generated in the foaming mould. This cavity pressure – more than the vapour pressure of the dissolved CO<sub>2</sub> – prevents early foaming-up, and a specific reduction of it can help control the timing and speed of the expansion process. This prevents early expansion and foam collapse.

The IKV scientists worked with PME fluidtec GmbH, Ettenheim, in the development of a sealed-off mould with valve technology and a

corresponding process control. Furthermore, the high-pressure HS500 metering machine from Hennecke GmbH was adapted to the new process technology. Preliminary trials have yielded flexible foam parts with a density of ~90 kg/m<sup>3</sup>. The process thus opens the door to expanding the range of individually adjustable mechanical properties of the PU foam. CO<sub>2</sub> significantly reduces the amount of isocyanate that needed for the conventional chemical foaming reaction, and thus helps to reduce costs. *Contact: Dipl.-Ing. Simon Latz, PU technology/Process technology, Institut für Kunststoffverarbeitung (IKV), at RWTH Aachen University, Pontstraße 49, 52062 Aachen, Germany. Tel: +49 (241) 809 3673; Fax: +49 (241) 809 2262; E-mail: latz@ikv.rwth-aachen.de; Website: www.ikv-aachen.de.*

Source: [www.ikv-aachen.de](http://www.ikv-aachen.de)

## PS/PE oxide copolymer cell size enlarger for foam

Owens Corning Intellectual Capital LLC, the United States, patented a composition for forming a closed cell, rigid thermoplastic polymer foam that includes a foamable polymer material, at least one blowing agent, an infrared attenuating agent, and a copolymer of grafted maleic anhydride-styrene with polyethylene (PE) oxide. Polymeric foam and polymeric foam products that contain a foamable polymer material, at least one blowing agent, an infrared attenuating agent and a polystyrene (PS)/PE oxide copolymer are provided. In an exemplary embodiment, the blowing agent contains a hydrofluorocarbon (HFC). The maleic anhydride-styrene copolymer grafted with PE oxide increases the polymer foam's cell size and offsets or even negates

the decreased cell size caused by HFC blowing agent and/or infrared attenuating agents. In addition, the copolymer of maleic anhydride-styrene grafted with PE oxide has a positive effect on the processability of the blowing agent(s) in the composition by both widening the process window and enhancing the solubility of the blowing agent in the polymer melt. Thus, the PS/PE oxide copolymer acts as a cell enlarger, a plasticizer and a processing aid. A method of forming an extruded foam product is also provided. *Contact: Owens Corning Intellectual Capital LLC, Toledo, Ohio, United States of America.*

Source: [www.freepatentsonline.com](http://www.freepatentsonline.com)

## Low-density PU for energy efficiency

BASF Polyurethanes, Germany, and Hisense, China, have jointly readied a highly energy-efficient domestic refrigeration technology using the novel Elastocool® low-density polyurethane solution from BASF. Elastocool, combined with Hisense's advanced foaming technology, sharply reduces polyurethane (PU) material usage while improving thermal insulation performance. This new generation of foams also helps reduce carbon dioxide (CO<sub>2</sub>) emission. The foam density can be reduced to 30 kg/m<sup>3</sup>, saving raw materials cost by up to 8 per cent. Energy consumption reduces by up to 5 per cent because of the low thermal conductivity (K value). In addition, the outstanding dimensional stability and compressive strength of the system allows manufacturers to design energy-saving refrigerators that combine excellent insulation performance with minimal material thickness, providing more storage space inside the fridge.

Source: [www.greater-china.basf.com](http://www.greater-china.basf.com)



## Destruction of MeBr captured on activated carbon

During post-harvest applications, methyl bromide (MeBr) fumigants get vented to the atmosphere from fumigation chambers. Elimination of these emissions is desirable due to concerns about their contribution to stratospheric ozone depletion. One alternative is to capture the emitted fumes on activated carbon. However, disposal of the MeBr-saturated activated carbon would be costly, both because this saturated carbon needs to be disposed of as a hazardous waste and because such a disposal will require continuous replacement of activated carbon. An alternative would be to heat the carbon and volatilize the MeBr for reuse as a fumigant. However, such recycling of MeBr could affect agricultural product quality because other constituents, including flavours, are likely to get recycled, potentially contaminating commodities in subsequent fumigations. Therefore, the most feasible option available currently involves capturing MeBr on activated carbon after each fumigation, heating the carbon to volatilize the MeBr, which is destroyed by purging it through a thiosulphate solution. Researchers at Yale University, the United States, are evaluating whether this option could be improved to reduce the cost.

