VATIS UPDATE

# Ozone Layer Protection

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### Highlights

- Global warming 'pause' linked to ozone chemicals ban
- India advances COOL HABITS initiative in the servicing sector
- Workshop for the adoption of HCFC alternatives
- Hybrid heat pump and gas water heater system
- Super-heated ultrasonic vapor degreaser
- Halon-free fire extinguisher
- Foaming technology for PU moldings using carbon dioxide
- Pesticide alternatives for strawberries


APCTT
Asian and Pacific Centre for Transfer of Technology

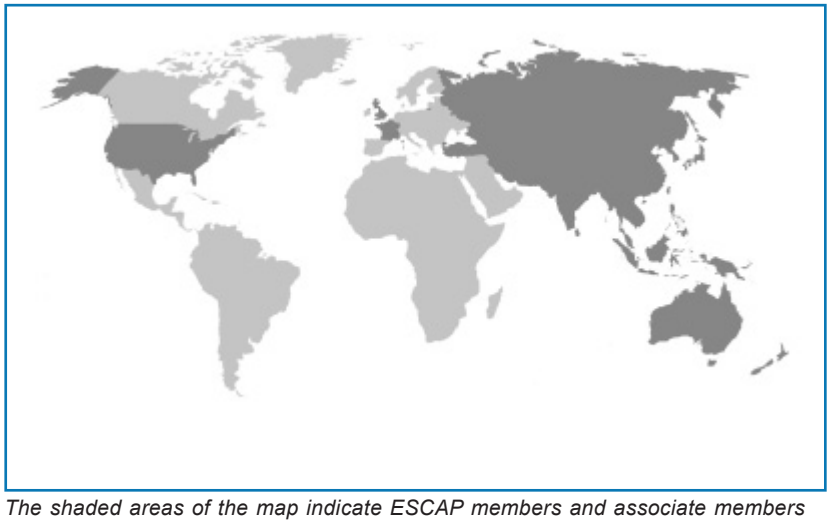
UNITED NATIONS ESCAP
Economic and Social Commission for Asia and the Pacific

Ozone Cell
Ministry of Environment and Forests
Government of India

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.

The Centre will achieve the above objectives by undertaking such functions as:

- 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 setup in the IKV PU pilot plant using carbon dioxide as the foam blowing agent

*(Credit: IKV Aachen, Germany)*

**VATIS* Update**
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# CONTENTS

Vol. 4 No. 121 Nov - Dec 2013

## Area of Antarctic ozone-depletion reaches annual peak

The area of the annually recurring Antarctic ozone hole reached its peak at 24.0 million square kilometers on 16 September, according to data from NASA. This is more than in 2012 and 2010, but less than in 2011. The World Meteorological Organization's newest Antarctic Ozone Bulletin said the ozone hole area averaged over the ten last days of September was 20.9 million $km^2$ (data from the Royal Netherlands Meteorological Institute, KMNI). The ozone mass deficit averaged over the same period was 19.59 megatonnes.

As the temperatures rise after the southern hemisphere winter, the ozone-depletion rate will slow down. It is still too early to give a definitive statement about the degree of ozone loss that will occur in 2013. Existing data indicates that this year's ozone hole is larger than in 2012 and possibly also 2010, but smaller than the one of 2011. The ozone bulletin is based on observations from the ground, weather balloons and satellites from WMO's Global Atmosphere Watch Program and its network of scientific stations in some of the world's most inhospitable terrain. Most stations reported clear signs of ozone-depletion. By most criteria, the largest ozone hole was observed in 2006. An international agreement banning the worst ozone depleting substances has stemmed the destruction of the ozone layer. However, severe Antarctic ozone holes are expected to continue during the next couple of decades.

*Source: http://www.wmo.int*

## Global warming 'pause' linked to ozone chemicals ban

A new study published in the journal *Nature Geoscience* suggests that the ban on ozone depleting chemicals may have also impacted the rise in global temperatures. CFC gases were responsible for a massive hole in the ozone layer but they also had a powerful greenhouse effect. The subject of a hiatus or standstill in global temperatures rises since 1998 has been the subject of intense debate among scientists, and it has been used as a key argument by some to show that the impacts of global warming have been exaggerated. There have been a number of theories as to why the rise in emissions from $CO_2$ and other gases has not been mirrored in temperatures since the late 1990s. These include increases in China's use of coal, changes in solar output, and the impact of the El Nino weather cycle. One report earlier this year suggested that it was caused by long-term changes in the warming of waters in the eastern Pacific. Now this latest piece of research says that it has been caused by attempts to protect the ozone layer.

A team of researchers from Oxford University, the United Kingdom, carried out a statistical analysis on the connection between rising temperatures and rates of increase in concentrations of greenhouse gases in the atmosphere between 1880 and 2010. They concluded that changes in the warming rate can be attributed to specific human actions that affected greenhouse gas concentrations. They were able to show that when emissions were reduced during both world wars and the Great Depression, temperature rises also stalled.

The researchers argue that the introduction of the Montreal Protocol, originally signed in 1987 by 46 countries, had an impact on global temperatures as well. The treaty phased out the use of chlorofluorocarbons (CFCs). These chemicals, used as spray can propellants and in refrigeration, had helped thin the ozone layer over Antarctica. But CFCs were not just damaging the ozone layer, they were also having a warming impact, as they are 10,000 times more powerful than carbon dioxide and can last up to 100 years in the atmosphere. Their removal, say the authors, was a critical factor in the slowdown.

*Source: http://www.bbc.co.uk*

## Cinderella gas a threat to climate and ozone layer

The United Nations Environment Programme (UNEP) has issued a warning about the dangers posed by nitrous oxide, the so-called "laughing gas". In a report presented at global climate talks, Unep says the chemical is now the biggest threat to the ozone layer. It says that thanks to farming and human activities, levels of the gas could double by 2050. If this happens, it could reverse gains made to slow the thinning of the ozone layer and exacerbate global warming. Nitrous oxide is one of several greenhouse agents which are dubbed "Cinderella" gases, because their contribution passes unnoticed.

Now, researchers say that $N_2O$ has emerged as the single biggest threat to the ozone layer since chlorofluorocarbons and other damaging gases were restricted by the Montreal Protocol signed in 1987. The famous "hole" over Antarctica has started to recover as a result of the phasing out of

the hair sprays and refrigerants that contained these substances. But according to this new report, if no action is taken, levels of nitrous oxide could increase by 83% from 2005 to 2050. However, the researchers were optimistic that both the warming potential and the danger to the ozone layer could be swiftly curtailed if action was taken, particularly in agriculture.

*Source: http://www.bbc.co.uk*

## Encouraging information about the ozone hole in 2013

For nearly 50 years, scientists with National Oceanic and Atmospheric Administration (NOAA), the United States, have launched high-altitude balloons from the South Pole, to understand why a hole was forming in the protective ozone layer high in the atmosphere. Now, organizations around the world track the infamous ozone hole through these balloon-sondes, satellite measurements, and ground instruments. This year, the ozone hole was a little smaller than in years past, those measurements showed, and ozone levels in a critical region of the atmosphere did not drop as low.

