VATIS UPDATE

Ozone Layer Protection

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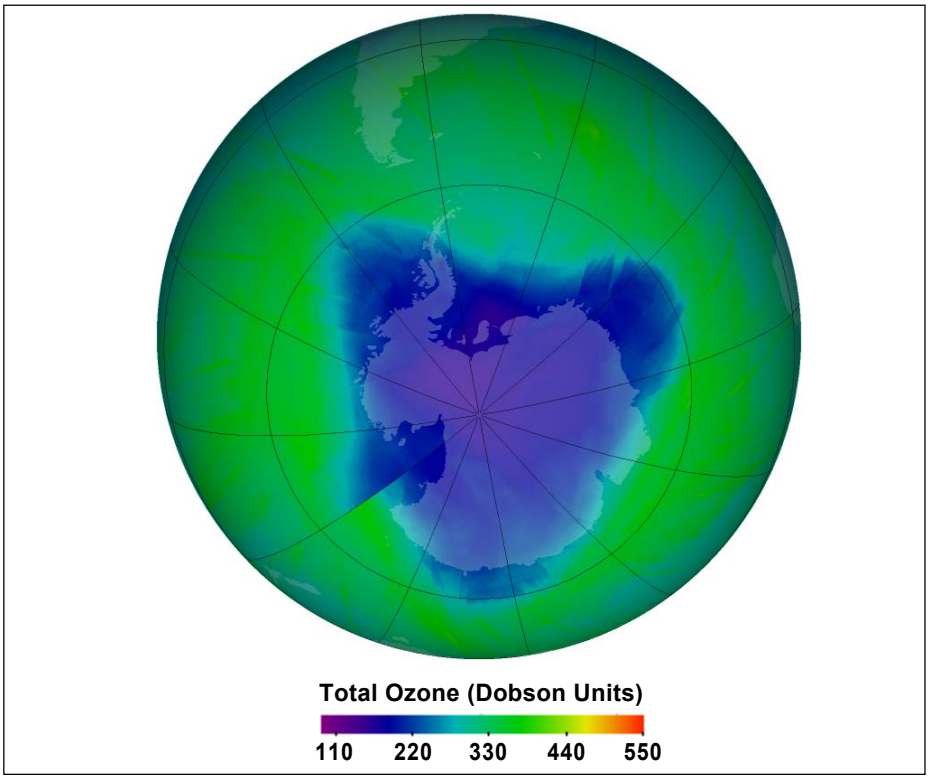
Highlights

- Asteroid strike could deplete ozone layer
- New HFO refrigerant blends
- Aqueous dewaxing system
- Spray foam insulation
- Aerosol fire-extinguishing system
- Novel fumigation formulation



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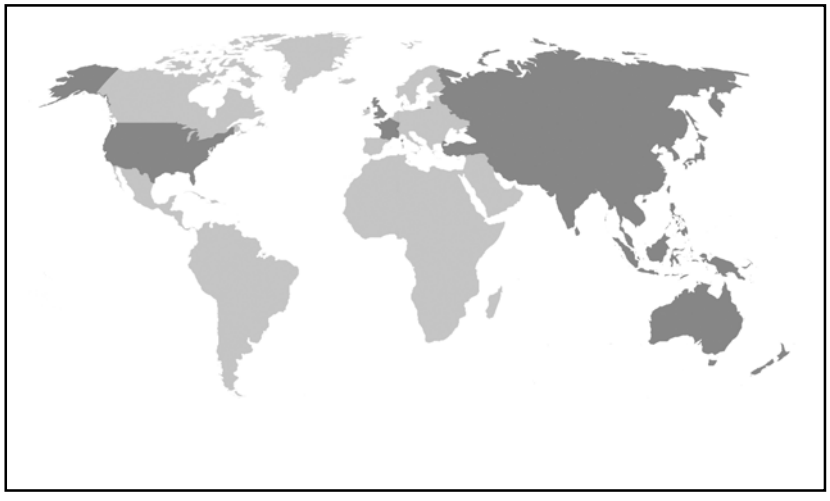
- Dissemination of information and good practices;
- Networking and partnership with international organizations and key stakeholders; and
- Training of national personnel, particularly national scientists and policy analysts.



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

Cover Photo

The status of ozone layer over the South Pole as on 15 November 2010

(Credit: NASA, the United States)

VATIS* Update
Ozone Layer Protection
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SCIENCE OF THE OZONE LAYER

Asteroid strike into ocean could deplete ozone layer

Scientists from the Planetary Science Institute in Tucson, the United States, say if a medium-sized asteroid were to crash into the ocean, the ozone layer could be depleted, allowing high levels of ultraviolet (UV) radiation to reach the surface. Dr. Elisabetta Pierazzo and colleagues ran computer simulations that revealed if an asteroid 500 m to 1 km in diameter were to hit the Pacific Ocean, it would eject enough water vapour and sea salt high enough into the atmosphere to affect the protective ozone layer.

The results of the simulations showed the 1 km asteroid could affect an area over 1,000 km in diameter, and vast quantities of water and vapour would be ejected up to 160 km high. The scientists say the water vapour would contain chlorine and bromine from the vaporized sea salts, and this would result in significant global depletion of the ozone layer by destroying it faster than it is created naturally. They said such an asteroid would produce "an ozone hole that will engulf the entire Earth," and produce a huge spike in UV radiation with levels higher than anywhere on the surface today.

The simulations showed the smaller asteroid, 500 m across, could produce UV index (UVI) levels of 20 (the highest recorded UVI known in recent times) or more in the northern tropics for a period of several months, and the global ozone depletion would be similar to the record ozone holes seen over the Antarctic in the mid-1990s. A 1 km asteroid could produce a spike of 56, and levels over 20 for about two years in both the northern and southern hemispheres. Dr. Pierazzo said asteroid strike would also make growing crops difficult, with a long-term negative effect on global food production.

The study said over 100 asteroids 1 km to 2 km in diameter are thought to be orbiting in paths that could bring them near to Earth, and there could be many more smaller undiscovered asteroids in the Earth's neighbourhood. Past research suggests, on average, an asteroid about 500 m wide hits the Earth about once every 200,000 years, and a larger asteroid strike happens around once every 800,000 years. (Source: www.physorg.com)

Ozone depletion could be damaging whales' skin

A closely studied community of whales, including the threatened blue whale, showed worrying signs of sunburn, possibly because of ozone depletion in the atmosphere, biologists reported recently. Whales come to the surface to breath, socialize and feed their young, exposing the skin on their backs to the full force of the Sun, sometimes for many hours. Scientists from the United Kingdom's Zoological Society and University of London and Mexico's Inter-Disciplinary Centre of Marine Sciences studied about 150 blue whales, fin whales and sperm whales in the Gulf of Mexico between January and June in 2007, 2008 and 2009. They took high-definition photographs, and took skin samples for examination under a microscope.

The biologists found widespread signs of blister-type lesions akin to symptoms of sunburn among humans. These signs worsened over time, as would be expected with higher exposure to ultraviolet (UV) rays. Worst affected were the whales that spent the most time in the Sun, and also blue whales, which have paler skins compared with other species. "The increase in skin damage seen in blue whales is a matter of concern, but at this stage it is not clear what is causing this increase," said Dr. Laura Martinez-Levasseur of the Zoological Society of London. "A likely candidate is rising UV radiation as a result of either ozone depletion or a change in the level of cloud cover." The impact of the lesions on the whales' health was not part of the research. (Source: www.terradaily.com)

Antarctic sea ice increase not linked to ozone hole

While sea ice extent has declined dramatically in the Arctic in recent years, it has increased slightly in the Antarctic. Some scientists had suggested that increased Antarctic sea ice extent can be explained by the ozone hole over Antarctica.

