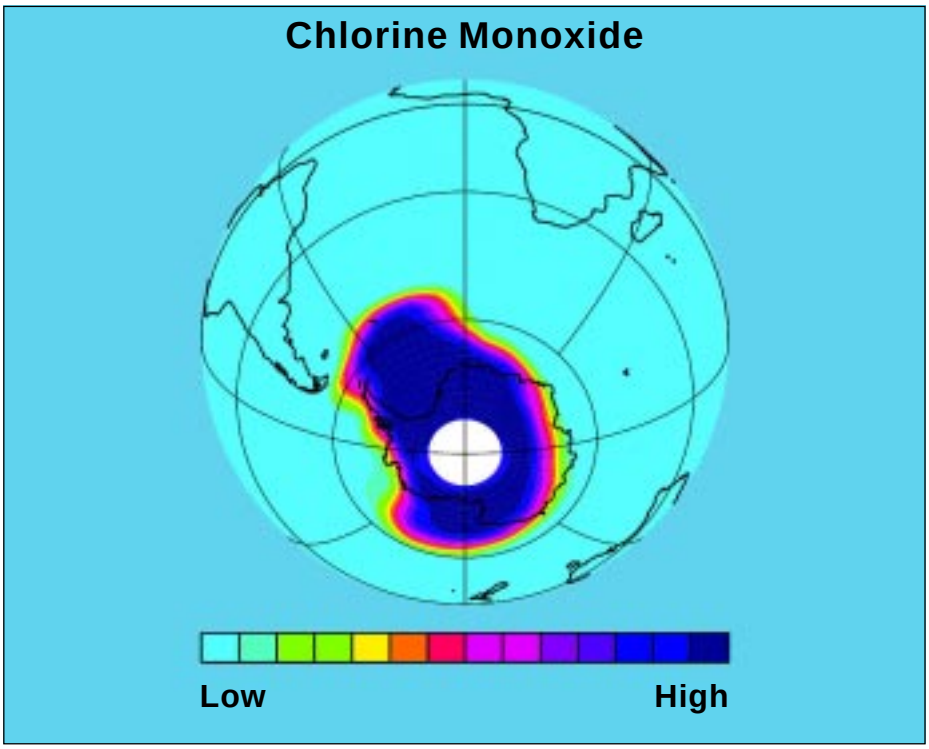
VATIS UPDATE

Ozone Layer Protection

Vol. 4 No. 100 ● May - Jun 2010
ISSN 0971-5657

Highlights

- Study sheds new light on ozone hole chemistry
- New material could revolutionize refrigeration
- Non-CFC flux cleaning solvent
- Liquid CO_2 blowing system
- Pharmaceutical grade aerosol propellants
- Alternatives to farm field chemical fumigation



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

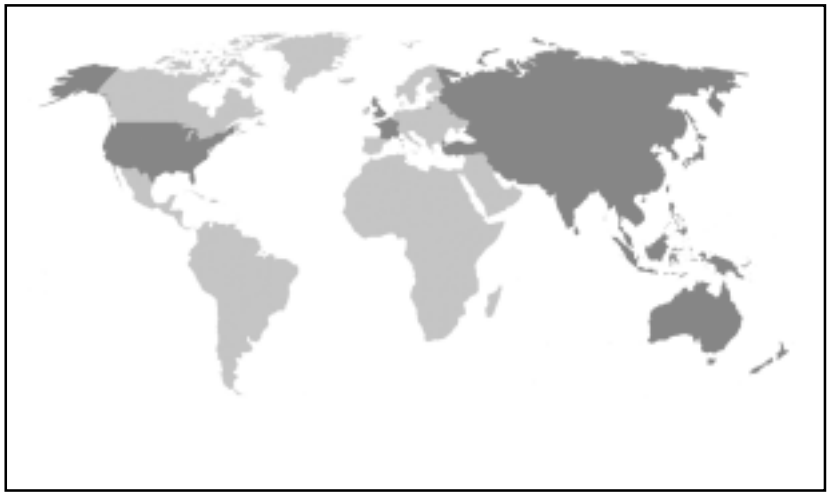
APCTT
ASIAN AND PACIFIC CENTRE FOR TRANSFER OF TECHNOLOGY

OZONE CELL
MINISTRY OF ENVIRONMENT AND FORESTS
GOVT. 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

Map of chlorine monoxide, the primary agent of ozone destruction in the Antarctic ozone hole, as measured by the Microwave Limb Sounder instrument on NASA's Aura satellite at an altitude of approximately 18 km within the ozone layer.

(Credit: NASA/JPL, the United States)

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

Website: http://www.techmonitor.net

ASIAN AND PACIFIC CENTRE FOR TRANSFER OF TECHNOLOGY
Adjoining Technology Bhawan
Qutab Institutional Area
Post Box No. 4575
New Delhi 110 016, India
Tel: (91) (11) 2696 6509
Fax: (91) (11) 2685 6274
E-mail: postmaster@apctt.org
Website: http://www.apctt.org

OZONE CELL
Ministry of Environment and Forests
Government of India
Zone IV, East Court, 2nd Floor
India Habitat Centre, Lodhi Road
New Delhi 110 003, India
Tel: (91) (11) 2464 2176
Fax: (91) (11) 2464 2175
Telegram: PARYAVARAN NEW DELHI
E-mail: ozone-mef@nic.in
Website: http://www.ozonecell.com

*** Value Added Technology Information Service**

CONTENTS

Vol. 4 No. 100 May - Jun 2010

SCIENCE OF THE OZONE LAYER

Measuring depletion of ozone in Arctic ozone hole

An international team of researchers is investigating ozone depletion in the polar stratosphere using data gathered during flights over the Arctic region at elevations of up to 20 km. The atmosphere researchers – among them Prof. Stephan Borrmann at the Institute of Atmospheric Physics of Johannes Gutenberg University Mainz and a Director of the Max Planck Institute of Chemistry in Mainz – hope to discover the length of the processes that result in the formation of the hibernal holes in the ozone layer at the polar caps.

It is also expected that the data collected during the flights undertaken with the high-altitude aircraft M55 Geophysica will provide insight into what effect climate change is having on the physical and chemical processes that influence the ozone layer. This would make it possible to extrapolate the future development of the ozone layer under the conditions obtained during on-going changes.