"We cannot say that this represents recovery, but it is certainly good news to see this year on the higher side of the average ozone range," said NOAA's Bryan Johnson, with the Earth System Research Laboratory (ESRL) in Boulder, Colorado, the United States. Johnson works with colleagues at NOAA and the Cooperative Institute for Research in Environmental Sciences (CIRES) (a joint institute of the NOAA and the University of Colorado Boulder) at the University of Colorado, Boulder, the United States, to track and understand trends in seasonal ozone from measurements made by a two-person NOAA crew at South Pole Station. Earth's ozone layer shields life on the planet's surface from ultraviolet radiation that can cause skin cancer and damage plants. According to NOAA global observations, chlorine levels at the poles reached a maximum at the beginning of this century and are now on the decline.

When conditions are right — as they are in the Antarctic spring — chlorine from ozone depleting gases can rapidly break apart ozone molecules, reducing ozone over Antarctica by one half in just a couple of weeks. The World Meteorological Organization, Switzerland, reports that this year's ozone hole stretched about 8 million square miles (21 million square kilometers) in late September, about the size of the United States, Canada and Mexico combined. For comparison, the Antarctic ozone hole stretched to more than 10 million square miles in the record year of 2006. Of particular interest is the region between 7 and 12 miles altitude (12-20 kilometers). There, ozone levels are more strongly influenced by man-made ozone depleting chemicals than by natural variations in meteorology. This year, ozone levels in this region of the atmosphere only dropped to about 25 Dobson Units (DUs) in late September; in previous years, they plummeted to less than 10 DUs.

*Source: http://www.cires.colorado.edu*

## Acid rain — ozone-depletion cause for ancient extinction

New results from a team including Director of Carnegie's Department of Terrestrial Magnetism, the United States, Linda Elkins-Tanton show that the atmospheric effects of the eruptions around 250 million years ago at the end of the Permian period could have been devastating. The mass extinction included the sudden loss of more than 90 percent of marine species and more than 70 percent of terrestrial species and set the stage for the rise of the dinosaurs. The fossil record suggests that ecological diversity did not fully recover until several million years after the main pulse of the extinction.

One leading candidate for the cause of this event is gas released from a large swath of volcanic rock in Russia called the Siberian Traps. Using advanced 3-D modeling techniques, the team, led by Benjamin Black of the Massachusetts Institute of Technology, the United States, was able to predict the impacts of gas released from the Siberian Traps on the end-Permian atmosphere. Their results indicate that volcanic releases of both carbon dioxide ($CO_2$) and sulfur dioxide ($SO_2$) could have created highly acidic rain, potentially leaching the soil of nutrients and damaging plants and other vulnerable terrestrial organisms. Releases of halogen-bearing compounds such as methyl chloride could also have resulted in global ozone collapse. The volcanic activity was likely episodic, producing pulses of acid rain and ozone-depletion.

The team concluded that the resulting drastic fluctuations in pH and ultraviolet radiation, combined with an overall temperature increase from greenhouse gas emissions, could have contributed to the end-Permian mass extinction on land.

*Source: http://www.sciencedaily.com*

## Kochi Metro for green fire fighting

The Kochi Metro Rail will soon be the first in the country to have an ecofriendly fire extinguishing system. The Fire and Rescue Service Department, during a discussion with Kerala Metro Rail Project (KMRL) officials, suggested the use of an eco-friendly fire extinguishing system like the ones used in aircraft. The authorities concerned have given the nod. According to Joe Ishow Kuruvilla, Division Officer, Fire and Rescue Service Department, it was agreed upon during the discussions to install a fire suppression system in which chemicals made of Trifluoroiodomethane would be used.

The Fire and Rescue Service Department official said an alarm-based fire system would be installed on the train and stations of the Metro. "In case of a fire, an alarm would ring. A specific time would be set for evacuating the passengers from the train or station. After the specified time, the doors would close automatically and Trifluoroiodemethanebased system would start extinguishing the fire," an official said. The use of Halon-based fire system is being discouraged due to its high ozone-depletion potential. "Trifluoroiodomethane is increasingly being used in aircraft considering its eco-friendly nature. Most of the European and American countries have stopped using the Halon-based system while India and some Asian countries are still resorting to it. Similar to Trifluoroiodemethane, Novec 1230 ($C_6F_{12}O$), which are also eco-friendly are used for fire fighting," an official said.

*Source: http://newindianexpress.com*

## India advances COOL HABITS initiative in the servicing sector

As the world in 2012 celebrated the 25th year of the global agreement to protect the ozone layer and the news that the size of ozone hole last year was the second smallest in the last 20 years, the Government of India remains vigilant in ensuring the phase-out of the remaining production and consumption of ozone depleting substances (ODS) in the country, particularly Hydrochlorofluorocarbons or HCFCs.

Just like in most developing economies, HCFCs are widely used in India in the Refrigeration and Air-Conditioning (RAC) sector. Being transitional substances for chloroflourocarbons (CFCs) in the last 20 years, the production and consumption of HCFCs has grown over the years. The average consumption of HCFC-22 alone during 2009-2010 was a whopping 10,945 metric tonnes which is equal to about 40% of India's baseline for this substance. In addition, it is expected that this may significantly increase due to high growth rate particularly in the room air-conditioner sub-sector, which is projected to have approximately 4.6 million units installed in 2013. This is a clear indication on the urgent need to address issues in the servicing sector in parallel with efforts to reduce HCFCs in the air-conditioning manufacturing industry.

To begin these efforts, the Ozone Cell, Ministry of Environment and Forests, GIZ, India, and the Compliance Assistance Programme (CAP) of the United Nations Environment Programme — Regional Office for Asia and Pacific (UNEP-ROAP) organized workshop on the HCFC Phase-out Management Plan (HPMP) in India at Mumbai, Maharashtra for the RAC servicing sector, particularly the distributors of spare parts and refrigerants and technicians' associations, through COOL HABITS or good practices in the servicing sector such as recovery, recycling and reclamation (RRR) and conversion to alternative technologies, the demand and emissions of HCFCs and other refrigerants will be reduced, contributing to the HCFC phase-out targets of the Government of India, said Mr. Atul Bagai, Senior Regional Coordinator, UNEP ROAP.

*Source: http://www.unep.org*

## Environment friendly water mist fire suppressants

INS Arihant, the Indian nuclear submarine features Defence Research and Development Organisation (DRDO) made water mist fire suppressant instead of the ozone depleting Halons. CFEES (Centre for Fire, Environment & Explosive Safety), a DRDO unit has designed and tested generation of water mist to fight pool fires. A water mist fire suppression system generates water droplets to sustain fire sprinkler system with the help of nozzles.

The DRDO technology was validated for INS Arihant submarine in real scale 590 $m^3$ cylindrical submarine fire simulation chamber. The simulation chamber was simulated as nuclear submarine compartment having four decks.

*Source: http://www.frontierindia.net*

## Twenty fifth meeting of the Parties to the Montreal Protocol

The twenty-fifth meeting of the Parties to the Montreal Protocol on substances that deplete the ozone layer (MOP25) took place in Bangkok, Thailand, from 21-25 October 2013. Over 560 participants attended the meeting, representing governments, UN agencies, intergovernmental and nongovernmental organizations, academia, industry, and the agricultural sector.

The preparatory segment took place from Monday to Wednesday, 21-23 October. The high-level segment (HLS), convened on Thursday and Friday, 24-25 October. The preparatory segment considered a number of substantive items as well as considered draft proposals forwarded by the Open-Ended Working Group (OEWG) at its thirty-third meeting in June 2013. The HLS adopted the decisions forwarded to it by the preparatory segment. Since the preparatory segment did not conclude its work by Wednesday, it reconvened several times in parallel to the HLS to complete discussions on outstanding agenda items. MOP 25 adopted 12 substantive and nine procedural decisions.