Previous simulations had indicated that the ozone hole induced a large change in atmospheric circulation in austral summer and that change could have contributed to the changing Antarctic sea extent.

To learn more, Canadian scientists Dr. Michael Sigmond at the Department of Physics, University of Toronto, and Dr. John C. Fyfe of the Canadian Centre for Climate Modelling and Analysis, Environment Canada, used a climate model, forced by monthly varying observed stratospheric ozone changes from 1979 to 2005, to simulate the effects of stratospheric ozone depletion on Antarctic sea ice extent.

Contrary to predictions of previous studies, their model found that ozone depletion would lead to a year-round decrease in Antarctic sea ice extent rather than the increase that was observed. The results suggested that processes other than ozone depletion must be causing the observed increase in Antarctic sea ice extent. It remains unclear why Southern Hemisphere sea ice trends differ so greatly from Northern Hemisphere trends. (Source: www.sciencedaily.com)

Antarctic ozone hole nears its annual maximum

The yearly depletion of stratospheric ozone over Antarctica started in early August 2010 and is now expanding towards its annual maximum. The hole in the ozone layer typically reaches its maximum area in late September or early October, though atmospheric scientists must wait a few weeks after the maximum to pinpoint when the trend of ozone depletion has slowed down and reversed. The Ozone Monitoring Instrument (OMI) aboard the Aura spacecraft of the United States National Aeronautics and Space Administration (NASA) acquired data for this map of ozone concentrations over Antarctica on 12 September 2010. So far in 2010, the size and depth of the ozone hole has been slightly below the average for 1979 to 2009, likely because of warmer temperatures in the stratosphere over the far southern hemisphere. However, even very slight changes in the meteorology of the region in September could affect the rate of depletion of ozone and how large an area the ozone hole might span. (Source: www.nasa.gov)

ODS PHASE-OUT IN INDIA

Status of ODS phase-out in India

India has phased out production and consumption of chlorofluorocarbons (CFCs), carbon tertrachloride (CTC) and halons as on 1 January 2010, except use of pharmaceutical-grade CFCs in the manufacture of metered dose inhalers (MDIs) for patients of asthma and chronic obstructive pulmonary diseases (COPD) under Essential Use Nomination (EUN) of the Montreal Protocol. A total of 301 projects have been approved and funded by the Executive Committee of the Multilateral Fund (MLF). A total of US$257,427,713 has been approved by the Executive Committee to phase out 58,638 ODP tonnes of ozone depleting substances. (Source: The Montreal Protocol – India's success story 2010)

SAIL phasing out carbon tetrachloride

Steel Authority of India Limited (SAIL), with support from the United Nations Development Programme (UNDP) and Ministry of Environment and Forests (MoEF) has taken up an umbrella project for the replacement of carbon tetrachloride (CTC), an ozone depleting substance used as cleaning solvent. CTC is being replaced with trichloroethylene, an environmentally friendly option, at the six SAIL steel plants located at Bhilai, Bokaro, Durgapur, Rourkela, IISCO and Salem. (Source: www.sail.co.in)

National CFC Consumption Phase-out Plan (NCCoPP)

Currently, National Chlorofluorocarbon Consumption Phase-out Plan (NCCoPP) has a presence in 15 States of India. It aims to encourage good servicing practices among all refrigeration servicing enterprises (RSEs), with a special focus on those firms consuming more than 50 kg of chlorofluorocarbons (CFCs) per annum. The project has been successfully implemented as per the schedule.

Till December 2009, 955 units were provided to RSEs throughout the country in four phases via the United Nations Development Programme (UNDP). The work plan targets for 2009 were achieved. Awareness generation workshops were conducted for small RSEs so that most of such enterprises across the country can participate in the project and get the advantage of assistance provided under the Montreal Protocol to phase-out ozone depleting substances (ODS) in servicing sector.

The focal activity of NCCoPP is training of RSE technicians. During training the participants are taught how to handle the alternative refrigerants and good servicing practices, with emphasis laid on CFC recovery. These training programmes have helped in creating a demand for recovery and reclaiming of refrigerants. With over 20,000 technicians already trained under NCCoPP and its earlier projects, the requirement of CFCs for servicing is addressed through reclaimed CFCs. Several reclamation centres have been set up at across the country. (Source: The Montreal Protocol – India's success story 2010)

Workshop on India Chiller Energy Efficiency Project

IDBI Bank Ltd. conducted a workshop on India Chiller Energy Efficiency Project (ICEEP) at New Delhi on 30 July 2010. Dr. B.P. Nilaratna, Joint Secretary, Ministry of Environment and Forests (MoEF), Government of India, Mr. Aloke Sengupta, Chief General Manager, IDBI Bank, and Mr. Yashpal Gupta, General Manager, IDBI Bank, addressed a large number of senior executives from public sector and private sector and chiller manufactures/Energy Service Companies who attended the Workshop. The Workshop outlined multiple benefits of the scheme and the roles of MoEF and World Bank, in the project.

The World Bank, in association with the MoEF, developed ICEEP for providing financial incentives aimed at accelerated replacement of energy inefficient centrifugal chillers based on chlorofluorocarbons (CFCs) with more energy efficient non-CFC chillers. The project aims to replace about 370 CFC centrifugal chillers in the country over two years, and is expected to reduce 159 tonnes of CFCs and 3.86 million tonnes of carbon dioxide over five years. (Source: www.equitybulls.com)

IN THE NEWS

Joint WCO/UNEP operation nets large haul of ODS

"Sky-hole Patching II", a joint global Customs enforcement operation by the World Customs Organization (WCO) and the United Nations Environment Programme (UNEP), has confiscated more than 7,500 cylinders of chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs) and other ozone depleting substances (ODS), totalling over 108 tonnes of ODS and 668 pieces of equipment containing ODS. "This global operation by Customs in partnership with the WCO and UNEP which hauled in spectacular quantities of illegal ODS clearly demonstrates the success of this tripartite alliance against this dangerous trade and the organized criminal gangs who profit from it," said Mr. Kunio Mikuriya, Secretary General of WCO. Built on the success of Project Sky-Hole Patching I, which saw 21 Customs administrations in the Asia-Pacific region seize over 700 tonnes of ODS in 301 incidents between September 2006 and September 2009, Project Sky-Hole Patching II saw over 80 countries pledge their commitment to participation, making it a truly global event.