The chlorine from chlorofluorocarbons (CFCs) can form aggressive ozone-destroying chlorine monoxide (CIO) radicals in the polar stratospheric clouds (PSCs). Analysis of these clouds is thus essential to the research being conducted by the Mainz team under Prof. Borrmann. It is these extraordinary but natural clouds that are formed only in the stratosphere over the Arctic and Antarctic regions during the cold polar winters that are implicated in the formation of the holes in the ozone layer.

The scientists are able to directly analyse the properties of the particles making up these polar stratospheric clouds – frozen droplets of ice and nitric acid with an approximate diameter of 3-20 microns – using instruments attached to the aircraft. To determine the rate and extent of ozone depletion, the scientists need to find out exactly what size these droplets are and how many of them are present in these PSCs. The Mainz team is using additional instruments to evaluate the characteristics of ultrafine airborne aerosol particles – meteoric dust – that are also present in the stratosphere and play a role in the relevant processes. (Source: www.eurasiareview.com)

Study sheds new light on ozone hole chemistry

A new study of Earth's polar ozone layer has reinforced scientists' understanding of how human-produced chlorine chemicals involved in the destruction of ozone interact with each other. A team of scientists led by Dr. Michelle Santee the Jet Propulsion Laboratory of the National Aeronautics and Space Administration (NASA), the United States, studied how night-time temperatures affect chlorine monoxide (CIO), a key chemical involved in ozone destruction. Combining NASA satellite measurements with a state-of-the-art chemical model, they found this relationship to be more consistent with recent laboratory work than with some older laboratory and field observational data. This verification is important, because scientists have not been able to conduct appropriate laboratory experiments to understand how polar CIO behaves at night at the lowest temperatures of the stratosphere.

"Our comprehensive study uses multiple years of Arctic and Antarctic satellite observations to quantify the night-time balance of ozone-destroying chlorine chemical compounds," said Dr. Santee. At night, CIO molecules combine to form chlorine peroxide. The balance between these two chemicals is highly temperature-sensitive and studying it quantitatively is challenging. Earlier studies had found significantly different degrees of balance. The Microwave Limb Sounder's very large number of measurements has quantified this balance far better than before. (Source: www.sciencedaily.com)

The downside to ozone hole recovery

Major efforts have been initiated to speed up the ozone hole's recovery, including the 1987 Montreal Protocol and the phasing out of CFCs. Even so, a study by Ms. Guang Zeng and her colleagues from the National Institute of Water and Atmospheric Research, New Zealand, shows that that the recovery, in concert with climate change, may do harm as well as good.

The study, published in *Geophysical Research Letters,* revealed that variations in atmospheric circulation due to climate change will cause a 43 per cent increase in gas exchange between the stratosphere and the troposphere, the layer of Earth's air at the surface and our air supply. As more and more ozone is replenished in the stratosphere, it will also have more opportunities to seep into the air we breathe.

Some ozone is currently present in the troposphere, mostly as smog from car emissions and other pollutants. It can be harmful to human respiratory systems and the environment. If carbon dioxide levels in the atmosphere increase as expected from unabated emission, Ms. Zeng said the ozone layer will cool off, blurring the temperature boundary that separates it from the troposphere. Within the next century, more ozone than ever before will surge into our air, her computer model study predicts. (Source: www.ouramazingplanet.com)

CFC replacements act to worsen acid rain

Chemicals that helped solve a global environmental crisis in the 1990s – the hole in Earth's protective ozone layer – may be making another problem – acid rain – worse, scientists report. The study – by Dr. Jeffrey Gaffney and colleagues from the University of Arkansas at Little Rock, the United States – on the chemicals that replaced the ozone-destroying chlorofluorocarbons (CFCs) appears in *Journal of Physical Chemistry*. Some earlier studies had pointed out that hydrochlorofluorocarbons (HCFCs), which emerged as alternatives to CFCs because they do not damage the ozone layer, act like super greenhouse gases – 4,500 times more potent than carbon dioxide. The new study raises the possibility that HCFCs may break down in the atmosphere to form oxalic acid, one of the culprits in acid rain.

The scientists used a computer model to demonstrate how HCFCs could form oxalic acid via a series of chemical reactions high in the atmosphere. The model, they suggest, could have broader uses in helping to determine whether replacements for the replacements are as eco-friendly as they appear before manufacturers spend billions of dollars in marketing them. (Source: eponline.com)

ODS PHASE-OUT IN INDIA

Chiller Energy Efficiency Project and carbon financing

The objective of the Chiller Energy Efficiency Project (CEEP) for India is to reduce greenhouse gas emissions while simultaneously supporting the completion of the phase-out of consumption of ozone depleting substances (ODS) required under the Montreal Protocol.

There are four components to the project. The first component of the project is provision of incentives for investment in energy-efficient chillers. In an effort to remove market and techno-economic barriers, the CEEP will provide:

- Chiller owners with either an upfront financial incentive to subsidize the cost of the replacement of centrifugal chillers before end of technical life, or an annual payment from a share of certified emission reductions to be generated from the energy savings achieved by the new chillers; and
- An incentive for chiller manufacturers, suppliers and energy service companies to actively participate in the project.

The second component of the project is measurement, monitoring and verification. As per the methodology approved by the Clean Development Mechanism (CDM) Executive Board, the CEEP is required to monitor data related to the power-output function of the old chiller to be replaced, electrical consumption of the new chiller, and cooling output in order to measure energy savings and emission reductions achieved.

The third component of the project is technical assistance. To support project readiness and sustainability, it focuses on enhancing the awareness of relevant stakeholders in energy conservation measures, enhancing the understanding of the impact of decision to accelerate the phase-out of production of chlorofluorocarbons (CFCs) on the servicing sector, and strengthening the capacity of chiller owners and other stakeholders to monitor the performance of new chillers and to undertake refrigerant management.

The fourth component of the project is project management. A Project Management Unit (PMU) will be established at a financial intermediary – Industrial Development Bank of India – and will be responsible for implementing all activities under the CEEP. (Source: web.worldbank.org)

Dow presents capability to create zero ODP facilities

Dow Building Solutions, a unit of Dow Chemical Company and its subsidiaries, might introduce its new zero ozone depleting (ODP), no-volatile organic compound (VOC) foaming agent technology, following the successful conversion of its facility in La Porte, Texas, the United States. The facility manufactures STYROFOAM™ extruded polystyrene (XPS) foam insulation, which offers R-5/inch insulation (R is resistance to heat flow; the higher the R value, the greater the insulating power), and good moisture resistance and compressive strength that provide a "greener" choice to builders designing energy efficient homes and buildings with rigid foam insulation.