The researchers evaluated whether heating the carbon to volatilize MeBr was necessary, as the heating cost is anticipated to account for a significant fraction of the operational costs of this process. Experiment results suggest that MeBr could be destroyed at full scale without heating the activated carbon and treating the resulting fumes in a separate thiosulphate bath. Rather, the MeBr-saturated

activated carbon bed could be filled with a thiosulphate solution to destroy the MeBr adsorbed. The relatively harmless product of the destruction reaction, bromide, will remain in the solution, which could be drained as a relatively harmless wastewater. The activated carbon bed could be dried by venting with air prior to being placed back into service for the next run.

Second, the researchers evaluated whether the process could be further simplified by eliminating the need for a thiosulphate solution. They evaluated the potential for the electrolysis of surface-bound MeBr, wherein the activated carbon would be transformed into an electrode, such that the MeBr adsorbed be directly destroyed by the electrons from the electrical grid. The activated carbon bed would be filled with salt water to facilitate completion of the electrical circuit. Experiment results indicate that electrochemical reduction is a feasible alternative technology to the current technology. Future experiments are focused on optimizing this system to achieve kinetics that equal or exceed those of the current thiosulphate-based system.

*Source: mbao.org*

## Bio-techniques for soil disinfestation

In Japan, chloropicrin (trichloronitromethane) and 1,3-dichloropropene (1,3-D) are seen as the best current alternatives to methyl bromide (MeBr). Although these two fumigants are not recognized as ozone depleting substances (ODS) such as MeBr, their rapid volatilization causes air pollution. As economically feasible new soil fumigation techniques are desired eagerly by growers, biological soil disinfestation (BSD) techniques with diluted ethanol have been developed to

prevent soil-borne diseases. The National Institute for Agro-Environmental Sciences (NIAES) conducted the project during 2008-2011, in cooperation with a number of other central and prefectural research entities, with financial support from the Ministry of Agriculture, Forestry and Fisheries.

The main purposes of this project were: to clarify the mechanism of the BSDs; to optimize and adapt the methods to each agricultural condition; and to draw up an implementation manual on BSDs with diluted ethanol. The main project results included the following:

- The suppression mechanisms of soil-borne pathogens account for differences in their sensitivities to changes in physical and chemical soil environments; and
- Because these diluted ethanol solutions to apply for BSDs have little direct impact on soil-borne pathogen, the diluted ethanol does not meet the category of pesticides in Japan. Consequently, this ethanol material is not to subject to any control under the pesticide regulation, and farmers are able to use these BSD techniques.

The implementation manual and details of technical data on BSDs with diluted ethanol have been published. *Contact: Mr. Y. Kobara, National Institute for Agro-Environmental Sciences (NIAES), 3-1-3, Kannondai, Tsukuba, Ibaraki 305-8604, Japan.*

*Source: mbao.org*

## New fumigant and fumigant blend buoy growers' optimism

The recently registered fumigant Paladin offers growers another option to help control soil-borne pests. Like nearly all soil fumigants, the



product contains dimethyl disulphide as the active ingredient and complies with a host of requirements of the United States Environmental Protection Agency (EPA). However, Paladin has what Arkema Inc., the registrant, describes as a distinct garlic-like odour that continues to be an issue with some.

In the United States, Mr. Stanley Culpepper, a University of Georgia weed scientist, Mr. Perry Fuller, Manager of the TriEst Ag Group Inc., and another colleague began exploring Paladin blends about two years ago. The goal was to reduce the overall amount of fumigant applied and the accompanying buffers yet maintain efficacy. By reducing application rates, the three figured they should be able to reduce the odour issue and improve economics. The result was a blend of Paladin, 1,3-dichloropropene and chloropicrin nicknamed WSP. It is used together with high-barrier mulches, such as virtually impermeable film (VIF) or totally impermeable film (TIF). "With WSP, you get the best of every world," Mr. Culpepper asserts. WSP also has to be used in conjunction with an herbicide programme applied over the bed top since it is weak on many other weeds. When mixed with chloropicrin fumigant, Paladin has performed as well as or better than a methyl bromide-chloropicrin blend in hundreds of field trials.