Project Sky-Hole Patching II between 3 May and 2 November 2010 was launched to monitor ODS trade, prevent and detect emerging trends in illicit trafficking and monitor gains made. Customs officials at 275 seaports and other selected points intensified their risk profiling and physical control over several thousand shipments to identify high-risk goods, notifying one another of suspicious consignments using CENcomm, WCO's secure communication tool for exchanging information. While a number of seizures were reported from Europe, Africa and Central Asia, the majority of seizures took place in the Asia-Pacific region, notably in China (Hong Kong and mainland), India and Thailand. Two significant examples illustrate the success of Sky-Hole Patching II: Royal Thai Customs netted a total of 1,200 cylinders of ODS during the course of the operation and French Customs successfully stopped the illegal export of 44 tonnes of HCFCs in two incidents. The ODS seized during Sky-Hole Patching II, had they

been released into the atmosphere, would have presented 400,000 t of carbon dioxide-equivalent emissions. (Source: www. unep.org)

China approves use of R-290 refrigerant

Gree, one of the largest air-conditioner manufacturers in China, became the first company to receive certification from the Association for Electrical, Electronic & Information Technologies (VDE) – one of the largest technical and scientific associations in Europe – for air-conditioners that use R-290. "R-290 is a globally recognized, environmentally friendly refrigerant. It neither harms the ozone layer nor affects the climate," claimed Mr. Wilfried Jaeger, President of the VDE Testing and Certification Institute. Gree's acquisition of VDE certification enables its R290 air-conditioners to be sold in European Union countries.

In October 2009, the Chinese Ministry of Environmental Protection (MEP) released the 'Notice on Strict Control of New Production Facilities using HCFCs', which prohibits the production of equipment using hydrochlorofluorocarbons (HCFCs), except for special use. Then at the end of April, China took its first step in the quest for next-generation refrigerants, looking to move away from the HCFC R-22. R-290 is pure propane, a naturally occurring hydrocarbon and an efficient refrigerant with properties similar to R-22. It is accepted across the world as an environmentally friendly refrigerant, as it has zero ozone depletion potential (ODP) and a very low global warming potential (GWP) of 3. Its highly inflammability, however, has restricted large-scale application in the air-conditioning industry.

Gree has successfully resolved key problems preventing the use of R-290 in air-conditioner applications, including controlling the amount of refrigerant charge, product safety, energy conservation, the need for a special compressor, leak prevention, isolating the ignition source and improving the safety-oriented control logic. The cooling capacity of the new product is 2,639 W and the refrigerant charge is less than 300 g, which meet the requirements of European Union standards. The new product can reduce energy consumption by 15 per cent compared with similar R-22 products. It has a coefficient of performance (COP) of 3.36, which meets the requirements for energy efficiency Grade 2 in the new national standard in China. (Source: www.ejarn.jp)

Border meeting on monitoring and controlling trade in ODS

The illegal trans-boundary movements of prohibited ozone depleting substances (ODS) exist with complex causes. To address the issues involved, the United Nations Environment Programme (UNEP) has been facilitating border dialogues between neighbouring countries. These have helped raise awareness, enhance enforcement capacity and optimize mechanism for coordination at borders.

As part of the ongoing dialogue process among Ozone and Customs Officers from Bangladesh, Bhutan, India and Nepal, a two day workshop – one-day training and one-day consultation – between border enforcement officers was held on 28-29 October 2010 at Pokhara, Nepal. The event was attended by more than 30 officers from Customs border check-posts and headquarters of the four countries. Representatives from National Ozone Units, law enforcement agencies, Regional Intelligence Liaison Office (RILO) of Asia-Pacific, the Regional Office of Interpol and Refrigeration Associations, along with communication experts, also attended the workshop.

Besides agreeing to strengthen cross border cooperation to suppress the illegal trans-boundary movement of ODS, the Customs administrations of India and Nepal agreed to launch a six-month joint operation using a mechanism similar to Sky Hole Patching. Along with regional enforcement organizations, UNEP would provide technical assistance and facilitate information exchange. *Contact: Mr. Atul Bagai, Senior Regional Network Coordinator, OzonAction Programme, UNEP Regional Office for Asia and Pacific, UN Building, Rajdamnern Nok Avenue, Bangkok 10200, Thailand. Fax: +66 (2) 2883 041; E-mail: atul.bagai @unep.org.* (Source: www.unep.org)

Ozone Officers training conducted

Following the recommendation of the Joint Meeting of South East Asia Pacific (SEAP) and South Asia Networks of ODS Officers in Beijing, China,

in September 2010 and taking the advantage of the 22nd Meeting of the Parties to the Montreal Protocol being organized in Bangkok, the Regional Office for Asia and Pacific (ROAP) of the United Nations Environment Programme (UNEP) is organizing a Capacity Building Programme for New Ozone Officers and Assistant Ozone Officers in the Asia-Pacific Region on 3-6 November 2010.

The training workshop primarily aims to build the capacity of the new ozone officers to operate national ozone offices on a daily basis to ensure that the country would be in compliance with the obligations under the Montreal Protocol. Another objective is to build a second line of defence by training the Assistant Ozone Officers of participating countries to tackle the complex challenges they will face with the phase-out of hydrochlorofluorocarbons (HCFCs). The third objective is to refresh the memories of some of the old ozone officers on the latest policy and technical information related to HCFC phase-out. This workshop will assist participating officers to the Montreal Protocol improve their skills to perform their daily work for implementing the Montreal Protocol.

About 20 Ozone Officers and Project Management Unit Coordinators from Afghanistan, Bhutan, Indonesia, Laos, the Maldives, Mongolia, Nepal, Pakistan, the Philippines, Sri Lanka, Timor Leste and Viet Nam are participating in the workshop. The main topics that are being covered include: ozone science; background on the Montreal Protocol institutional structure; data reporting; policy and enforcement for ODS phase-out; and ozone climate linkages. *Contact: Mr. Atul Bagai, Senior Regional Network Coordinator, OzonAction Programme, UNEP Regional Office for Asia and Pacific, UN Building, Rajdamnern Nok Avenue, Bangkok 10200, Thailand. Fax: +66 (2) 2883041; E-mail: atul.bagai@unep.org.* (Source: www.unep.org)

Indonesia moves closer to phasing out HCFCs

The Indonesian government will begin phasing out industrial use of gases with ozone depleting potential (ODP) in 2011, an Environment Ministry official said. Indonesia has agreed to begin restricting the import of hydrochlorofluorocarbons (HCFC) starting in 2011. HCFCs are currently used as a blowing agent in foam manufacturing, refrigerators, air-conditioning equipment, fire extinguishers and industrial solvents. “The target was determined by all stakeholders, including business owners,” said Ms. Tri Widayati, atmosphere protection unit expert at the Environment Ministry. Indonesia had imported 5,714 tonnes of HCFCs, or the equivalent of 364 ODP tonnes, in 2009. According to the national HCFC phase-out plan, Indonesia would reduce 10 per cent of HCFC consumption levels by 2012, and 97.5 per cent by 2030, Ms. Tri said.

Import limitations would be determined based on ODP tonnes, not import volume, Ms. Tri said. Four kinds of HCFCs are currently used in Indonesia: HCFC-141b in the foam industry, HCFC-22 in air-conditioning and refrigeration, HCFC-123 in fire extinguishers and HCFC-225 in solvents. Most of the imports are HCFC-22 produced in China and India. Some 70 companies producing foam have committed to supporting the government’s target to slash imports of HCFCs, it is reported. The World Bank will support financing for companies seeking to upgrade to non-HCFC technologies. (Source: www.thejakartapost.com)

Bangladesh phases out ozone depleting substances

Bangladesh has achieved a notable success in phasing out a major ozone depleting substance (ODS) early this year, State Minister for Environment Dr. Hasan Mahmud announced recently. “Except a very limited use in the pharmaceutical industry, we have replaced every ozone depleting substance in the country in line with the Montreal Protocol,” he stated, at the sideline of a seminar on the World Ozone Day. Highlighting the country’s success, the Minister said, his government would take further steps to improve the overall environment of Bangladesh, a country, which is the most vulnerable to climate change and global warming.