"Our high performance rigid foam insulation is the ultimate solution for achieving long-term energy efficiency while reducing greenhouse gas emissions," says Mr. Zafer Ansari from Marketing and Sales, Dow Building Solutions in India.

The new proprietary foaming agent technology was developed by a team led by Dow's Mr. Simon P. Lee, whose contributions to an Intergovernmental Panel on Climate Change (IPCC) report (in the United States) gained him recognition as a co-recipient of the organization's 2007 Nobel Peace Prize. The zero ODP, no-VOC foaming agent technology also helps save carbon dioxide emissions. (Source: www.dow.com)

R744r.com™

R744.com™ is an interactive platform that covers "Everything R744" in Mobile Air-conditioning (MAC), Refrigeration, Heat Pumps and other applications. The website keeps abreast of all developments on the natural refrigerant R744 (CO_2) in a user-friendly manner.

For more information, access:

Web: http://www.r744.com

IN THE NEWS

A giant leap towards HCFC phase-out goal

Policies to enable developing countries to freeze, reduce and eventually eliminate their consumption of hydrochlorofluorocarbons (HCFCs) were agreed in April 2010 in Montreal. In developing the HCFC project guidelines that set out the eligibility and criteria for funding to enable countries to comply with the Montreal Protocol's HCFC phase-out timetable, all members of the Multilateral Fund's Executive Committee demonstrated their continuing determination and commitment to finding solutions. Despite the complexity and technical nature of the lengthy negotiations that took place, the Executive Committee again proved that governments can come together and work out concrete means to address global environmental issues.

The criteria for funding projects that phase out HCFCs in the consumption sector were developed in direct response to the accelerated HCFC phase-out schedule set by the Parties to the Montreal Protocol on 21 September 2007. Manufacturing capacity in developing countries will be eligible for funding to convert to non-HCFC technology provided that it was installed before 21 September 2007. In addition, facilities previously financed through the Multilateral Fund to move away from CFCs would also qualify for funding to convert from HCFCs if essential for a country's compliance with the Montreal Protocol HCFC freeze in 2013, and the 10 per cent and 35 per cent reduction targets in 2015 and 2020. Guidelines were also agreed to address the phase-out of HCFC consumption in the refrigeration servicing sector of low-volume-consuming countries to enable them to meet compliance targets.

The guidelines cover the principles that will govern the level of funding and how countries can set their starting point for aggregate HCFC reductions. They also include consideration of funding for the introduction of low global warming potential (GWP) alternatives to HCFCs. *Contact: Ms. Julia Anne Dearing, Information Management Officer, United Nations Multilateral Fund Secretariat. E-mail: secretariat@unmfs.org.* (Source: www.unep.fr)

Four Asian countries join forces to combat illegal ODS trade

National Ozone Offices and Customs administrations from Bangladesh, Bhutan, India and Nepal have come together to forge an alliance to tackle illegal trade in chemicals that destroy the ozone layer and contribute to climate change. The co-operation was initiated at the Border Dialogue on Monitoring and Controlling Trade in Ozone Depleting Substances (ODS) that took place in Chalsa, West Bengal, India, in April 2010.

All countries have committed to reduce consumption and production of ODS under the Montreal Protocol. While alternatives are available to service equipment that work on chlorofluorocarbons (CFCs), the cost and incompatibility of some replacements can lead some users to seek out illicit supplies of the CFCs. The smuggling of these chemicals to satisfy this demand has posed significant challenges to border enforcement personnel. "Unified international efforts will be the key to the prevention of the environmental crime related to ODS smuggling," said Mr. Anil Bhatnagar, Director General, National Academy of Customs, Excise and Narcotics, Ministry of Finance, Government of India. Following the one-day regional dialogue, a capacity building training was held for the participating customs and enforcement officers in order to enhance their knowledge and skills in identifying and handling ODS. (Source: www.unep.fr)

Project for next-generation MAC technology

The European Commission-funded 'HCFC Phase-out and Mobile Air-conditioning' project of the United Nations Environment Programme (UNEP) aims at raising awareness in developing countries about sustainable non-hydrochlorofluorocarbon (HCFC) technologies available, such as R744, and of means to facilitate their take-up in a range of applications, including mobile air-conditioning (MAC). The overall objective of the project is to contribute towards reducing emissions of ozone depleting substances – HCFCs – and greenhouse gases – HCFCs and hydrofluorocarbons (HFCs) – by promoting best practices and energy-efficient technologies that have zero ozone depletion potential (ODP) and low global warming potential (GWP).

The project has two main components that will run over 2010. The first component concerns the overall HCFC phase-out in developing countries while the second will focus on next generation MAC technology in China and India. The first scale of the project is a "jump-start" project to encourage developing countries to expedite their compliance with the HCFC phase-out obligations and to adopt environmentally friendly alternatives to HCFCs. It will facilitate information sharing on HCFCs and their alternatives and encourage the adoption of non-ozone depleting, low or zero GWP and energy-efficient technologies and alternatives.

The second scale of the project provides support for next-generation MAC technology, with the aim of reducing emissions in China and India's MAC sector. This part of the project will raise awareness on sustainable MAC technology focusing on new and near market MAC technologies that leads to lower direct and indirect greenhouse gas emissions, and reduced local pollution. It will also cover the issue of responsible servicing practices of current technologies. (Source: www.r744.com)

Tougher control of ozone layer depleting substances

The production and use of ozone layer depleting substances (ODS) in China would be strictly controlled, according to a regulation made public by the State Council, or cabinet. According to the regulation, the country will set a national limit on the overall amount of production and use of such substances annually and allocate a quota to businesses. Entities that need to produce or use ODS should apply for the quota annually.

Exports and imports of such substances would also be strictly administrated. However, use of such substances for household electrical appliance such as refrigerators and air-conditioners was not governed by the regulation, a spokesperson with the Legislation Affairs Office of the State Council clarified. Environment protection authorities and other relevant authorities in China should draft a national plan to phase out, and finally eliminate such substances, the regulation said. The plan would be put into effect and carried out after the approval of the State Council. The regulation is to take effect on 1 June 2010. (Source: www.chinadaily.com.cn)

Fiji's Environment Ministry brings RAC firms together

In an attempt to involve businesses in taking responsibility for the environment, Fiji's Ministry of Environment is in the process of forming associations for refrigeration and air-conditioning (RAC) companies. The first such meeting, which was held in Lautoka this May, resulted in the appointment of office bearers for the Refrigeration and Air-Conditioning Association branch in the western division.