Source: [www.thegrower.com](http://www.thegrower.com)

## Catalytic oxidation of MeBr emissions

Efficient methods to destroy or capture and reuse spent methyl bromide (MeBr) are required if the current critical-use exemption of MeBr for applications, which include quarantine and pre-shipment (QPS) chamber fumigations, are to be preserved. Catalysed combustion is

a well-developed technology in the abatement of hydrocarbon emissions but few studies have looked at this technology for removal of brominated compounds. Scientists at the Department of Environmental Sciences, Connecticut Agricultural Experiment Station, the United States examined air oxidation of 30,000 ppmv MeBr over catalysts composed of platinum (Pt), palladium (Pd), ferric oxide ( $\text{Fe}_2\text{O}_3$ ), copper oxide (CuO) or lead oxide (PbO) nanoparticles on oxides of aluminium ( $\text{Al}_2\text{O}_3$ ), silica ( $\text{SiO}_2$ ) and titanium ( $\text{TiO}_2$ ) or mixed-oxides of cerium-aluminium ( $\text{CeO}_2\text{-Al}_2\text{O}_3$ ), cerium-silica ( $\text{CeO}_2\text{-SiO}_2$ ) and cerium-titanium ( $\text{CeO}_2\text{-TiO}_2$ ) supports and by self-assembled core-shell catalysts (Pd on  $\text{SiO}_2$  and Pd on 10 per cent  $\text{CeO}_2\text{-Al}_2\text{O}_3$ ).

The most efficient among the catalysts tested, 1 per cent Pt on 30 per cent  $\text{CeO}_2\text{-70 per cent Al}_2\text{O}_3$ , completely oxidized MeBr at  $400^\circ\text{C}$  – hundreds of degrees lower than spontaneous combustion – to give out a mixture of bromine ( $\text{Br}_2$ ) and hydrogen bromide (HBr). Ceria ( $\text{CeO}_2$ ) was the most effective support. In fact, 100 per cent ceria was comparable in activity to 1 per cent Pt/30 per cent  $\text{CeO}_2\text{-70 per cent Al}_2\text{O}_3$ , the stability of which was indicated in preliminary tests over three runs lasting a total of about an hour. The selectivity for  $\text{Br}_2$  increased with temperature and was slightly greater when the inlet stream was hydrated than when it was not. With further development catalytic oxidation may be a promising approach for elimination of MeBr emissions from QPS fumigation operations. Contact: Mr. Chia-Ying Chen, Department of Environmental Sciences, Connecticut Agricultural Experiment Station, New Haven, Connecticut, CT 06511, United States of America.

Source: [mbao.org](http://mbao.org)

## Response of soil organisms to DMDS fumigation

Dimethyl disulphide (DMDS), which is known to have broad-spectrum pest control, is increasingly being used as an alternative to methyl bromide. DMDS' effectiveness has been mainly investigated to study target soil-borne pathogens and nematodes; its effects on microbial community structure are largely unknown. Researchers from Water Management Research Unit of the United States Department of Agriculture's Agricultural Research Service (USDA-ARS) and University of California, the United States, examined and compared the impact of different rates of DMDS on target (Citrus nematodes, *Pythium* spp., *Fusarium oxysporum*, etc.) as well as non-target soil organisms (fungi, Gram-positive and negative bacteria, actinomycetes, arbuscular mycorrhizal fungi, etc.)

DMDS was applied at 32, 64, 128 or 256 mg/L air space per vine. One treatment remained without DMDS fumigation and served as control. Immediately after fumigation, 3.7 L water was applied to each vine in a 2 h period to seal the soil surface. One soil sample per vine at 1-60 cm soil depth was taken 15, 45, 60 and 90 days after fumigation with a 2.5 cm diameter auger. Phospholipid fatty acids (PLFAs) were extracted from 10 g top soil samples. Individual PLFA signatures were used to quantify the abundances of specific microbial groups in soil samples. Contact: Mr. Sadikshya Dangi, Water Management Research Unit, Agricultural Research Services, United States Department of Agriculture, Parlier, CA 93648, United States of America.