The Department of Environment (DoE) in a statement claimed that it has been able to eliminate chlorofluorocarbon (CFC), carbon tetrachloride and methyl chloroform by the first day of 2010 and steps are under way to replace hydrochlorofluorocarbon (HCFC) in 20 years. HCFCs are now being used in the air-conditioner and foam industries in the country. (Source: www.thedailystar.net)

A touch of green in vocational training

One of the Philippines' good practices in Education for Sustainable Development (ESD) programme in technical vocational education and training (TVET) is its commitment to phase out completely the use of ozone depleting substances (ODS), particularly chlorofluorocarbons (CFCs), from the country by 2012. The biggest contributors to ozone depletion are the untrained technicians, according to the Project Management Unit (PMU) of the National Chlorofluorocarbon Phase-Out Plan (NCPP): one of the primary causes of ozone layer depletion is accidental venting of refrigerants. Under the code of trade practice, only technicians certified by the Technical Education and Skills Development Authority (TESDA) are allowed practice of the trade and purchase refrigerants.

The TESDA strategy on NCPP implementation includes the conduct of skills assessments for refrigeration and air-conditioning (RAC) and mobile air-conditioning (MAC) technicians, the development of training curriculum and modules, development of competency requirements for technician certification, and conduct of trainers training programmes. The education starts with the identification of work standards in the operation of the recovery machine and the procedures in ensuring that the refrigerant will not be vented accidentally into the air. The same process applies to the two other critical competencies of recycling and retrofitting air-conditioning systems. From these competency standards, the assessment tools are drawn to establish the performance and competence level of a technician. Curricula and training standards are likewise drawn from the competency standards. (Source: www.mb.com.ph)

Reiterating zero HCFC commitment

Bhutan is planning to ban hydrochlorofluorocarbon (HCFC)-based equipment from 2013. A high green environmental taxation system will be introduced at the end of 2010 and reporting will be made mandatory for importers from 1 January 2011. It is part of Bhutan's commitment to zero consumption of HCFC by 2020.

"This action will demonstrate to the global community that small countries like Bhutan can also be at the frontline of battle against climate change," said Mr. Lyonpo Yeshey Zimba, Bhutan's Minister for Works and Human Settlement, who was the chief guest at the celebrations of the International Day for the Preservation of the Ozone Layer by the National Environment Commission. He said that when environment is degraded too far, nursing it back to health tends to be a long journey. In Bhutan, the common source of ozone depleting substances (ODS) are air-conditioners, refrigerators, fire extinguishers, aerosols, fumigants, and solvents used for cleaning appliances in industries. Bhutan successfully phased out chlorofluorocarbon (CFCs) by the beginning of this year. (Source: www.bhutanobserver.bt)

Updated standards for refrigerant safety

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) has published 2010 editions of the major refrigerants-related standards, including the addition of 14 new refrigerant blends. American National Standards Institute (ANSI)/ASHRAE Standard 34-2010 titled "Designation and safety classification of refrigerants" and Standard 15-2010 titled "Safety standard for refrigeration system" are meant to be used together.

Standard 34-2010 includes 37 published addenda to the 2007 standard. Key changes include: the assignment of designations and safety classifications for one new single compound refrigerant and 14 new refrigerant blends; the addition of occupational exposure limits for refrigerants; new data and updates of refrigerant concentration limits (RCL) and safety classifications for several existing refrigerants; plus the introduction of a modified method of calculating the heat of combustion for refrigerants.

Nine addenda have been included to Standard 15. They incorporate changes including the revision of requirements for terminating relief vent discharge lines; the addition of definitions so that the standard can better provide for the safety of cascade refrigeration systems; plus revised guidance for the protection of positive displacement compressors when used in cascade refrigeration system configurations. (Source: www.construction weekonline.com)

REFRIGERATION/ AIR-CONDITIONING

Integrating CO_2 and tri-generation for supermarkets

Brunel University, the United Kingdom, along with 14 industrial partners from across the world – including Danfoss (Denmark), Emerson (the United States) and Bock (Germany) – has announced an innovative energy system for retail food and manufacturing facilities that integrates carbon dioxide (CO_2) and tri-generation technologies. The system has the potential to realize 30 per cent energy savings and over 40 per cent emission savings compared with conventional systems.

Designed to meet the needs of medium and large-sized supermarkets for retrofit or new applications, the system uses the energy released by a combined heat-and-power (CHP) system to drive a sorption (thermally driven) refrigeration system, which in turn is used in a cascade arrangement to condense CO_2 refrigerant of a subcritical CO_2 refrigeration system. This ensures operation of the CO_2 refrigeration system in the subcritical region at all times and at a constant condensing temperature, ensuring thus high energy efficiency round the year. Basic elements of the system include:

- A CHP module – This can be based on an internal combustion engine driven by any fuel such as natural gas, biogas, diesel, or biodiesel or micro gas turbines, with the actual selection to be based on the specific requirements of the application;
- Sorption refrigeration system – This can employ any type of sorption machine [absorption (ammonia-water), lithium bromide-water or adsorption (silica gel-water)], depending on the temperature of the heat available from the CHP plant and the desired condensing temperature for the CO_2 refrigeration plant; and
- CO_2 refrigeration system – The refrigeration system uses CO_2 as a secondary (volatile) refrigerant for the medium temperature (MT) cabinets and direct expansion (DX) for the low temperature (LT) cabinets, maximizing the system efficiency.

Laboratory tests have shown the LT system to deliver a steady state Coefficient of Performance (COP) of 4.0 at evaporating temperature of -32°C and condensing temperature of -7°C. The COP of the MT system is very high, exceeding 50, due to the low power requirement of the pump. System simulation and energy analyses of a conventional R-404A system and the integrated CO_2-trigeneration system in a 5,000 m^2 sales area in a supermarket has shown the integrated energy system to produce energy savings of 30 per cent and greenhouse gas emission savings of 43 per cent. (Source: www.r744.com)

Unique drop-in solution for R-22

As South African industry faces ever-tightening restrictions on the importation and use of refrigerants containing virgin hydrochlorofluorocarbons (HCFCs), Afrox has announced the introduction of a new direct drop-in replacement. Forane® 427A is a new 100 per cent hydrofluorocarbon (HFC) blend with zero ozone depleting potential, offering a direct drop-in replacement solution for existing R-22 installations across a broad spectrum of applications.

Mr. Robert Carlton-Shields, Special Products and Chemicals Manager of Afrox, says that Forane 427A "is non-toxic and non-inflammable, meeting the highest A1/A1 requirement on both counts, with low global warming potential (GWP)". According to him, no modification of the installation is necessary for the conversion process, and Forane 427A requires only one oil draining and its replacement by a POE lubricant. "By reducing the end cost to the user, Forane 427A makes the transition to a more environmentally friendly alternative that much easier," he adds. Forane 427A is manufactured by Arkema, France. (Source: www.gasworld.com)

New HFO refrigerant blends

Two of the world's leading chemical companies, both based in the United States, have revealed details of a new range of refrigerant blends with low global warming potential (GWP). These blends are based on the technology behind the refrigerant HFO1234yf, which is currently being adopted as R-134a replacement in car air-conditioning systems.