Substantive decisions adopted include: terms of reference for the study of the 2015-2017 multilateral fund (MLF) replenishment; the implementation of the Montreal Protocol with regard to small island developing states (SIDS); and a Technology and Economic Assessment Panel (TEAP) report on alternatives to ozone depleting substances (ODS). Procedural decisions adopted include: budget; organizational issues related to the TEAP; and membership of Montreal Protocol bodies for 2014. MOP 25 did not conclude discussions on the Montreal Protocol amendment proposals, additional funding for the MLF for the implementation of the Protocol to maximize the climate benefit of the accelerated phase-out of hydrochlorofluorocarbons (HCFCs); and the harmonization and validation of the climate impact fund.

*Source: http://www.unep.org*

## Workshop for the adoption of HCFC alternatives

A one-day workshop on technology, policy and standards for the adoption of HCFC alternatives was held in Tehran, Islamic Republic of Iran, which was back-to-back to the ozone day celebration. In Iran, the Montreal Protocol's anniversary was celebrated on 22nd September with an event at the Department of Environment. Its theme: "A healthy atmosphere, the future we want." The newly appointed Vice President of the Islamic Republic of Iran and Head of the Department of Environment, Ms. Masoumeh Ebtekar, in her opening speech emphasized on the readiness of her government to work and cooperate with the international community to promote international and national standards in the environmental issues in different fields particularly on the protection of ozone layer.

UN Resident Coordinator and UNDP Resident Representative Mr. Gary Lewis also delivered a message from UN Secretary-General Mr. Ban Ki-moon on the occasion of International Ozone Day. Mr. Lewis commended Iran for implementing the Montreal Protocol, but added that environmental issues, especially climate change, are still of great concern and pose immense challenges. UNIDO's representative, Mr. Alessandro Amadio was the last speaker in the opening session of the workshop and ozone celebration.

*Source: http://www.unep.org*

## Amendments to cut down HCFC by 2015

Malaysian Deputy Minister, Datuk, Dr. James Dawos Mamit said the ministry was in the midst of finalizing the amendments to the Environmental Quality Regulations (Refrigerant Management) 1999 under the Environmental Quality Act 1974, He expressed hope that the amendments could be gazetted in the Parliament by early 2015. The amendment was also made in part of the Montreal Protocol on substances that deplete the ozone layer that Malaysia had ratified in 1989. The protocol is an international treaty designed to protect the ozone layer by phasing out the production of numerous substances believed to be responsible for ozone depletion.

Dawos said the amendments made to the regulations were part of the country's strategy to slowly eliminate the usage of HCFC in conversion technology in industries such as manufacturing of foam, refrigerators and airconditioners. "Before the amendments are made, discussions were held with stakeholders and industry players, and this engagement is continuous," he added. Earlier, Dawos launched the International Ozone Day and a seminar on the plans to manage the elimination of hydroclorofluorocarbon usage (HCFC).

*Source: http://www.nst.com.my*

## Myanmar moves forward on HCFC emissions

Myanmar is on target for the reduction and eventual phasing out of chemicals that harm the earth's ozone layer, the environment minister said last week. Speaking at a ceremony to mark the International Day for the preservation of the ozone layer, Minister for Environmental Conservation and Forestry U Win Tun said the harmful chemicals known as HCFC would be phased out on schedule by 2030. The government started drawing up plans in 2010 to reduce domestic consumption of hydrochlorofluorocarbon (HCFC) over the next 20 years, with financial and technical support from the United Nations Environment Programme and the UN Industrial Development Organisation.

The minister said the plan, which is now complete, would be implemented once the necessary regulations have come into effect. "We will train professionals to replace HCFC with other technology and substances in refrigerator and air-conditioning manufacturing," U Win Tun said. Myanmar is a signatory to the Vienna Convention for the protection of the ozone layer and signed the Montreal Protocol on Substances that deplete the ozone layer and its London Amendment on November 24, 1993.

*Source: http://www.mmtimes.com*

## Sri Lanka to tackle ozone depleting substances

The Environment Ministry in Sri Lanka required the support of Government and Non-Governmental Organizations (NGOs) to eliminate ozone depleting substances (ODS) in the atmosphere, Environment and Renewable Energy Minister Susil Premajayantha said. Addressing a workshop, organized by the National Ozone Unit (NOU) and Sri Lanka Customs, to introduce new Customs symbols, he said that his ministry had already launched many programmes to reduce the emission of Chlorofluorocarbon (CFC) which damages the ozone layer.

Since Sri Lanka was not producing any of the ozone depleting substances, consumption was based on imports, he said adding that the CFC included in perfumes, refrigerators, air conditioners and pesticides was depleting the ozone layer largely. However, he noted that the Sri Lanka was one of the few countries with low emission levels of ozone depleting substances.

Commenting on the Montreal Protocol on Substances that Deplete the ozone layer, Minister Premejayantha said it was a universally ratified Protocol signed by 197 countries including Sri Lanka. He said worldwide reduction of the use of CFCs had drastically reduced skin cancers and cataract. He added that the number of global skin cancer patients had reduced by 295 million and cataract patience by 22 million. Premajayantha also mentioned that CFC emitting equipment such as refrigerators and air conditioners were being replaced by new equipment which do not use CFCs. He lauded the Customs Department for the assistance rendered to protect the environment by preventing such equipment from entering the country.

Meanwhile, the Minister also said that Sri Lanka had been recognized as a country which achieved many of the Millennium Development Goals (MDG) announced by the UN and the UNESCO due to the high literacy rate in the country.

*Source: http://www.island.lk*

## Indonesia optimistic about slashing HCFC use by 97.5%

Indonesia is optimistic about slashing the production and use of ozone depleting hydrochlorofluorocarbons (HCFCs) by up to 97.5 per cent as part of the country`s commitment under the Vienna Convention and Montreal Protocol, an official said.

"We are optimistic the target can be achieved since Indonesia managed to phase-out the use of chlorofluorocarbons (CFCs) in 2008, two years earlier than the target set by the Montreal Protocol," said Arief Yuwono, deputy for environmental destruction and climate change control to the environment minister. At their meeting in Montreal, Canada, in September 2007, all parties to the protocol agreed to expedite the phase-out of HCFC production and consumption between 2013 and 2030, he said. The parties to the protocol agreed to freeze production and consumption of HCFCs at the baseline level, the average of 2009 and 2010 consumption, as of January 2013, he said.

The level will then be reduced by 10 percent starting in 2015; 35 percent in 2020; 67.5 percent in 2025; and 97.5 percent in 2030. "From 2030-2040, the use (of HCFCs) at 2.5 percent of the baseline level will only be allowed for the repair of air conditioners," he added.

*Source: http://www.eco-business.com*

## Philippines appeals support to phase-out HCFCs

Foam, air-conditioning and refrigeration industry players and other stakeholders in the Philippines were asked to continue supporting the government's environmental programs, particularly the effort on ozone depleting substances (ODS) as the country moves for the complete phase-out of hydrochlorofluorocarbons (HCFCs) by 2040 under the Montreal Protocol.

Environment Undersecretary Analiza Teh said the Philippines has made significant breakthroughs in the global effort to restore the ozone layer by phasing out ODS since 2010 as agreed upon by 197 country-signatories to the treaty. Teh spoke in behalf of Secretary Ramon J.P. Paje of the Department of Environment and Natural Resources (DENR) during the Ozone2Climate technology roadshow and industry roundtable in Pasay City. She said that by 2010, the Philippines has successfully Phased out 98 percent of the production and consumption of ODS, including 100 percent of chlorofluorocarbons (CFCs), which were widely used in refrigeration, air conditioning and mobile air conditioning.