Source: [mbao.org](http://mbao.org)

### Fundamentals of Refrigeration

This handy booklet covers the fundamental principles of refrigeration including air-conditioning design, applications, equipment, components and systems. It is ideal for newcomers joining the industry as well as for those who want to brush up on basics.

### Basics of Air-conditioning

This booklet covers the basics of air-conditioning systems and includes definitions, explanation of the psychrometric chart, estimating cooling loads, air distribution and duct design. This guide is aimed at trainees and other newcomers joining the industry.

### HVAC Handbook Part 1

A comprehensive reference book for all heating, ventilation, air-conditioning and refrigeration engineers whether involved in sales, design, installation, service or maintenance, this handbook is convenient to refer and use. The contents are presented in the form of tables, graphs, figures and thumb rules. This book is divided into 12 sections covering: design data, psychrometrics, IAQ and comfort; air ducts – design, materials and installation; water and steam piping; refrigerant piping; refrigerants, secondary coolants and lubricants; thermal insulation; noise and vibration; electrical; conversion factors and tables; codes and standards; safety; and glossary.

*For the above three books, contact: ISHRAE Headquarters, 502, DDA Building, District Centre, Laxmi Nagar, Delhi 110 092, India. Tel: +91 (11) 4300 1814/2254 0537; E-mail: ishrahq@airtelmail.in; Website: www.ishrae.in.*

### Risk Assessment of Illegal Trade in HCFCs

The report provides an assessment of the current and future risk of illegal trade in hydrochlorofluorocarbons (HCFCs) with particular focus on developing countries. The document takes a holistic approach analysing numerous factors contributing to black market trade as well as historical information and recent case studies. It analyses the risk and scale of future HCFC smuggling and proposes targeted recommendations to mitigate these risks.

*Contact: UNEP DTIE, OzonAction Branch, 15 rue de Milan, 75441 Paris CEDEX 09, France. Tel: +33 (1) 4437 1450; Fax: +33 1 4437 1474; E-mail: unep.tie@unep.org; Website: www.unep.org/dtie/.*

03-04 Jun  
Vienna  
Austria

### UNIDO ATMOSphere Technology Summit 2013

Contact: Mr. Halvart Koeppen, Regional Officer (Europe & Central Asia), UNEP DTIE OzonAction Programme, 15 rue de Milan 75441 Paris Cedex 09, France. Tel: +33 (1) 4437 1432; Fax: +33 (1) 4437 1474; E-mail: halvart.koppen@unep.org.

29-30 Jun  
Bangkok  
Thailand

### Advancing Ozone & Climate Protection Technologies: Next Steps Second International Conference

Contact: Mr. Atul Bagai, Senior Regional Coordinator, United Nations Conference Centre, Rajdamnern Nok Avenue, Bangkok, Thailand. Tel: +66 (2) 2881662; E-mail: atul.bagai@unep.org.

25-27 Sep  
Bad Krozingen  
Germany

### 5th International Conference on Solar Air-Conditioning

Contact: Ostbayerisches Technologie-Transfer-Institut e.V. Wernerwerkstr. 4, 93049 Regensburg, Germany. Tel: +49 (941) 296 88 29; Fax: +49 (941) 296 88 17.

09-13 Oct  
Bangkok  
Thailand

### BANGKOK RHVAC 2013

Contact: Thai Trade Fair, 44/100 Nonthaburi 1 Road, Bang Kra Sor, Nonthaburi 11000, Thailand. Tel: +66 (2) 507 7842; Fax: +66 (2) 547 5683-4; E-mail: rhvac@ditp.go.th.

04-06 Nov  
San Diego  
United States

### 2013 Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reduction

Contact: Methyl Bromide Alternatives Outreach, 6556 N. Dolores Avenue, Fresno, California, CA 93711, United States of America. Tel: +1 (559) 449 9035; Fax: +1 (559) 449 9037; Website: mbao.org.

12-14 Nov  
Jakarta  
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### HVACR INDONESIA 2013

Contact: Informa Exhibitions Pte. Ltd., 111 Somerset Road #11-08, TripleOne Somerset, Singapore 238164. Tel: +65 6411 7777; Fax: +65 6411 7778; E-mail: info@pssseries.com.

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- VATIS Update (4 issues/year)
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  - Non-conventional Energy (e-version)
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  - Waste Management (e-version)

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