Mr. Seru Ramakita, the Ozone Depleting Substances Inspector at the Ministry, reminded members of their obligation to the environment and said the creation of the association was also an effort to reduce penalising of businesses for breaching environmental laws. He said certain businesses had been operating without proper licences and not abiding by the codes of practice. As a result, harmful gases were being released into the atmosphere. "The purpose of this association will be to uplift and maintain the standards of codes of practice in the industry. The association will also provide a forum through which government can liaise with, unlike in the past when consultations were only with individuals from the industry and this did not depict the view of other players in the industry," he said. (Source: www.fijitimes.com)

Climate-damaging refrigerant gases on their way out

Household and commercial freezers and refrigerators around the world could soon be using different gases to cool the food in storage. The gases now used either deplete the ozone layer or contribute to global warming, or both. Canada and Mexico have joined the United States in proposing to expand the scope of the international treaty governing ozone depletion to phase out these damaging gases. On 29 April 2010, the three countries together submitted an amendment to phase down hydrofluorocarbon (HFC) consumption and production under the Montreal Protocol on Substances that Deplete the Ozone Layer. The proposed amendment, which builds on a proposal last year, updates the step-wise HFC phase-down schedule for both developing and developed nations. The proposal would phase down production and use of the gaseous HFC refrigerants, which are "a significant and rapidly growing contributor to climate change," the United States Environment Protection Agency (EPA) said in a statement.

HFCs, which were touted as the environmental alternative to CFCs by chemical companies, are up to 14,000 times more damaging to the Earth's climate system than carbon dioxide, the most prevalent greenhouse gas, scientists have found. EPA led the analysis in the proposal, which demonstrates environmental benefits equal to removing greenhouse gas emissions from 59 million passenger cars each year through 2020, and 420 million cars each year through 2050.

EPA is proposing four hydrocarbon-based refrigerants as possible substitutes – isobutane, propane, HCR-188C and HCR-188C1 – in place of ozone-depleting chemicals CFC-12 and HCFC-22 in household and commercial freezers and refrigerators in the United States. Globally, hydrocarbon refrigerants have been in use for more than 10 years in countries such as Germany, Australia, the United Kingdom and Japan. (Source: www.ens-newswire.com)

HCFC-125 plant comes on stream in China

Arkema and Daikin have announced the successful start up of the HFC-125 (Forane® 125) world-scale production plant built on the Changshu site, China, as part of the Arkema Daikin Advanced Fluorochemicals Co. Ltd. The company is a joint venture owned 60 per cent by Arkema Group, with its global headquarters in France, and 40 per cent by Daikin Industries, based in Japan.

HFC-125, together with HFC-32, is an essential component in new-generation refrigerant blends such as R-410A that are meant to replace HCFC-22. "Following the launch of Forane 32 in the United States in 2007, this latest development confirms Arkema's commitment to investing in the production of new-generation components poised to replace HCFCs," commented Mr. Pierre Chanoine, Group President of Fluorochemicals business and Executive Vice President in charge of Arkema's Performance Products segment. (Source: www.chemie.de)

REFRIGERATION/ AIR-CONDITIONING

R-134a refrigerant, an HFC product

BOC India Limited, a member of the Linde Group, a leading global gases and engineering company headquartered in Germany, has introduced BOC Refrigerants R-134a, an HFC product, in India after successful launches worldwide. The company says that the product has been widely appreciated for its purity and user friendly packaging across geographies and has been used by leading players in the refrigeration and air-conditioning (RAC) industry.

R-134a package has the following key benefits:

- Product compliant to ARI 700 standard thus ensuring quality of product;
- Cylinders compliant to ISO 4706 thus ensuring safety;
- Bar-coded cylinders ensure accurate filling and tracking;
- Ergonomically designed (rounded bottom edge and wider base) cylinders that are safer to use;
- Dual phase valves providing flexibility to use the product in either the liquid phase or the gaseous phase; and
- Minimum pressure retention valves that prevent backflow of impurities thus ensuring pure and uncontaminated product on each occasion.

The product can be used in commercial, industrial and household refrigeration applications, including mobile air-conditioning. It offers retrofit from R-12 or R-401A/R-409A. (Source: www.bocindia.net)

Portable chiller with R-407C refrigerant

The Iceman portable chiller line from Mokon, the United States, has been expanded with a new unit that offers from ¼ tonne up to 40 tonnes of cooling capacity in both air-cooled and water-cooled designs. The new chiller, which meets process cooling requirements to -7°C, employs zero ozone depleting R-407C refrigerant. The chiller can also be supplied with other environment-friendly refrigerants to achieve temperatures down to -15°C.

The main feature of the new 40 tonne portable chiller is its tandem compressor arrangement that provides a flexible and energy-efficient design solution to ever-changing process cooling needs. This design offers users the option to run the chiller at 50 per cent if loads do not require the full cooling capacity. Another main element of the new chiller is its Carel uC2 microprocessor-based controller that is specifically designed for chiller applications and provides compressor anti-cycling and lead lag. This feature ensures equal run time and extended life of the two compressors.

The Iceman 40-tonne system also features scroll compressor technology and its benefits of quiet, smooth operation and the ability to tolerate "liquid slugging" during shutdown of the compressor. Refrigerant and process fluid loops are constructed of non-corrosive materials, including a stainless steel-brazed plate evaporator. Both are standard features in Mokon Iceman portable chiller. *Contact: Mokon, 2150 Elmwood Avenue, Buffalo, New York, NY 14207, United States of America. Tel: +1 (716) 876 9951; Fax: +1 (716) 874 8048; Website: www.mokon.com.* (Source: news.thomasnet.com)

Commercial HVAC unit with R-410A refrigerant

Specific Systems – a United States-based leader in industrial and explosion proof heating, ventilation and air-conditioning (HVAC) units – has announced the full release of its new APK-150 HVAC unit. APK-150 is a 12.5 tonne commercial and light industrial to-the-wall mount unit, and has dual horizontally mounted backwardly inclined fans producing up to 5,200 cfm air. Combined with Specific Systems' standard dual refrigeration circuit, AirPak 150 provides nearly 160,000 BTU/h at standard operating conditions using non-ozone-depleting R-410A refrigerant. APK-150 is available in several electrical configurations and multiple levels of environmental corrosion protection. *Contact: Specific Systems, 7655 E. 41st Street, Tulsa, OK 74145, United States of America. Tel: +1 (918) 663 9321; Fax: +1 (918) 663 5498; Website: www.specificsystems.com.* (Source: news.thomasnet.com)

Geothermal heat pumps using R-410A refrigerant

The Synergy3D Series geothermal heat pump, from WaterFurnace in the United States, is a multi-stage heating and cooling system. It is a single unit that operates as a furnace, boiler and an air-conditioner. This forced-air heating system is available in different sizes ranging from 3 to 6 tonnes. It provides hot water for radiant floor heating and is suitable for residential applications.