The Philippines, like most developing countries, has started implementing the HCFC phase-out management plan (HPMP) to achieve these phase-out targets. HPMPs are funded by the Multilateral Fund for the implementation of the Montreal Protocol. Early this year, the Philippine government has frozen the import of HCFCs at the 2010 base level of 162 ozone depleting potential tons. The level would then be reduced by 10 percent in 2015; 35 percent in 2020; 67 percent in 2025; 97.5 percent in 2030; and altogether banned in 2040. Teh said the government is exerting efforts to provide industry players help and support to identify and have access to the best possible alternative to HCFCs, so as not to adversely affect their businesses without compromising the country's commitment under the international agreement.

*Source: http://www.businessmirror.com.ph*

## Ebara to expand chiller business in Southeast Asia

Starting in October, Ebara Thermal Systems (Thailand) Co., Ltd. (ETST), which conducts the chiller business for the Ebara Group in the Southeast Asian region, has started the sale of a value-priced centrifugal chiller model RTGC that uses eco-friendly refrigerants. The two-stage compression centrifugal chiller model RTGS that is now available for purchase achieves high efficiency, high performance and long life. ETST also has a service and support system in place to perform regular maintenance after delivery to ensure that the product will always be at peak performance and be able to be used by customers for years to come.

With a thorough and precise service and support system at its core, Ebara will continue to contribute to the development of Southeast Asia not only through pumps, but also centrifugal chillers as well. Ebara was the first company in Japan to manufacture centrifugal chillers. Ebara Refrigeration Equipment and Systems Co., Ltd. (ERS), an Ebara Group company that engages in the chiller business, currently offer a wide-ranging lineup of products that includes COP7.0 super high efficiency chillers, chillers that utilize refrigerants with zero ozone depletion potential, as well as cooling towers that are used in 60 countries around the world.

*Source: http://www.malaysiasun.com*

## HC cooling equipment showcased in Bangkok

During the 25th Meeting of the Parties to the Montreal Protocol (MOP) in Bangkok at the end of October 2013, GIZ Proklima showcased their both climate-friendly cooling equipment, namely a Coca-Cola bottle cooler using $CO_2$ as a refrigerant and a supermarket freezer cabinet using propane (R-290), manufactured by AHT.

Austrian manufacturer AHT, specialised in hydrocarbon (HC) freezers for commercial applications, displayed its Paris model at the Bangkok meeting, which has a charge amount of 110 grams of R-290. "These plug-in cabinets are very efficient, so a supermarkets changing from an older centralised system to these cabinets can have a return on investment in as little as two years", explained Sumitra Eksithichai, Sales Director at AHT. While some visitors of the GIZ Proklima booth expressed their concerns about the maintenance of HC cabinets, experts were able to reassure the delegates that the maintenance of commercial propane freezers is very simple and requires cleaning the compressor room, if dusty, every three to six months — a task that can be done easily by the end-user.

*Source: http://www.hydrocarbons21.com*

## Low GWP refrigerant

Airedale International Air Conditioning, the United Kingdom, believes it will be the first to launch a production range of high performance free cooling chillers using the low global warming potential (GWP) refrigerant R1234ze. In recognition of its low global warming impact, the TurboChill free cooling chiller (TCF) with R1234ze automatically receives two BREEAM points, according to the company. In contrast, R134a TurboChill TCC and TCF variants receive one point for their Direct Effect Life Cycle (DELC) CO2 equivalent emissions of ≤1000 kg-CO2e/kW cooling capacity and a further point for leak detection and automatic shutdown and pump-down of refrigerant.

Energy efficiency is a key design criterion across Airedale's entire range of chillers, precision air conditioning and IT cooling systems which offer industry-leading part-load performance and energy efficiency for footprint. All models in the TurboChill range have been designed to meet the criteria established by the Energy Technology List and selected models qualify for a 100% first year capital allowance under the Government's Enhanced Capital Allowance (ECA) scheme.

The TurboChill FreeCool (TCF) is said to offer twice as much free cooling as a thermosiphon free cooling system and can deliver free cooling for up to 95% of the year. By constant monitoring of temperature differences, Airedale's control software permits concurrent free cooling — a mixture of free cooling and mechanical cooling — switching on the mechanically-driven compressor only when extra cooling is required.

*Source: http://www.racplus.com*

## Hybrid heat pump and gas water heater system

More than 70 attendees including the president of Noritz, a Japanese manufacturer of household water heaters with a head office in Kobe, Soichiro Kokui, gathered at Kandatsu factory in central Japan on 24 September to celebrate the shipment of the very first R290 hybrid heat pump (HP) unit.

The company's adoption of R290 refrigerant in a domestic hybrid water heater is a first for the industry. Hot water is supplied by the heat pump, which has a heating capacity of 2.2 kW, and is stored in a 90 liter storage tank. The heat pump unit is charged with 220 g of propane refrigerant. The unit's small footprint, with a depth of on 300 mm, enables easy installation in urban residences with limited space. Hot water is primarily supplied by high efficiency R290 heat pump system and stored in the tank. The additional gas heater starts working before hot water runs out or when the ambient temperature drops. Thanks to the hybrid system users do not need to worry about running out of hot water. According to the company, the primary energy efficiency of the new hybrid system is 50% higher than a previous model of gas water heater and 18% higher than a heat pump with an Annual Performance Factor (APF) of 3.2. These efficiency gains can lead to annual utility expenses savings of 60,000¥ (€450). This equates to an approximate 45% reduction in annual CO2 emissions in comparison with previous gas water heaters.

The hybrid system is available in two models. The SH-GTHC2400AD model provides hot water for household needs including bath hot water, while the SH-GTC2400A model provides hot water also for space heating. The space heating optimised unit is available for 865,000¥ (€6,550) while the hot water unit can be purchased for 765,000¥ (€5,800) excluding consumption tax. The company intends to sell 5,000 units on the domestic market in the first year.

*Source: http://www.hydrocarbons21.com*

## Propane heating and cooling plants in series production

Two German companies Futron GmbH in collaboration with the Thermofin GmbH, developed a compact refrigeration unit for a German discount retailer by using propane for refrigeration (130 kW) and a heat pump for heating (40 kW). The shelves, counters and cold rooms are indirectly cooled by the coolant propylene glycol. An optional $CO_2$ cascade system supplies the freezing demand. An additional vaporizer circuit in the lamella blocks of the air-cooled condenser supplies the heat from the ambient air for the floor heating. The compact refrigeration unit is designed to be cost efficient and environmentally friendly, producing the refrigeration needed to cool shelves, refrigerated counters, cold rooms, cold storage cells, and air-conditioning. It also generates floor heating and integrates the electro-technical equipment for the whole store.

Propane has energy-related and economic benefits compared to HFC refrigerants like R404A. Whilst it is largely used in systems with very low filling

capacities, below 150 g, such as in plug-in deep freezers, scientific studies have proven that for applications with higher charges, such systems can be designed to carry lower risks than conventional gas heating systems. Due to the outside installation and emergency facilities that go beyond required measures, the propane cooling and heating unit developed by Futron is absolutely reliable and safe, and does not require any special permits to operate.