DuPont announced the development of Opteon XP10, a blend based on HFO1234yf and some other as yet unspecified gases, but thought to be readily available hydrofluorocarbons (HFCs). The blend, formerly known as DR-11, has been designed as a lower GWP (~600) alternative to R-134a in new and existing medium-temperature commercial refrigeration systems. The gas is non-inflammable and thermodynamic properties are said to be similar to 134a. Pilot projects with ALDI Süd and Penny in Germany and Spar in Austria have been completed, and DuPont says it is considering an initially limited commercial launch of Opteon XP10 between 2012 and 2013 in Europe.

Honeywell has revealed some of its work with five hydrofluoroolefin (HFO) blends, which could eventually provide a low GWP alternative to many of today's common refrigerants. The company is working on HFO blends based on 1234yf, 1234ze (currently being used as a propellant and solvent) and a possible as yet unnamed third-generation HFO. The blends being developed include replacements for R-404A, R-134a and R-410A. GWPs will be 50-99 per cent lower than existing refrigerants, says Honeywell, and the blends will be non-inflammable or have mild (A2L) inflammability. (Source: www.acr-news.com)

Climate-friendly refrigerator that runs on HCR-188C1

A.S. Trust & Holdings, the United States, is finalizing energy reduction efforts on its 'Climate Friendly 188' residential refrigerator, which will employ a proprietary hydrocarbon-blend refrigerant called HCR-188C1. The refrigerant will be blended by ComStar International, the United States. The HCR-188C1 refrigerant was certified by Intertek as having zero global warming potential (GWP) and zero ozone depletion potential (ODP). A.S. Trust expects the refrigerant will receive the official designation 'R-441A' in January 2011 at the annual meeting of the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE).

The HCR-188C1 refrigerant is said to be the first hydrocarbon refrigerant approved by the United States Environmental Protection Agency (EPA) for sale in the country. The blend is designed to replace hydrofluorocarbon (HFC) R-134a, which has been commonly used in refrigeration applications since the 1990s. HFC-134a use is being phased-out in most appliance applications due to its high GWP. A.S. Trust estimates that the refrigerant charge of HCR188C1, at 37 g, will be about 25 per cent the amount of R-134a by mass. The refrigerant is a patented blend of ethane, butane, propane and other hydrocarbons. ASHRAE has listed HCR188C1 as non-toxic.

ComStar and A.S. Trust said that Intertek test results show that HCR-188C1 displays properties "superior to R-134a". Refrigerators running on the new blend showed a 48 per cent decrease in power consumption when compared with the same units operating with R-134a. Although inflammable, the suppliers said that the small amount of the refrigerant required for residential appliances presents very little risk. In addition, A.S. Trust holds a patent on a Refrigerant Safety Service Port Valve that could be used on larger systems to shut down the system when there is a drop in operating pressure. (Source: www.appliancemagazine.com)

Green products and services from Carrier Corporation

Carrier Corporation, based in the United States, has used its Middle East HVAC Engineering Conference to introduce new products and services focused on sustainability and high-performance building solutions. At the event, Carrier formally launched the latest addition to its portfolio of water-cooled chillers, the Evergreen 19XRD, its largest single-piece chiller employing non-ozone depleting refrigerant HFC-134a. The company also introduced the Aquaforce 30XW, a new generation of water-cooled liquid chillers, which offer flexible, energy-efficient solutions for commercial building owners in high ambient conditions.

A natural evolution of Carrier's approach to sustainability is the AdvanTE3C Solutions Centre, a new global group of Carrier experts in efficiency and environment focused on developing sustainable building solutions. Michel Grabon, Director of Carrier's AdvanTE3C Solutions Centre, says the new engineering capability is an innovative approach to achieve even greater energy efficiency and environmental benefits for sustainable buildings. (Source: www.constructionweekonline.com)

Refrigerator recycling – post-degasification of polyurethane

Better safe than sorry – this is the principle that the German plant manufacturer Anlagenbau Umwelt + Technik Chemnitz GmbH (AU+T) must have taken to heart when it decided to add another degasification step to its technological solution for the recycling of cooling units. This step of post-degasification ensures that any remaining chlorofluorocarbons (CFCs) that could not be extracted from the polyurethane (PUR) foam in the first degasification stages do not just vanish into thin air but are removed and recovered in an environmentally friendly way. Straight after the charging material is shredded and separated according to the material type, the recovered and pulverised PUR is fed into a so called "drying tower" where it degasses entirely.

"Generally, there are three degasification stages as part of the recycling process of cooling units," explains Mr. Mirko Winter, Managing Director of AU+T. These tend to take place: firstly, just before the cooling appliances are fed into the shredding machine; secondly, during the shredding and grinding process; and, finally, just before the material is separated on basis of material type with the help of sifters and metal separators. In the case of the AU+T system solution, a final degasification step, which specifically focuses on the degassing of PUR powder potentially containing CFC, had been added to the process subsequent to the separation line.

Just before the PUR powder is filled in bulk bags, the material is transported to the 'drying tower' via feed hoppers. Within the 'drying tower' the powder is heated, and mixed and transported with the help of six conveyors that have a total length of 24 m. All these happen under an inert nitrogen atmosphere. Water, used in the first degasification step during the shredding process, is reused for heating the PUR powder. As the water cools down during this process, it is transported back to the shredding device and heated again by the heat generated by the mechanical processing. *Contact: Anlagenbau Umwelt+Technik Chemnitz GmbH, Clemens-Winkler-Str. 6b, Chemnitz 09116 Germany. Tel: +49 (371) 909860; Fax: +49 (371) 9098611; E-mail: info@aut-chemnitz.de*. (Source: www.environmental-expert.com)

SOLVENTS

Environment-friendly powerful degreasing agent

A Belgian company has developed an environment-friendly degreasing agent to remove oils, greases, nicotine, soot and carbon black. This product has various applications, ranging from manufacturing industries (including rubber, polymer master-batches and bunker oils) to the domestic sector. The company is looking for a commercial tie-up with technical assistance, as well as for partners interested in buying its know-how and its existing commercial network covering Germany, Spain, Italy and the Netherlands.

This degreasing product based on surface-active agents can be used for cleaning surfaces contaminated by vegetable, animal and/or mineral fats, nicotine, soot, oil and in particular carbon black. In addition to its highly effective degreasing properties, this new product is an environmentally friendly alternative to chlorinated solvents. As this degreasing agent is water-based, it is not inflammable, fully biodegradable and does not produce any volatile compounds or toxic residues. The company will provide to its potential partner technical assistance in terms of testing of new applications, adaptation of the technology to specific needs, quality control, etc. *Contact: Ms. Belen Lanuza, Asociacion de Empresarios del Henares, ES 28820 Coslada, Spain. Tel: +34 (91) 889 5061; Fax: +34 (91) 889 1112; E-mail: blanuza@aedhe.es.* (Source: http://160.44.251.10)

CFC-free testing of oil and grease in water

A quick and easy field analysis method for determining oil and grease concentration levels is very important for offshore oil platforms, refineries and oil depots. With the manufacture of Freon 113 banned under the Montreal Protocol, the older methods like ASTM D 3921 that used infrared analysis and Freon as the extraction solvent have become obsolete. Eralytics, Austria, has introduced the Eracheck for the fast and easy measurement of sub-ppm concentrations of total petroleum hydrocarbons (TPH) in water and soil. The innovative

and patented Quantum Cascade Laser Infra-Red (QCL-IR) measuring technology allows the CFC-free testing of TPH in water and soil samples.