The Synergy3D Series geothermal heat pump uses R-410A refrigerant, which has zero ozone depletion. It incorporates variable speed ECM blower motors and dual capacity Copeland scroll compressors. The compressors fixed on double isolation plates provide silent operation. This heat pump is equipped with a microprocessor control to sequence all components for optimal performance. This control also provides troubleshooting features using on-board diagnostics.

The geothermal heat pump includes cabinets made of heavy-gauge metal. It operates in a liquid temperature from -7° to 49°C. There is an alert control module designed to identify and display any abnormal functions of compressors for easy maintenance and service. This multi-stage heating and cooling system is available in ground water heat pump and ground loop heat pump versions. The 049 ground loop heat pump version has a full cooling capacity of 44,600 BTU/h and a full heating capacity of 34,000 BTU/h with 3.7 COP. (Source: www.azocleantech.com)

New material could revolutionize refrigeration

Two teams – one from the University of Barcelona (UB) and another from the Universitat Politècnica de Catalunya (UPC) – based at the Barcelona Knowledge Campus, Spain, have worked with a group from Germany's University of Duisburg-Essen to develop a solid material that produces a caloric effect under hydrostatic pressure (solid-state barocaloric effect). The work was carried out using a high-pressure system developed by UPC.

Research into materials showing large caloric effects close to room temperature is one of the areas currently being explored to develop new refrigeration systems. The authors of this new study show that application of a moderate hydrostatic pressure to a nickel-manganese-indium alloy (Ni-Mn-In) produces results comparable to those achieved with the most effective magneto-caloric materials, which change temperature under the influence of an external magnetic field.

Mr. Antoni Planes, a professor at the UB Department of Structure and Constituents of Matter, explains: "This type of material can produce much greater calorific effects with only slight variations in pressure, which makes it ideal for domestic refrigeration systems. When these alloys are subjected to an external field, either magnetic or pressure, the material undergoes a solid-state phase transition". According to Mr. Lluís Mañosa, a professor with the same UB department, "this phase change generates a considerable latent heat exchange". The physical principle involved is the same as that observed when an ice cube is placed into a glass of water: the ice absorbs heat from the water, lowering its temperature.

The experiments were carried out using a unique high-pressure system developed by the Materials Characterization Group at UPC, directed by Mr. Josep Lluís Tamarit, a professor at the Department of Nuclear Physics and Engineering. The system was designed to measure temperatures during state changes according to the pressure and heat exchanged in the process. In addition to the effect described above, the Ni-Mn-In alloy also exhibits the inverse magnetocaloric effect. (Source: www.azom.com)

High-performance portable refrigerant leak detector

In the United States, Tracer Products has introduced TP-9360 Pro-Alert, a portable refrigerant leak detector featuring high-performance heated-diode sensor technology to accurately detect refrigerant leaks down to 0.25 oz per year. TP-9360 Pro-Alert features dual-sensitivity controls: a high-sensitivity setting when initially checking the leak area, and a low-sensitivity setting to hone in on the exact leak point. It is self-calibrating to neutralize background contamination, sensitive to both R-12 and R-134a refrigerants, and certified to meet SAE J1627 standard. Its variable-intensity audible alarm and flashing LED help pinpoint leaks fast.

The cordless, compact tool needs to be just turned on to make it ready for inspection instantly. Its 43 cm long, chrome-plated, flexible metal probe easily goes into tight spots and holds its position for more thorough inspection. The unit includes a powerful, built-in positive displacement pump that draws a test sample into the detector for fast, accurate sensing. *Contact: Tracer Products, 956 Brush Hollow Road, P.O. Box 483, Westbury, New York 11590, United States of America. Tel: +1 (516) 333 1254; Fax: +1 (516) 876 8411; E-mail: info@tracerline.com; Website: www.tracerline.com.* (Source: www.fleetequipmentmag.com)

Eco-friendly, super-efficient CPU cooling system

NEC Corporation of Japan has developed an eco-friendly cooling system for central processing units (CPUs) of computers. The technology uses 60 per cent less energy than a water-cooling system and even 80 per cent less than an air-cooling system, NEC claims. The system's core is a liquid chlorofluorocarbon substitute with a low global warming potential, which circulates around the CPU to draw away heat.

NEC says the refrigerant begins boiling at around 50°C, changes into vapour that absorbs the heat coming from the CPU, flows through a tube, and is cooled by a fan in a radiator before changing back into liquid. After that, the process in the closed loop starts again. According to NEC, the cooling fan doesn't have to work as much as under other cooling systems and needs less energy. The system, which was jointly developed with Japan's New Energy and Industrial Technology Development Organization, is said to be around 70 per cent cheaper to produce. NEC says the system can cut the total power consumption of data centres by at least 40 per cent. (Source: www.crunchgear.com)

Ozone Hole Watch

This is the Ozone Hole Watch web site, where you can check on the latest status of the ozone layer over the South Pole. Satellite instruments monitor the ozone layer, and we use their data to create the images that depict the amount of ozone.

For more information, access:

Web: http://ozonewatch.gsfc.nasa.gov

SOLVENTS

Specialist "green" cleaners for electronics manufacture

Intertronics, the United Kingdom, offers two new environment-friendly Techspray Renew precision cleaners, designed specifically for electronics manufacturing applications: Eco-Stencil Cleaner and Eco-Oven Cleaner. Both are effective, safe, non-inflammable and biodegradable, and have low volatile organic compound (VOC), zero global warming potential (GWP) and zero ozone depleting potential (ODP).