Since 2009 Lidl has been focussing on using sustainable building technology including high efficiency heating and cooling systems for its stores. In the integral units used by Lidl, the core part of the system, as well as the freezer cabinets uses the refrigerant propane. By the beginning of April 2012 Lidl had already opened 109 stores with these new integral units. The achieved annual savings, compared to conventional stores, correspond to the heating energy of 872 residential houses, the electricity consumption of 436 residential houses and the $CO_2$-emissions of 3,270 passenger cars.

*Source: http://www.hydrocarbons21.com*

## Compressors using R290 for commercial applications

Having already gained popularity in Latin America and China, Embraco directs its Fullmotion for commercial compressor using natural refrigerant R290 to other international markets. The VNEK is Embraco's first high energy-efficiency product for commercial applications compatible with natural fluids. Due to a new category of variable-speed technology branded under the company's 'Fullmotion' label, energy efficiency can be improved by almost 40% compared to conventional compressors.

- Fullmotion technology adjusts to thermal fluctuation demands and enables the target temperature to be reached quickly and maintained more stable, which results in better energy-efficiency of the overall system;
- Reduced noise and less vibration contributes to a more comfortable working environment; and
- Wide capacity range guarantees the equipment will continue to operate smoothly in the event of voltage variability.

Application areas for the VNEK compressor are beverage dispensers, vending machines, ice-cream machines, chest freezers and wine coolers. VNEK compressor models using natural refrigerant propane (R290) are the VNEK2070U, VNEK213U and VNEK217U (currently in development).

*Source: http://www.hydrocarbons21.com*

## High temperature hydrocarbon steam heat pump

More than 580 participants attended the 2013 Japan Society of Refrigerating and Air Conditioning Engineers' (JSRAE) Annual Conference that took place during 10-12 September in Tokyo. A number of presentations centered around natural working fluids $CO_2$, ammonia, hydrocarbons and water. Hideki Fuchikami from Mayekawa's R&D Center introduced the company's latest research on a high temperature heat pump (HP) using hydrocarbon refrigerant. Industrial processes such as food processing have a high demand for steam in the temperature range 100-150°C. Traditionally, fossil fuel fired boilers have been used to supply the heating needs of the industrial sector. To provide a more efficient and environmentally friendly solution, since 2009 researchers at Mayekawa have been developing a heat pump using hydrocarbon as the refrigerant to generate high temperature steam above 150°C, as an alternative to fossil fuel using boilers.

According to Hideki Fuchikami, 39% of boiler use in the industrial sector is associated with temperatures under 100°C and 61% with temperatures above 100°C. While the sub 100°C heat demand can be efficiently provided by an industrial Eco Cute HP, new research was required to develop a natural refrigerant HP for high temperatures which could help to reduce $CO_2$ emissions and energy consumption in the industry. The newly designed HP system with a heating capacity of 245kW underwent a series of tests to verify its performance. Tests were carried out at condensing temperatures of Tc = 150-160°C and evaporation temperatures of Te = 70-80°C and a COP of 3 was confirmed. A high COP is expected by adjusting the system for optimal operation. The prototype system performance was verified with promising results. The commercialization is however still a few years away. Utilization of n-pentan as a refrigerant will require changes to current regulation. The PAG lubricant, prototype compressor and its newly designed parts, will need to be tested and evaluated for long term durability and performance.

*Source: http://www.hydrocarbons21.com*

## New environment friendly cleaning specifications

The South Coast Air Quality Management District (SCAQMD), the United States, has recently imposed restrictions limiting the use of solvents with volatile organic compound (VOC) contents no greater than 25 g/L for immersion-cleaning processes or requiring the use of airtight cleaning systems. To meet this need, the Naval Air Warfare Center Aircraft Division Patuxent River (NAVAIRWARCENACDIV) Materials Engineering Division developed NAVSOLVE™, an effective, environmentally friendly cleaning solvent that meets and exceeds the new low volatile organic compound (Low-VOC), free of hazardous air pollutants (HAP-free) specifications. Invented by Dr. El Sayed Arafat, 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, entitled "Cleaner, Non-Aqueous, Low-VOC, HAP-Free," was developed to provide environmentally friendly cleaners to Department of Defense agencies. MIL-PRF-32295 states that a solvent must be free of HAPs, contain no more than 25 grams per liter of VOCs, be effective on grease and oil, not contain ozone depleting substances, be nontoxic and compatible with metals and non-metals and, most important of all, be safe to use. Further, the Aerospace National Emission Standards for Hazardous Air Pollutants require that immersion-cleaning solvents have vapor pressures less than 7 mm Hg and wipe cleaning solvents have vapor pressures less than 45 mm Hg. The MIL-PRF-32295 specification classifies low vapor pressure solvents as Type I (less than 7 mm Hg) and moderate vapor 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 that has been shown to meet both Type I and Type II specifications for MIL-PRF-32295, with the exception of the storage stability testing. *Contact: NAVAIRWARCENACDIV, Tel: +1-301-342-5586.*

*Source: http://www.federallabs.org*

## Environmentally compatible fluorinated solvents

AGC Chemicals Americas, Inc. is launching a new line of fluorinated solvents that have no flash point, no Ozone-Depletion Potential (ODP) and Low Global Warming Potential (GWP), making them safer and more environmentally friendly than traditional halogenated solvents. The AsahiKlin™ AE-3000 Series of products is designed for use as precision cleaning solvents, moisture displacement fluids, defluxing agents for electronics, and carrier solvents for lubricants. Developed by the makers of best-selling AsahiKlin AK-225, the AE-3000 Series comprises four products that are nonflammable and non-corrosive. They have low surface tensions, low viscosities and high liquid densities, and they are chemically and thermally stable.

- AsahiKlin AE-3000 is a hydrofluoroether excellent for precision cleaning of metals, alloys, composites and plastics and as a carrier solvent for fluorinated oils, greases and silicone oils. It is a suitable replacement for HCFC and DuPont's Vertrel® and 3M's Novec™ solvents;
- AsahiKlin AE-3000ATE is a mixture of trans-1,2-dichloroethylene, 1,1,2,2-Tetrafluoroethyl-2,2,2-trifluoroethyl ether, ethanol and a stabilizer. It is outstanding for defluxing printed wiring assemblies; precision cleaning of plastics, substrates, electrical components and metals; and particle removal. It is a suitable replacement for HCFC, perchloroethylene, trichloroethylene, and Vertrel and Novec solvents;
- AsahiKlin AE-3000AT is a mixture of trans-1,2-dichloroethylene, 1,1,2,2-Tetrafluoroethyl-2,2,2-trifluoroethyl ether and a stabilizer. It is outstanding for removing oils and greases from metal and electrical components. It is a suitable replacement for HCFC, perchloroethylene, trichloroethylene, and Vertrel and Novec solvents;
- AsahiKlin AE-3100E is a hydrofluoroether that offers outstanding drying and thus works as a high-performance drying agent after wet plating, for carbide metal before coating for cleaning, and for drying after cleaning. It is also well suited to precision cleaning and dewatering, as well as for defluxing of electronics, electrical components and printed wiring assemblies. It is an appropriate replacement for HCFC, and Vertrel and Novec solvents.