Eracheck uses a very similar extraction procedure, but comes with the CFC-free, cheap and easily available solvents cyclohexane or cyclopentane. It offers maximum precision in sub-ppm range over a wide measuring range (0.5 to 1000 ppm) in excellent correlation to ASTM D 3921 and D 7066. Eracheck is a portable stand-alone analyser equipped with data portability to popular PC worksheet formats for further data analysis. (Source: www.envirotech-online.com)

Aqueous dewaxing system

Dewaxing components that have been plated is normally a messy job involving removal of the wax in a tank of heated water, followed by further cleaning and degreasing, traditionally in hot trichloroethylene (TCE). In the United Kingdom, industrial washing system supplier Turbex Ltd., in collaboration with AEM, an aircraft overhaul and repair specialist belonging to Ametek Group, has developed a much cleaner, faster and more eco-friendly alternative.

In what is believed to be a world first, an aqueous washing machine has been adapted and installed at one of AEM's centres to remove the masking wax, and then clean and degrease components thoroughly in a continuous, 30-minute process. The secret to its success lies in the system's ability to keep the wax molten while it is in the cleaning machine. This is achieved first while the wax droplets are held in suspension in the hot water/detergent mixture, and then as they float to the top to form an oily layer, during subsequent separation from the water, and finally as the wax moves through a separation unit before dropping into a container, where it solidifies. There is no need for recourse to expensive biochemicals to break down and absorb the wax.

Benefits of the new technique include not having to manually shovel wax into sacks and significantly less mess in the working environment. The potential for hazardous TCE emissions into the work place and the atmosphere are eliminated. Other advantages of the Turbex system are a reduction in the electricity used, a 50 per cent reduction in floor space occupied by the cleaning plant, and the potential to reclaim the wax and use it again once it has been returned to the supplier to be reconstituted.

AEM is currently working with a wax supplier to investigate the feasibility of re-blending the reclaimed wax back to its original state. Initial trials have proved successful and could result in lower expenditure on the consumable, as well as further cost savings by avoiding sending used wax to landfill. Another plus is the uptime of its cleaning plant. It used to have to limit the use of the TCE tank to a couple of times per day to keep below the one-tonne annual limit for open systems stipulated by the Solvent Emissions Directive (SED). By contrast, there are no restrictions on the use of the Turbex water and detergent system. Even the rinse water can be recirculated by use of a closed loop system. In addition, a filter mist unit condenses water from the vented steam back into the aqueous cleaner. *Contact: Turbex Ltd., Unit 1 Riverwey Industrial Park, Newman Lane, Alton, Hampshire, GU34 2QL, United Kingdom. Tel: +44 (1420) 544909; Fax: +44 (1420) 542264; E-mail: sales@turbex.co.uk.* (Source: www.belki.dk)

"ASK THE HCFC EXPERT" platform

The OzonAction Programme of the United Nations Environment Programme (UNEP) recently launched the "ASK THE HCFC EXPERT" platform for answering queries related to hydrochlorofluorcarbons (HCFCs), used as substitutes for chlorofluorocarbons (CFCs) in refrigeration, air-conditioning and foam manufacture. Through this new interactive feature on OzonAction's HCFC Help Centre, an "expert of the week" will answer questions on HCFC replacement technologies and on HFCs in the context of Mobile Air-Conditioning (MAC). This knowledge-sharing, web-based platform will be conducted in English, and in other languages proposed by the experts. Leading environmentalists, industry leaders, policy makers and OzonAction experts aim to bring the environment into public consciousness and to stimulate discussion on major issues relevant to the ozone layer and climate change. This new platform has been created through the European Commission-supported JumpStart project on climate-friendly HCFC replacement. For further information, contact:

Ms. Lian Lomax, E-mail: Lian.Lomax@unep.org
Ms. Samira de Gobert, E-mail: samira.degobert@unep.org
UNEP DTIE OzonAction Branch
Website: http://www.unep.org/ozonaction/

Aqueous cleaning solutions

Kyzen Corporation, based in the United States, has launched Aquanox® A4703, Aquanox® A4625B and Ionox® I3302 – three aqueous cleaning solutions for the electronics assembly manufacturing and cleaning processes. An aqueous cleaning solution designed with a pH neutral formulation, Aquanox A4703 is combined with Kyzen's inhibition technology to provide superior material compatibility. This chemistry was developed for use in spray batch and spray in-line cleaning systems to remove organic acid (OA), no-clean and rosin mildly active (RMA) pastes and fluxes, including difficult lead-free residues. Aquanox A4703 is effective at concentrations as low as 3 per cent, while being environmentally friendly and providing the lowest cost of ownership. It is easily controlled by refractive index, manually or when using an automated process control system.

Aquanox A4625B has an aqueous chemistry designed for optimum effectiveness in batch washers. This easy-to-use, non-inflammable, non-corrosive liquid will remove all types of electronic flux residues, including lead-free residues. A4625B is environmentally friendly, has a long tank life and low maintenance cost. Additionally, it will provide brilliant mirrored finishes even after multiple cleaning cycles. It is fully biodegradable and contains no chlorofluorocarbons (CFCs) or hazardous air pollutants (HAPs), and is low on volatile organic compounds (VOCs). It is used at low concentrations for optimum cleaning efficiency without damaging delicate substrates.

Ionox I3302 is a semi-aqueous solvent blend designed to remove difficult flux and paste residues including lead-free, rosin, no-clean and tacky flux, as well as other common electronic assembly residues. It has proven effective in ultrasonic, centrifugal and semi-aqueous spray under immersion cleaning systems. Easy to use, Ionox I3302 is used at full strength then followed by a water rinse for complete removal of all soil and cleaner residues. It is a biodegradable, non-inflammable, non-corrosive solvent that contains no CFCs or HAPs. *Contact: Kyzen Corporation, 430 Harding Industrial Drive, Nashville, TN 37211, United States of America. Tel: +1 (615) 831 0888; 1 (615) 831 0889; E-mail: contact_usa@kyzen.com.* (Source: www.engineerlive.com)

FOAMS

Spray foam insulation

Gaco Green 052 from Gaco Western, the United States, is a water-blown, spray-applied system that cures to a semi-rigid very low-density foam. In-place density ranges from 6.4 kg/m^3 to 8.8 kg/m^3. The cured product is dimensionally stable in all weather conditions and its insulating properties do not significantly diminish over time. Gaco Green 052 is safe for the environment, containing no chlorofluorocarbon (CFC), hydrochlorofluorocarbon (HCFC), hydrofluorocarbon (HFC), formaldehyde or other ozone depleting chemicals. It is a Class I fire rated foam and meets the requirements of ICC-ES AC12 Acceptance Criteria for Foam Plastic Insulation.

Gaco Green forms a completely sealed air barrier in wall cavities. Its performance is superior to commonly used fibreglass batting or loose fill insulation. It adheres well to most building materials and will provide a continuous barrier against air infiltration for the life of the building. Gaco Green is semi-rigid in nature but flexible enough to withstand normal expansion and contraction of building components. Yields of up to 15,000 board feet per kit are possible under optimum conditions.