Eco-Stencil Cleaner effectively removes all types of solder paste and uncured adhesive from misprinted boards, screens and equipment. It is safe on stencils, squeegees and equipment surfaces. Eco-Stencil cleaner is an ideal replacement for isopropyl alcohol (IPA), which is often restricted because of safety and environmental restrictions on VOC emissions or waste disposal issues. Eco-Oven Cleaner cleans reflow ovens, wave soldering systems and associated heat exchanger systems by removing all types of flux residues. It is fast-acting and more effective than IPA for baked-on flux residues. (Source: www.emsnow.com)

Non-VOC coatings for maximum protection

Solvent-based conformal coatings – designed to protect printed circuit boards (PCBs) and related equipment from their environment – are extremely versatile and can be applied in many ways, such as dipping, spraying and brushing. The downside, particularly in low solids applications, is the high content of volatile organic compounds (VOCs) of these materials, and the environmental, health and safety impact their use has. For instance, VOCs contribute towards the formation of ground-level ozone, a major component of smog.

Electrolube, the United Kingdom, introduced a non-VOC (NVOC) conformal coating in 2007. Two years on, it is still the only coating to offer a drop-in replacement for solvent-based materials in selective spray applications. The NVOC coating, based on polyurethane (PUR) technology, is now

also available in a range of formats, covering all application requirements. It utilizes a PUR pre-polymer – pre-reacted polyurethane and isocyanate where some of the functional groups are blocked – as the base resin.

ENVOC05L, the non-VOC coating was created by adapting the PUR pre-polymer with a blend of carefully chosen diluents. The diluents chosen offer a massive reduction in viscosity, creating a 100-per cent solids material at a sprayable viscosity, similar to that of solvent-based materials, without the emission of any VOCs. The cure profile starts with the PUR pre-polymer reacting with moisture in the air. This is then followed by a further reaction with the diluent blend, releasing only carbon dioxide from the reaction. The coating's cross-linking nature means that the mechanical strength and abrasion resistance properties are excellent. The cured coating therefore is very tough, and possesses excellent moisture and chemical resistance.

Electrolube recently launched three new products: ENVOC-HV05L a high-viscosity version; ENVOC-GL05L, a semi-thixotropic gel version; and an ENVOC200H aerosol version. These products are environmentally and user-friendly alternatives to solvent-based conformal coatings in a vast array of applications. (Source: www.oilandgaseurasia.com)

Non-CFC flux cleaning solvent

Fluxclene from HK Wentworth, Australia, is a fast-drying solvent cleaner specially formulated for the quick and efficient removal of flux residues after soldering. It is a replacement for ozone depleting solvents such as CFC-113 and exhibits rapid cleaning and fast evaporation rates. The cleaning power of Fluxclene exceeds that of traditional CFC-based solvents, easily giving MIL-STD cleanliness, the company says.

Fluxclene contains inflammable solvents. Surfaces to be cleaned may be immersed in the solvent or the solvent could be sprayed onto the surface to excess and allowed to evaporate. In large scale production, the solvent may be used in ultrasonic cleaning equipment that is adapted for use with inflammable liquids.

The main features of Fluxclene are:

- Zero ozone depletion potential;
- Excellent removal of greases, oils and flux residues and acrylic conformal coatings from printed circuit boards;
- Leaves a perfectly clean, dry surface, unlike conventional solvents that often leave greasy deposits to attract dust and dirt;
- Harmless to most plastics, rubbers, elastomers and surface coatings.
- Carbon dioxide-propelled aerosol version available containing 20 per cent more active cleaner, fitted with a 360° valve for use in any orientation.

Contact: HK Wentworth, 3/98 Old Pittwater Road, Brookvale, NSW 2100, Australia. Tel: +61 (2) 9938 1566; Fax: +61 (2) 9938 1467. (Source: www.ferret.com.au)

Ultrasonic precision cleaning systems

Microsolve ultrasonic precision cleaning systems from Guyson International Ltd., United Kingdom, are claimed to provide the highest cleaning standards yet keep running costs surprisingly low. Users have a choice of processes: MONO-SOLVENT for general precision cleaning, CO-SOLVENT where contamination is particularly heavy or for some applications in electronics, and 3-SUMP for certain special applications. Options include dual frequency ultrasonics, solvent monitoring with auto top-up and a choice of Autotrans robotic work handling systems.

Microsolve MONO-SOLVENT two-stage systems provide ultrasonic cleaning using hydrofluoroether (HFE) or hydrofluorocarbon (HFC) solvents, followed by vapour rinsing and freeboard drying. Typical applications include gyro components, bearings and precision medical components; maintenance cleaning of pneumatic and hydraulic components; and, in electronics, flux removal from PCBs or from soldering jigs and fixtures.

Microsolve CO-SOLVENT systems provide two ultrasonic cleaning stages, followed by vapour rinsing and freeboard dry. In the first cleaning stage, a mixture of HFE and a hydrocarbon solvating agent removes gross contamination from the components. Large quantities of dirt and oils can be taken up by the solvating agent, making the process particularly suitable for heavy duty ultrasonic cleaning applications.

The CO-SOLVENT process handles with ease applications such as removal of polishing compounds, cleaning of power generation system components and flux removal from PCBs, including no-clean and lead-free solder flux residues. *Contact: Guyson International Limited, Snaygill Industrial Estate, Keighley Road, Skipton, North Yorkshire BD23 2QR, United Kingdom. Tel: +44 (1756) 799911; Fax: +44 (1756) 790213; E-mail: info@guyson.co.uk.* (Source: www.guyson.co.uk)

Fast-acting cleaner for electrical and electronic use

KC™ Electrical Cable & Equipment Cleaner from American Polywater Corporation, the United States, replaces CFC and chlorinated solvent cable and contact cleaners. It is non-inflammable, fast evaporating and non-carcinogenic. This contact cleaner will not attack or degrade sensitive plastics or corrode metals. It is compatible with most plastics and elastomers, and does not tarnish or corrode copper per ASTM D 130 and D 1729 (Testing is based on a soak test described in ASTM D 543). This cleaner has less effect on these materials than chlorinated solvents and HCFC-141b.

KC™ Electrical Cable & Equipment Cleaner is essentially non-conductive and effectively cleans oxidation, dust and light oils from electrical equipment. It could be used to clean cables, circuit boards, controls, switches, sub-station relays, etc. It will evaporate from the cleaned surface quickly, leaving no residue. The contact cleaner is a slightly stronger solvent than the CFC azeotropes that are normally used. It will clean light oils, silicone compounds and fluorinated greases. *Contact: American Polywater Corporation, P.O. Box 53, Stillwater, MN 55082, United States of America. Tel: +1 (651) 430 2270; Fax: +1 (651) 430 3634.* (Source: www.polywater.com)

JumpStart Project for HCFC Phase-out

This project is designed to help reduce direct and indirect releases or emissions of HCFCs and HFCs) both through promotion of zero ozone depletion potential and low global warming potential alternatives as well as promotion of best practices and better engineered and energy efficient technology. For more information, contact:

UNEP DTIE OzonAction
15 rue de Milan, 75441 Paris CEDEX 09, France
E-mail: ozonaction@unep.org

FOAMS

Foam blowing agents

BOC, a member of the Linde Group, a leading global gases and engineering company headquartered in Germany, has a proven international track record in providing an extensive range of foam blowing solutions to customers for a wide range of applications – construction, automotive, white goods OEM, food packaging, HVAC or leisure equipment.