*Source: http://www.manufacturing.net*

## Replacement for mineral and odorless mineral spirits

Greenhome Solutions, the United States has developed Citrus Natural Solvent, a paint thinner alternative, used as a direct replacement for mineral spirits and odorless mineral spirits. Citrus Solvent can be used wherever paint thinner or mineral spirits are required as a natural, safer alternative. It is an excellent degreaser, paint thinner alternative, and can be used to replace petroleum chemicals such as mineral spirits. "Citrus Solvent" is 98% pure citrus peel oil extracted from the peel of the orange fruit. The other 2% is water. This small amount of water is emulsified in the solvent and will not raise wood grain but is released into the air as the solvent evaporates. "Citrus Solvent" does not contain any emulsions, surfactants or any other additives that paint thinner products do. The Citrus Solvent is "Water Clear" and not deep orange like lower grades. "Water Clear" means that it will not add more amber color when mixed with Pure Tung Oil. The "Citrus Solvent" does not contribute to depletion of the upper ozone or to smog like mineral spirits or paint thinner, but is gently returned to earth with the rain.

An advantage of Citrus Natural Solvent as a paint thinner alternative is that Citrus Natural Solvent can be easily disposed of with no threat to the environment. In the past decade, use of citrus natural solvent has expanded tremendously. Much of the product goes into making paint solids, used into impart an orange fragrance to products, and used as a secondary cooling fluid. But the largest growth segment has been the use of citrus solvent in cleaning products. This has occurred in both industrial uses and in household/institutional products. Citrus solvent can be used either as a straight solvent, or as a water dilatable product. Straight citrus solvent can be used as a wipe cleaner, in a dip bath, or in spray systems as a direct substitute for most other organic solvents. *Contact: Greenhome Solutions, LLC 1210, W. Nickerson Street, Seattle, WA 98119, USA. Tel: +1-206-284-2281; Fax: +1-206-284-2291; E-mail: info@ghsproducts.com*

*Source: http://www.ghsproducts.com*

## ODS free hydrocarbon and oxygenated solvents

Paterson Enterprises, the United Kingdom, has developed a complex mixture of hydrocarbon and oxygenated solvents designed to clean and degrease all flat and irregular surfaces. Solvent Cleaner is free from chlorinated and other ozone depleting solvents and is provided in aerosol form to provide an easy means of applying to surfaces, the powerful jet allowing easy purging of blind holes and crevices. After degreasing, the solvent evaporates rapidly leaving components chemically clean and free from oily and corrosive residues. The low temperature resulting from rapid evaporation may, in some instances, be used for shrink fitting of small mechanical parts. The applications include:

- Particularly designed to remove all dirt and deposits from brake shoes and to evaporate leaving behind no residues;
- Also recommended for general degreasing applications in a workshop environment; and
- Due to the flammability of the product Solvent Cleaner is not recommended for use on electrical equipment, particularly where "sparking" may occur.

*Contact: Paterson Enterprises PLC, Castle Foregate, Shrewsbury Shropshire, England, SY1 2EL, UK. Tel: +44-174-323-2200.*

*Source: http://www.morrislubricants.co.uk*

## Super-heated ultrasonic vapor degreaser

The Forward Technology F-300 SERIES from Crest Ultrasonics, the United States, is an economical solution to solvent precision cleaning applications. The F-300 Series Super-heated Ultrasonic Vapor Degreaser contains dual Solvent immersion tanks with the patented Crest 40, 58, 132 or 192 kHz ultrasonics. The ceramically enhanced ultrasonics products unrivaled cleaning with HFC, HFE, NPB and HCFC solvents. Applications can be found in most industrial facilities. The F-300 Series is a super-heated ultrasonic vapor degreaser. A typical process includes immersion in the latest ultrasonic technology — Crest's ceramically enhanced transducers that produces unrivalled cleaning with HFC, HFE, NPB, HCFC solvents.

The F-300 Series is ideal to remove organic residues like organic films, fingerprints, grease, mold release, oils, etc. Applications can be found in most industrial domains. *Contact: Crest Ultrasonics 1886, Berkshire Lane, North Minneapolis, MN 55441, USA. Tel: +1-763-559-1785; Fax: +1-763-559-3929; E-mail: sales@crest-ultrasonics.com*

*Source: http://www.echemproducts.com*

## Abu Dhabi phased out halon

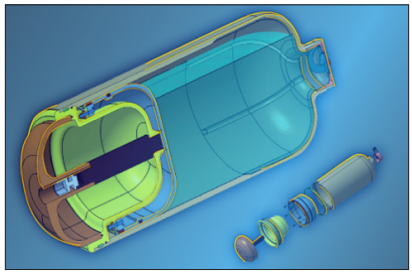
The Abu Dhabi Water & Electricity Authority (ADWEA), UAE, on behalf of all its group of companies leads the initiative of phasing-out Halon, a chemical fire extinguisher, from all ADWEA sites (main and substations) located within Abu Dhabi and Al Ain. ADWEA began phasing-out the halon in line with government directives as well as a commitment to environmental sustainability. This was a significant undertaking; it required technical recommendations for adequate and environment-friendly fire protection in existing facilities. A team of specialists, led by ADWEA's Environmental Health and Safety Section, conducted feasibility studies and prepared a project design for the contractor to begin construction. ADWEA replaced all halon extinguishers with $CO_2$, taking into account the best for option for safety and the environment. ADWEA is in the process of exporting the collected amount of Halon gas 1301(5,731.59 kg) and Halon 1211 (375.42 kg) to the USA in order to insure that the banned gas is recycled outside UAE.

*Source: http://www.adwea.ae*

## Halon-free fire extinguisher

This eco-friendly fire extinguisher offered by EADS Technology Licensing, Germany, incorporates a totally new design approach allowing the traditionally used Halon 1301 extinction agent, which is harmful to the environment, to be replaced by NOVEC 1230, which does not degrade the ozone layer nor contribute to the atmosphere's greenhouse effect.

Due to the physical properties of NOVEC 1230 (which is liquid in



*NOVEC 1230 – Halon-free fire extinguisher*

normal pressure and temperature conditions), the simple replacement of Halon by this new environment-friendly product in fire extinguisher applications is not possible. Therefore, new fire extinguisher designs, fully adapted to the NOVEC 1230 characteristics, have been evolved, along with the implementation of several innovative technological building blocks. Multiple possibilities for the extinguisher's pressurization have been developed to accommodate NOVEC 1230's physical properties of: a cold gas system (Gasogene); a hot gas system (pyrotechnic gas generator); and a hybrid system. In addition, weight-saving measures are incorporated through optimized agent spraying efficiency due to two separate discharge phases: the extinguishing agent discharge phase, followed by depressurization and the piping cleaning phase. *Contact: EADS Technology Licensing, Tel: +49-896-073-4910; E-mail: wulf.hoeflich@eads.net.*

*Source: http://www.technology-licensing.com*

## Pre-engineered fire extinguishing systems

Fireboy clean agent fire extinguisher systems developed by Fireboy®-Xintex®, the United States, are designed to automatically. When the Fireboy System discharges, the extinguisher is designed to fully empty the contents in less than 10 seconds. No clean-up is required. There is no powdery residue or water left behind. The fire is extinguished by a combination of heat reduction and chemical reaction.

Fireboy Systems are available to protect engine rooms and machinery spaces from as small as 25 cubic feet to as large as 3000 cubic feet. *Contact: Fireboy®-Xintex® Inc, P.O. Box 152, Grand Rapids, Michigan, USA. Tel: +1-616-735-9380; Fax: +1-616-735-9381; E-mail: fireboy@fireboy-xintex.com.*

*Source: http://www.fireboy-xintex.com*

## Fire agent technology approved by Qatar Civil Defense

International Gulf Trading Company (IGTC), Chubb Fire, Qatar, has introduced a new fire retardant technology: 3M Novec 1230 fire protection fluid. It is the first company to offer this product to the local market. Developed by 3M, Novec 1230 fire Protection Fluid is a 'next generation' clean agent which is a direct replacement for Halon in retardant systems that currently use the gas. It is suitable for a range of offshore and land-based operations to protect occupied spaces and critical equipment.