The catalyst for Gaco Green is packed separately and must be thoroughly mixed with it before use. The product is distributed by American WeatherStar Spray Foam & Coatings Systems. *Contact: American WeatherStar Spray Foam & Coatings Systems Inc., 2100 Government Street, Suite F, Mobile, AL 36606, United States of America. Tel: +1 (251) 476 7385; Fax: +1 (251) 479 3602.* (Source: www.sprayfoam.com)

Hydrofluoropropene blowing agents

Arkema Inc., the United States, has filed a patent application on blowing agent compositions comprising at least one hydrochlorofluoroolefin (HCFO) for use in the preparation of foamable thermoplastic compositions. The HCFOs of the present invention include 1-chloro-3,3,3-trifluoropropene (HCFO-1233zd) (particularly the trans-isomer), 2-chloro-3,3,3-trifluoropropene (HCFO-1233xf),

dichloro-fluorinated propenes, and their mixtures. The blowing agent may be used with co-blowing agents such as carbon dioxide, hydrofluorocarbons (HFCs), hydrofluoroolefins (HFOs), alkanes, hydrofluoroethers (HFE) and their mixtures. Preferred HFCs used as co-blowing agents include 1,1,1,2-tetrafluoroethane (HFC-134a), 1,1-difluoroethane (HFC-152a), 1,1,1-trifluoroethane (HFC-143a), pentafluorethane (HFC-125), difluoromethane (HFC-32). The blowing agent compositions are useful in the production of low density insulating foams with improved k-factor. (Source: www.freepatentsonline.com)

Inflammable blowing agent control and blend systems

Apache Products Company, the United States, has been assigned a United States patent on a system and a method of providing polyurethane (PUR)/polyisocyanurate (PIR) foam using an inflammable blowing agent, preferably pentane. The inflammable blowing agent is introduced to PUR/PIR manufacturing equipment via an independent feed-line. This enables the blowing agent storage vessel to be located off-site from the foam manufacturing equipment. The independent blowing agent feed-line couples the off-site blowing agent storage vessel with the foam production system.

In a preferred embodiment, the pentane feed-line is connected with a polyol premix feed-line and the combined flow is directed to the ninth barrel of a 12-barrel extruder. The polyol premix reservoir feed-line includes an inline mixer downstream the connection with the pentane feed-line, which provides some mixing of the combined flow of the premix and pentane prior to introduction into the screw of the extruder. A micro motion flow meter and pentane control valve may be provided on the pentane line to facilitate either operator or computer control of the pentane flow during processing. In lieu of an extruder, other types of mixing equipment can be used to produce the foam.

Eliminating inflammable blowing agent storage on site realizes substantial cost savings by reducing the amount of flame proofing required for the processing site as compared with the on-site storage of inflammable blowing agent or the utilization of an inflammable blowing agent premix. (Source: www.freepatentsonline.com)

HALONS

Aerosol fire-extinguishing system

Koryo Pyrotechnics, the Republic of Korea, has introduced “Firewall”, an environmentally friendly, aerosol-based fire-extinguishing system. The main body of the extinguisher consists of a stainless steel outer cover and the interior container. Specifically, the interior container consists of three major parts: the core comprising solid aerosol wet chemical agents; an oxygen space that facilitates combustion of the solid aerosol wet chemical agents; chemical refrigerants that cool down the wet chemical agents.

Firewall offers numerous advantages. First, it is an environment-friendly product with zero ozone depletion potential and zero global warming potential. Second, it is compact in size. Third, it does not require additional installations such as pressure vessels or piping because it gets activated through the combustion of compound solid aerosol. Therefore, it poses no hazard of gas leak, and is easy to transport and install. Fourth, it is easy to dispose of after fire-fighting, as it does not leave residues. Natural ventilation would be sufficient to clear it. *Contact: Koryo Pyrotechnics Co. Ltd., Wooyang Building, 7-8F, 39-5, 1-Ga, Chungmu-dong, Seo-gu, Busan, Republic of Korea. Tel: +82 (51) 256 1771; Fax: +82 (51) 256 7366.* (Source: www.tradekorea.com)

New generation fire protection

Novec™ 1230 Fire Protection Fluid, manufactured by 3M, based in the United States, is a next-generation halon alternative offering outstanding performance, large margin of safety and excellent environment profile. It suppresses fire by removing the heat energy and interrupting the combustion process. With extinguishment capability of 10 seconds or less, the product extinguishes fires rapidly and effectively. Its key features include: a very low global warming potential of 1; atmospheric life time of just about 5 days; zero ozone depleting potential; electrical non-conductivity; and no post-fire residue.

Novec 1230 is applied as a gas, but is a liquid in room temperature. It has a heat of vaporization

approximately 25 times less than that of water. This, along with a higher vapour pressure, causes Novec 1230 to evaporate 50 times faster than water, allowing the agent to transition from liquid to gaseous state very rapidly when discharged through the nozzle of fire-fighting equipment.

Although Novec 1230 is a liquid at room temperature, its vapour pressure is sufficient for the agent to readily achieve vapour extinguishing concentrations in air. At 25°C, it could form vapour concentrations up to 30 vol. per cent prior to reaching saturation: typical fire suppression design concentrations for the most of applications is 4-6 vol. per cent. That large differential between design and saturation concentrations dictates that vapour condensation will not occur. (Source: multimedia.3m.com)

Environment-friendly fire suppression technology

The aerosol fire suppression agent technology developed by Dynamit Nobel, Germany, is one of the leading fire protection solutions worldwide. The Dynameco fire extinguishers are manufactured to standards of DIN EN ISO 9001/2000 and ISO 14001, and in accordance with the requirements of VDE, IQNet, TÜV and BAM certifications. Major fields of application are electrotechnical facilities and equipment, kitchens, machinery, ships and vehicles.

The high effectiveness of the fire suppression agent – a minimum of fire suppression agent generates a high fire suppression power – lets fires be extinguished within a few seconds. Dynameco fire extinguishers are especially suitable for fire fighting in the phase leading up to the conflagration. The fire suppression agent is non-toxic, environmentally safe with zero ozone depletion potential and zero global warming potential, and leaves negligible residual amounts in the atmosphere. The technology is listed as official halon substitute by the United States Environment Protection Agency (EPA). There more than 60,000 different Dynameco installations in various fields in different countries. *Contact: Dynamit Nobel Defence GmbH, Dr.-Hermann-Fleck-Allee 8, 57299 Burbach, Germany. Tel: +49 (2736) 462 104; Fax: +49 (2736) 462 107; E-mail: info@dynameco.com*. (Source: www.dynameco.com)

FUMIGANTS

1,3-dichloropropene as a MBr alternative in tomato crops

In China, researchers from Shandong Agricultural University, Shandong Academy of Agricultural Sciences and Plant Protection and Inspection Station of Feicheng conducted field trials to evaluate the efficacy of 1,3-dichloropropene (1,3-D, $C_3H_4Cl_2$) as a methyl bromide (MBr) alternative in tomato (*Solanum lycopersicum* L.) crops. Five treatments were replicated five times in a randomized complete block design: fumigation with MBr (400 kg/ha), three 1,3-D doses (180, 120, and 90 l/ha), an avermectin dose (7.5 l/ha), and an untreated control.