BOC's unique blending capability enables it to customize the foam blowing agent blend to meet the application requirements. The hydrocarbon blowing agents offered include cyclopentane, isopetnane, n-pentane and isobutene. BOC also offers Ecomate, a next-generation foam blowing product that has high thermal efficiency, ultra low global warming potential, zero ozone depletion potential, zero volatile organic compounds and approval by the United States Environment Protection Agency's Significant New Alternatives Programme (SNAP).

Oxygen-free nitrogen (OFN) and carbon dioxide (CO_2) are products that have applications in the foam blowing industry, mainly in the production of flexible foam. OFN is also used to make enclosed spaces "inert" and to provide a protective blanket over flammable liquids. CO_2 can be used as a powerful fire extinguisher in unmanned, enclosed space (compactors). BOC can also offer several hydrofluorocarbons (HFC-152a, HFC-365mfc/227 and HFC-245fa). *Contact: BOC, The Priestley Centre, 10 Priestley Road, The Surrey Research Park, Guildford, Surrey GU2 7XY, United Kingdom. Tel: +44 (1483) 579 857; Fax +44 (1483) 505 211.* (Source: www.boconline.co.uk)

Liquid CO_2 blowing system

The CarDio™ developed by Cannon Viking, the United Kingdom, is a process of manufacturing flexible polyurethane (PUR) foam slabstock using liquid carbon dioxide (CO_2) as the physical blowing agent. Conventional physical blowing agents such as CFC-11, methylene chloride, acetone or 1,1,1 trichlorethane have adverse environmental or safety issues. As part of earth's atmospheric eco-cycle, CO_2 is an environment-friendly material.

CarDio was the first commercial process to successfully use liquid CO_2 as a physical blowing agent in PUR foam production on a continuous basis. CarDio equipment can be supplied complete and incorporated with a new continuous foam slabstock plant, or installed as an addition to a customer's existing foam block production machinery as a retrofit. *Contact: Cannon Viking Viking House, Unit 1, Parkway Trading Estate, Barton Dock Road Stretford, Manchester, M32 0TL, United Kingdom. Tel: +44 (161) 8669909; Fax: +44 (161) 8668808.* (Source: www.cannonviking.com)

Thermoplastic foam blowing agent combination

Arkema Inc., the United States, has patented a blowing agent for thermoplastic foams such as extruded polystyrene foam. The blowing agent is a blend of a low solubility blowing agent, such as 1,1,1,2-tetrafluoroethane, and a dichloroethylene such as trans-1,2-dichloroethylene (TCDE). The blowing agent combination is claimed to enhance the processability of thermoplastic foam.

It has been discovered that TDCE can improve the processability when foaming thermoplastics with blowing agents, particularly hydrofluorocarbons (HFCs) such as 1,1,1,2-tetrafluoroethane (HFC-134a). Being non-ozone depleting compounds, HFCs have been identified as alternative blowing agents to chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) in the production of thermoplastic foams. However, it has been observed that it can be more difficult to process thermoplastic foams with many HFCs than with CFCs or HCFCs. For instance, in the production of extruded polystyrene (XPS) foam, HFC-134a and HFC-125 (pentafluoroethane) have limited solubility and higher degassing pressure in the polystyrene resin than HCFC-142b (1-chloro-1,1-difluoroethane). This makes them more prone to premature degassing and makes it more difficult to control the foaming process when using these lower solubility HFCs. The use of such HFCs can require a higher operating pressure, which may not be acceptable in many extrusion systems currently in vogue.

It was found that adding a small amount TDCE to a foamable thermoplastic composition being blown with a low-solubility blowing agent can improve the processability by lowering the required operating pressure and limiting the premature degassing. This results in better control of the foaming process in the production of thermoplastic foams, such as open-cell or closed-cell styrenic insulating foams. Furthermore, adding TDCE can improve the solubility of the blowing agent in the resin mix, allowing for more blowing agent to be added. This allows for lower density, closed-cell foam to be produced than when the blowing agent is used without TDCE. Increasing the blowing agent loading, such as HFC-134a, by increasing the solubility in the resin can result in improvement in the insulating performance of the closed-cell foam. (Source: www.faqs.org)

Die innovation for polystyrene foam board

Extrusion Dies Industries LLC (EDI), the United States, has announced a new die system for extruded polystyrene (XPS) foam board that dramatically reduces downtime for product changeover, enabling manufacturers to offset much of the loss in productivity caused by switching to a non-ozone depleting blowing agent. In addition, EDI's technology incorporates innovations that enhance control over product dimensions, reduce scrap and eliminate shutdowns for die maintenance.

"The EDI XPS foam board die technology makes it possible to accomplish a product changeover on the fly in only 15 minutes," said Mr. Dennis S. Paradise, Vice President of Sales and Marketing. "By comparison, a change in width or thickness with a conventional die system requires shutting down the production line for at least eight hours, followed by a two-hour start-up phase in which no saleable board is produced."

A key innovation of the die system is a new type of forming box. In most conventional die systems, the forming box and die lip constitute a single component. Changing the dimensions of the board requires stopping the production line, disassembling the lip/forming box, adjusting for new product dimensions, and reassembling the unit. In the EDI system, the forming box is an independently adjusted component that makes possible product changeovers without stopping the production line. An adjustable full-manifold internal deckle inside the flow channel of the die also reduces downtime.