Unlike Halon, Novec 1230 does not damage the ozone layer, nor does its use contribute to global warming. It is not restricted by the Kyoto Protocol and has no 'phase-out' requirement. The technology has a higher safety margin versus other extinguishing agents and a faster extinguishing time. It has also been approved by Qatar Civil Defence for use in the country.

*Source: http://www.firemiddleeastmagazine.com*

## A blowing agent for polyurethane foams

Arkema, France, has patented the use of Forane® 1233zd as a blowing agent in the manufacture of polyurethane foams: US Pat. No. 8,314,159 and EP Pat. No. 2,129,709. Forane® 1233zd blowing agent provides exceptional energy performance and environmental benefits over existing blowing agents, such as HCFC, HFC, and hydrocarbon molecules.

Forane® 1233zd blowing agent is a liquid, non-ozone depleting, non-flammable, high performance blowing agent with a global warming potential of 7. In trials at a manufacturer of household refrigerators and freezers, an unoptimized system based on Forane® 1233zd blowing agent delivered a 3% improvement in energy efficiency versus HFC 245fa and surpassed 2014 DOE energy standards. In other evaluations conducted by Arkema, Forane® 1233zd blowing agent provided a 6% improvement in insulation value versus HFC 245fa, a 7% improvement versus HCFC 141b, and a 16% improvement versus hydrocarbons. Target markets for Forane® 1233zd blowing agent include polyurethane foams used in the manufacture of household refrigerators and freezers, commercial refrigeration, spray foam, and polyurethane panels for commercial and residential building and construction applications.

Arkema is a global chemical company and France's leading chemicals producer. Arkema is building the future of the chemical industry every day. With operations in more than 40 countries, some 14,000 employees and 10 research centers, Arkema should generate annual revenue of approximately $8.3 billion, and holds leadership positions in all its markets with a portfolio of internationally recognized brands. *Contact: Stan Howard, Tel: +1-610-205-7027.*

*Source: http://www.sprayfoam.com*

## Foaming technology for PU moldings using carbon dioxide

The Institute of Plastics Processing (IKV) in Industry and the Skilled Crafts at RWTH Aachen University, Germany, is developing a new foaming technology for the production of foamed polyurethane moldings. The new technology enables the use of $CO_2$ as the blowing agent. It is regarded as the most promising and environment-friendly alternative to chemical foaming with water, which results in hard segments and embrittlement in the polyurethane part. Until now, however, the use of large amounts of $CO_2$ as the blowing agent led to a lack of control of the foaming process.

Initial tests already show that the new $CO_2$ foaming process results in much lower densities than have been possible until now. To achieve controlled expansion of the reaction mix, a gas counter pressure is generated in the foaming mold. This cavity pressure, which is above the vapor pressure of the dissolved $CO_2$, prevents early foaming-up. With a specific reduction of the cavity pressure, the timing and speed of the expansion process can be controlled. This prevents early expansion and collapse of the foam. For this process, the IKV scientists cooperated with PME fluidtec GmbH, Ettenheim, Germany, in the development of a sealed-off mold with valve technology and a corresponding process control. Furthermore, the high-pressure HS500 metering machine from Hennecke GmbH, Sankt Augustin, was adapted to the new process technology.

*Source: http://www.materialsviews.com*

## Commercial production of $CO_2$-based polyols

Following a two-year test phase, Bayer MaterialScience, Germany, is aiming to commercialize the use of carbon dioxide as a raw material for polyurethane foam. The company has started the planning process for the construction of a production facility at its site in Dormagen, Germany, where $CO_2$ will be used to produce precursor for PU foam. Bayer said its objective is to initially make larger quantities of this precursor available to "selective processors" from 2015. The planned production facility in Dormagen will have a facility of several thousand metric tons, though Bayer expects higher volumes in the future.

The use of $CO_2$ replaces a portion of the fossil-fuel raw materials, such as petroleum, that would otherwise be used exclusively, Bayer said. The chemical giant also expects the new process to provide economic advantages over a conventional production method. Bayer said it collaborated with partners from industry and academia to develop the process, which has been tested intensively over the last two years. As part of the publicly funded research project Bayer calls Dream Production, a pilot plant at Bayer's main site in Leverkusen produced smaller quantities of the precursor polyol, in which the $CO_2$ is chemically bound. The first use of the new $CO_2$-based flexible foam will be for the production of mattresses.

*Source: http://www.plasticsnews.com*

## Agriculture in extreme weather conditions

An Israeli company has developed a new method that allows at minimal expenses to heat up greenhouses even in temperatures of –30°C. The method was sold to the Government of Georgia, the United States. Now agriculturists in the country will be able to continue to grow vegetables and flowers in the mountainous area in an extreme winter. The principle is hot water injected into fine tubes that create a wide surface area and spread the heat throughout the greenhouse.

Zion Suki, the CEO of Energy Industry Ltd. Company, Israel, which built the method, noted that the project in Georgia was particularly challenging due to the need of dealing extreme temperature we aren't familiar in Israel. According to his the method is energy efficient since the heating loss outside of the greenhouse is very low and the agriculturist's profits won't hurt. Also the system allows the agricultures an disinfection of the ground between growth cycles as a replacement to methyl bromide whose been prohibited many years ago.

*Source: http://www.jewishbusinessnews.com*

## Cover crops to control potato cyst nematodes

Incorporating cover crops can give good non-chemical control of the potato crop's most serious pest with 60-85% reduction seen in potato cyst nematodes (PCNs). Research focused on growing a number of brassica species ahead of potato planting has shown a reduction in PCN numbers. Brassica cover crops such as Indian mustard, when macerated and ploughed in, decompose and produce a biofumigation effect. Work at Harper Adams University, England — in conjunction with Agrovista, the United Kingdom, and Barworth Agriculture, the United Kingdom — has worked on which brassica species give the best level of ITCs for PCN suppression. Those used to produce this biofumigation effect have been selected for their high levels of glucosinolates. When combined with a certain enzyme and water in the soil, glucosinolates produce substances toxic to nematodes known as isothiocyanates (ITCs). "Brassicas usually contain six or more glucosinolates that produce a range of ITCs and modern biofumigation crops are bred for the highest levels possible," says Matthew Back, the university's PCN expert.

Dr. Back and his team focused on Indian mustard and also oil radish, white mustard and rocket, all brassica species that contain high levels of glucosinolates. "Plants are naturally high in glucosinolates, but they are completely inert until cells are damaged, when they combine with the enzyme myrosinase in the presence of moisture to produce volatile substances called isothiocyanates," he explains. It is that substance that provides the biocide effect that suppresses PCN, but can also control potato skin blemishes such as rhizoctonia and black dot, which reduce tuber quality and saleable yield. "It looks like we need to focus our attention on summer-established Indian mustard and oil radish for PCN control," says Dr. Back.

But perhaps the most exciting discovery from the project, conducted by PhD student Bruno Ngala, was evidence that the viability of nematode eggs within the characteristic cysts that lay dormant in the soil is decreased without the maceration and incorporation. Dr. Back explains that glucosinalates can be leached from roots, but the enzyme myrosinase cannot, and his theory is that micro-organisms in the soil are producing myrosinase to use glucosinolates as a food source. A three-year project, funded by the Potato Council, will investigate the suitability of species around Great Britain, incorporation methods and cover crop nutrition. The Potato Council research and development manager Sue Cowgill says that the trials will take place in Shropshire, eastern England and Scotland. "We need to understand which cover crops perform best in which region and how their performance is influenced by crop agronomy and incorporation techniques," she says.