Results consistently indicated that MBr was generally superior to the treatments involving all 1,3-D levels and avermectin, which in turn were better than the control, for improving tomato yield and inhibiting nematode, weed, and mortality caused by plant disease. In both seasons, 1,3-D at the dose of 180 l/ha was as effective as MBr in increasing plant height, vigour and tomato yield, and in reducing the incidence of soil-borne disease, especially in maintaining nematode control efficiently, but it provided relatively poor control over weeds.

On the basis of these results, the scientists have recommended 1,3-D, in combination with other alternatives to MBr, to achieve integrated pest management. *Contact: Mr. Kaiyun Wang, Department of Plant Protection, Shandong Agricultural University, 61 Daizong Street, Tai'an, Shandong 271018, China. Tel: +86 (538) 8242345; E-mail: kywang@sdau.edu.cn.* (Source: pubs.acs.org)

Heat treatment as MBr alternative for managing stored-product pests

Researchers from Temp-Air Inc., the United States, Kansas State University, the United States, and Agriculture and Agri-Food Canada carried out a joint study to determine the viability of heat treatment as an alternative to methyl bromide (MBr) use for managing stored product insects in food processing facilities. Heat treatment involves

raising and maintaining temperatures of grain storage structures, warehouses and food processing facilities between 50°C to 60°C to manage stored-product insect species. The duration of heat treatment is application-specific and may vary from 6 hours for an empty storage facility to 24 hours for an entire food processing facility.

Insect response vary with temperature, among species and within a species among life stages. Air movement and strategic placement of fans are important for eliminating cool spots (<50°C) and for uniformly heating a treated area. Insect bioassays and monitoring insect populations before and after a heat treatment are important to understand the degree and duration of insect suppression obtained in commercial facilities. Heat treatments are safe and effective for the organic and non-organic sectors. Research in both laboratory and food processing facilities has shown heat treatments to be a viable alternative to MBr fumigation. *Contact: Hulasare, R., Temp-Air Inc., Burnsville, MN 55337, United States of America. E-mail: rhulasare@temp-air.com.* (Source: home.cc.umanitoba.ca)

Novel fumigation formulation

In Australia, the Grains Research & Development Corporation (GDRC) and the Commonwealth Scientific & Industrial Organization (CSIRO) are now trying to commercialize their GLO2 technology. GLO2 is a liquid fumigant that efficiently kills a wide range of invertebrate biota including insects, bacteria, fungi, nematodes, worms, spiders, etc. Its action is fast and specific to biota with active enzyme systems. GLO2 is a formulation of 10-30 per cent methyl isothiocyanate (MITC) dissolved in liquid ethyl formate. MITC is a waxy white solid with a melting point of 31°C. This organo-sulphur compound is a natural component of turnips, radishes and flowers. Ethyl formate (EF) is a clear liquid with a boiling point 54°C. It is an organic ester and used as food flavouring.

GLO2 is applied as a liquid solution, which subsequently vaporizes rapidly. It is taken up by the target invertebrate by either inhalation or direct contact, or both. Its disinfestation action is by both EF and MITC actives, which react with the alternative enzymes within the targets to induce mortality. The preferred application method for stored grain will be via devices that dribble or drip liquid GLO2 onto grain flows.

GLO2 is a replacement for dichlorvos as well as methyl bromide, and can be directly applied to grain during in-loading, turning or out-loading. Combining direct application of GLO2 onto grain-flows with grain cooling methods (aeration, refrigeration, etc.) can provide insect control for all storage scenarios and essentially act as a replacement for phosphine. Its other potential uses include fumigation of timber for insect control, and fumigation of fresh fruits and vegetables. *Contact: Ms. Bettina Garrett, Grains Research and Development Corporation, P.O. Box 5367, Kingston, ACT 2604, Australia. Tel: +61 (2) 6166 4500; Fax: +61 (2) 6166 4599; E-mail: b.garrett@grdc.com.au.* (Source: www.grdc.com.au)

Ammonia fertilizer can degrade methyl bromide

Researchers have demonstrated that ammonia fertilizer can degrade methyl bromide (MBr). Although the study is preliminary, they think that the method could prevent MBr emissions from crop fields. Earlier studies found that MBr degrades quickly under alkaline conditions to methanol and bromide, both harmless. Dr. Scott Yates, a soil scientist with the United States Department of Agriculture, and his colleagues measured how fast MBr degraded in ammonia, calcium hydroxide and potassium carbonate solutions. Ammonia was the most effective, breaking down MBr about 16 times faster than calcium hydroxide. The researchers tried a proof-of-principle experiment that simulated field conditions by applying MBr to soil samples in the lab at the same concentration that farmers use and sealing the soil samples under a virtually impermeable plastic film. The ammonia degraded more than 99.5 per cent of MBr after just 8 hours.

Dr. Robert Rhew, a biogeochemist at the University of California-Berkeley, the United States, wonders if the process will work in the fields. Dr. Rhew and Dr. Susan Kegley, a principal scientist at the Pesticide Research Institute, point out that the plastic tarps used on fields do not provide the tight seals available in a lab. Dr. Yates admits that more research is needed to see if his team's method is feasible on farms. (Source: pubs.acs.org)

RECENT PUBLICATIONS

The Montreal Protocol: India's Success Story

The booklet titled "The Montreal Protocol: India's Success Story" gives an account of the various initiatives taken by the Government of India to fulfil the obligation of the Montreal Protocol, besides covering the evolution of Montreal Protocol. The 12th edition of this publication contains relevant aspects of India's commitment to the Protocol.

Contact: Ozone Cell, Ministry of Environment and Forests, India Habiat Centre, Core 4B, 2nd Floor, Lodhi Road, New Delhi 110 003. Tel: +91 (1) 2464 2176; E-mail: ozone-mef@nic.in; Website: www.ozonecell.com.

Refrigeration Systems and Applications, Second Edition

This 2nd edition offers a comprehensive treatise that addresses real-life technical and operational problems, enabling the reader to gain an understanding of the fundamental principles and the practical applications of refrigeration technology. New and unique analysis techniques (including exergy as a potential tool), models, correlations, procedures and applications are covered, and recent developments in the field are included – many of which are taken from the author's own research activities in this area. The book also includes a discussion of global warming issues and its potential solutions. *Refrigeration Systems and Applications,* forms a useful source of reference for graduate and postgraduate students and researchers in academia as well as practicing engineers working in this field, and those who are interested in refrigeration systems and applications as well as the methods and analysis tools for their analysis, system design and performance improvement.

Contact: John Wiley & Sons (Asia) Pte. Ltd., 2 Clementi Loop #02-01, Singapore 129809. Tel: +65 6463 2400; Fax: +65 6466 4912; E-mail: onlinelibrarysales@wiley.com.

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Heating, Air-Conditioning, Refrigeration and Fluid Exhibition Korea 2011 – HARFKO 2011
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Website: www.harfko.com.

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CHINA REFRIGERATION EXPO 2011
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College of Engineering & Petroleum,
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Tel: +86 (10) 58565888;
Fax: +86 (10) 58566000;
E-mail: penglu@biec.com.cn.

10-11 May
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Blowing Agents & Foaming Processes 2011
Contact: iSmithers,
Shawbury, Shrewsbury, Shropshire,
SY4 4NR, United Kingdom.
Tel: +44 (1939) 250383, 252421;
E-mails: info@ismithers.net;
conferences@ismithers.net;
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