*Source: http://www.fwi.co.uk*

## Researcers test new alternative to methyl bromide

The scarecrows perched in Santa Cruz strawberry fields do little to scare away the birds, much less the insects and fungi harbored in the soil. Everything likes to eat strawberries, which makes growing them a risky business. This predicament led professor Carol Shennan of the University of California, Santa Cruz, the United States, to take an unconventional approach to pest management. Nine years ago, the fatal plant disease Verticillium wilt was wiping out strawberry plants at the university farm. Chemicals hardly phase the pathogen, and Shennan saw little improvement with crop rotation, which is typically used to treat infested fields. A visiting plant pathologist from the Netherlands recommended a

little-known organic technique called anaerobic soil disinfestation, and, with so few other options, Shennan decided to give it a try. Shennan is currently compiling nearly a decade of results comparing anaerobic soil disinfestation to chemical fumigation. The results, which will be submitted for publication this summer, show that after disinfestation, the number of Verticillium disease spores consistently drops by 80-100 per cent. "This is similar to the levels we have achieved with fumigation," says Shennan.

Kill-all fumigants like methyl bromide have been a staple of the local berry industry for decades. Twenty years ago most California strawberry crops were treated with methyl bromide, and after the ozone depleting chemical was banned by the Montreal Protocol, the United States lagged behind other nations in the phase-out process. The problem has turned the spotlight to fumigant-free alternatives like anaerobic soil disinfestation. While disease organisms decline after treatment, the total number of soil bacteria increase. As part of the treatment, carbon sources like rice bran, molasses and grape skins are mixed into the soil. A tarp is placed over the field, and drip irrigation is used to saturate the planting beds. This triggers the growth of anaerobic bacteria.

*Source: http://www.gtweekly.com*

## Biofumigant crops as replacements for methyl bromide

The most important soil borne disease is caused by the fungus *Verticillium dahliae*, which is capable of causing significant crop and economic losses. Effective control of *V. dahliae* can only be achieved by soil sterilisation resulting in the widespread use of methyl bromide to sterilise soil used for strawberry production. Methyl bromide has been banned from use since 2008 and this poses a huge threat to productivity. Other chemical controls, such as chloropicrin and dazomet, are less effective and it is uncertain how much longer their use will be permitted or acceptable to the consumer. Steam sterilisation is being considered, but is currently uneconomic and energy inefficient for most soil types.

Ten potential biofumigant crops were screened in laboratory trials in the University of Greenwich, Natural Resources Institute, the United Kingdom, for their effects on reducing soil populations of *V. dahliae*. These included several brassica species known to produce isothiocyanates (ITCs), sudan grass, onion, lavender and the soil amendment, BioFence. The brassicas showed a good effect, but the most effective was lavender. Chemicals given off by the plant residues were characterised. These included ITC's but also large quantities of several sulphides and monoterpenes from the lavender. Field trials are in progress to compare effects of Brassica juncea, Sinapis alba and BioFencein both conventional and organic plots.

*Source: http://www.nri.org*

## Pesticide alternatives for strawberries

For decades, California strawberry growers like Rod Koda injected the potent pesticide methyl bromide into soil to kill bugs, weeds and plant diseases before planting strawberries. But the chemical was slated to be phased out by international treaty because it depletes the Earth's ozone layer. And later its replacement methyl iodide was pulled off the market after numerous public protests. Now, California regulators have proposed stricter rules to protect the public from a third fumigant that Koda and other conventional berry growers use to sanitize their fields. The restrictions are pushing California's $2.3 billion strawberry industry toward developing nonchemical alternatives to pesticides. The industry and state have poured millions of dollars into research, but they say alternatives such as sterilizing soil with steam or growing berries in peat are not ready for prime time.

Since the 1960s, California strawberry growers have fumigated their fields before each crop is planted to control devastating soil-borne pests, increase yields and produce uniform and disease-free fruit. But expansion of urban development bordering berry fields on the Central Coast and in Southern California has increased unease over the dangers of fumigants to residents and farmworkers. Growers and state regulators say the chemicals are safe with precautions such as not using fumigants in buffer zones near schools and residential areas and posting signs that prohibit entry to fields. Critics say those protections aren't sufficient.

A state-convened working group formed to discuss alternatives to fumigation called in April for more testing of nonchemical alternatives in the fields — and for grants or crop insurance to help growers mitigate the risk of adopting the new methods. Many growers are already experimenting with growing strawberries without fumigation. The bacteria rid the soil of Verticillium, one of the most persistent berry diseases, at similar levels that fumigation does, says University of California, the United States, researcher Carol Shennan.

*Source: http://www.agweek.com*

## Ozone connections: Expert networks in global environmental governance

This critically acclaimed book by sociologists Penelope Canan and Nancy Reichman describes how the 1987 Montreal Protocol (MP) became the most successful global environmental treaty in history, based in part on the successful creation and operation of the Technology and Economic Assessment Panel (TEAP), a platform for innovation, leadership and collaboration in global governance. The book reminds us that the Protocol was/is an exercise in social action from the micro to the global, knitting together individuals into a formidable force for global change. *Contact: Claire Jackson, Director of Publishing at Greenleaf Publishing, E-mail: claire.jackson@gseresearch.com*

## Natural solutions for developing countries

The main objective of this GUIDE is to share relevant experiences in the refrigeration, air-conditioning and foam sectors in which low-GWP technologies are employed, especially natural refrigerants and foam-blowing agents. This is especially important from the perspective of the current phase-out of HCFCs in Article 5 countries, as prescribed in the phase-out deadlines of the Montreal Protocol. With that purpose in mind, this GUIDE seeks to identify and describe barriers as well as good practices in the uptake of natural substances. *Contact: Marc Chasserot, Managing Director, E-mail: marc.chasserot@shecco.com*

## National Ozone officers guide

This Guide aims to support National Ozone Units and the MLF's country-driven approach. It was originally developed by OzonAction through the Regional Office for Asia and the Pacific Compliance Assistance Programme (ROAP CAP), and has been updated to reflect important developments in the Protocol since 2005. The Guide is based on the experiences of numerous NOOs around the world, international agencies and individual experts. *Contact: OzonAction Branch, United Nations Environment Programme, Division of Technology, Industry and Economics, 15 rue de Milan, 75441 Paris, France. Tel: +331-4437-1455, Fax: +331-4437-1474 E-mail: ozonaction@unep.org*

### 2014

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ASHRAE India Chapter
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New Delhi-110048, India
Tel: +91-11-41635655
E-mail: ashraeic@airtelmail.in
Website: http://www.acrex.in

**9-11 Apr**
Beijing, China
**China Refrigeration Expo**
Contact: Mr. Jeff Malley
E-mail: eiusa@optonline.net,
Website: http://www.cr-expo.com

**18-21 May**
Jeju Island, Republic of Korea
**The 7th Asian Conference on Refrigeration and Air Conditioning**
Contact:
E-mail: acra2014@nate.com
Website: http://www.acra2014.org

**10-12 Jun**
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**REVAC Expo & Forum 2014**
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A-8-1, Level 8,
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**The 22nd International Compressor Engineering Conference, The 15th International Refrigeration and Air Conditioning Conference**
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Conference Coordinator
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