A second new component that reduces downtime is an adjustable full-manifold internal deckle inside the flow channel of the die. The deckle blades at either end of the manifold can be used to change flow-channel width by being moved farther into the channel or farther out. Still another new component for ensuring dimensional consistency is external edge restrictors, which create the final side dimensions of the board as it emerges from the forming box and then passes between the two top and bottom sizing plates that are typically used in foam board production. A fourth innovative component is a purge block located between the extruder and the die. This innovation makes it possible to carry out all die maintenance works while the extruder is temporarily shut down but still full of polymer. (Source: www.strictly-extrusion.com)

Blowing agents for polymeric foams

In the United States, Honeywell International Inc., along with four individual inventors, has filed for patenting foam blowing agents comprising one or more chlorofluoro-olefins selected from 1,2-dichloro-1,2-difluoroethene, 3,3-dichloro-3-fluoropropene, 2-chloro-1,1,1,3,4,4,4-heptafluoro-2-butene, and 2-chloro-1,1,1,4,4,4-hexafluoro-2-butene, as well as foams produced using these.

Applicants have discovered unexpectedly that the above-mentioned group of chlorofluoro-olefins have a low or near-zero ozone depletion potential (ODP), a low global warming potential (GWP), demonstrate a low or no-toxicity, and are soluble in polyols. Accordingly, these compounds offer desirable to be used as environmentally friendly blowing agents.

In one aspect, this invention is directed to a foamable composition comprising (a) a polymerizable material capable of forming a foam matrix; and (b) a blowing agent comprising one or more compounds selected from the group mentioned above. In another aspect, this invention is directed to a closed-cell foam comprising a cell wall comprising polyurethane or polyisocyanate and a cell volume within said cell wall, wherein said cell volume comprises at least one of the blowing agents from the earlier mentioned chlorofluoro-olefins. (Source: www.wipo.int)

AEROSOLS

Pharmaceutical grade aerosol propellants

Solvay Chemicals, a chemicals business unit of Solvay S.A. based in Belgium, offers pharmaceutical grade aerosol propellants Solkane® 227 pharma and Solkane 134a pharma. These propellants are free of chlorofluorocarbons (CFCs) and manufactured in dedicated facilities according to current good manufacturing practices (cGMP).

Solkane 227 pharma is HFA-227, HFC-227 or 1,1,1,2,3,3,3-heptafluoropropane, while and Solkane 134a pharma is HFA-134a, HFC-134a or 1,1,1,2,-tetrafluoroethane. These are used in medical sprays such as: metered dose inhalers (MDIs), nasal sprays, foam sprays and other oral/ topical sprays to propel the active ingredient which is dispersed or solubilized in the hydrofluoroalkane (HFA).

Neither HFA-227 nor HFA-134a contains chlorine and are thus non-ozone depleting. Furthermore, they are non-inflammable and chemically inert, which make them ideal for use in medical products. Moreover, as both these propellants have thermodynamic and physical properties that closely resemble CFC-11, CFC-12 and CFC-114 traditionally used in medical sprays, they can replace the CFCs. (Source: www.solvaychemicals.com)

Co-polymer stabilizers for HFA dispersions

In the United States, Wayne State University researchers Mr. Sandro Da Rocha and Mr. Libo Wu investigated the ability of biodegradable and biocompatible lactide-based nonionic amphiphiles to stabilize a model drug (salbutamol base) dispersion in hydrofluoroalkane (HFA) propellant. A series of triblock copolymers of the type poly (lactide)-poly(ethylene glycol)-poly(lactide) (LAmE OnLAm) with varying molecular weight (MW) and percentage of ethyl oleate (EO) were synthesized. The cohesive forces between drug particles in liquid HFA in the presence of the amphiphiles were quantitatively determined by colloidal probe microscopy (CPM). The effect of co-solvent, oleic

acid and a non-ionic triblock copolymer with the propylene oxide moiety as the HFA-phile was also investigated.

CPM results show that the overall concentration, MW, surfactant tail (LA) length and the ratio between the stabilizing LA moiety and the anchor EO group have a great impact on the drug's cohesive forces. The CPM results in liquid HFA were correlated to the bulk physical stability of the drug suspensions in the propellant 1,1,1,2,3,3,3-heptafluoropropane (HFA-227). The dispersions in HFA-227 were significantly improved in the presence of LAmEOnLAm, correlating well with the low cohesive forces determined by CPM. The applicability of LA-based amphiphiles might be extended to other suspension-based formulations provided a suitable head group is found. This study is relevant for the development of HFA-based dispersion pressurized metered-dose inhaler (MDI) formulations. *Contact: Wayne State University, 5057 Woodward, Suite 6306, Detroit, Michigan 48202, United States of America.* (Source: pubs.acs.org)

CFC-free aerosolized formulation for the treatment of asthma

Schering-Plough Corporation, the United States, has been assigned patent on a metered dose inhaler containing an aerosol suspension formulation for inhalation, with the aerosol suspension formulation comprising an effective amount of mometasone furoate, a surfactant and a propellant free of chlorofluorocarbon (CFC), preferably HFA-227 or HFA-134a, wherein the formulation is substantially free of a carrier.

The invention also covers a process for producing the above-said aerosol suspension formulation for inhalation, comprising the steps of:

- Mixing a dry powder blend of micronized mometasone with a dry powder surfactant to form a uniform mixture;
- Filling said mixture into a metered dose inhaler canister;
- Crimping the canister with a metering valve; and
- Filling the canister with a non-CFC based propellant, and the products produced thereby. (Source: www.patents.com)

FUMIGANTS

Alternatives to farm field chemical fumigation

In the United States, agricultural scientists from the University of California (UC) have been working on hundreds of research projects to find new alternatives to chemical soil fumigation, particularly using methyl bromide (MBr). Some promising alternatives now being tested are discussed here.

Injecting superheated steam into the soil may be one way to replace chemical fumigants in agriculture. UC Cooperative Extension specialist Mr. Steve Fennimore, working with a private company, imported a machine that is used in Italy to prepare soil for greenhouse basil plantings. The machine, manufactured by Ferrari Constructione, has a 100 × 74 inch platform fitted with 99 10-inch spikes that inject steam into the ground. Within just two minutes, it will take soil at 15.5°C in the top 8 inches and heat it to about 93°C, says Mr. Fennimore.

However, there are drawbacks associated with the steam machine. Treating the field is expensive. The machine moves only 8 ft at a time up and down the field, each time pushing the spikes into the ground and leaving them positioned there for 6 min while the steam does its work. With one steam machine, it takes about 30 h per acre. Mr. Fennimore calculated that operating the steam machine, labour and fuel cost US$3,848 per acre compared with chemical fumigation cost of US $2,700 to US$3,000 per acre. Applying steam to raised beds rather than the entire field could cut steam treating expenses to about US$3,000 per acre. Another concern is pollution, as the Italian machine runs on diesel fuel. But Mr. Fennimore is encouraged by the success Italians have had with the steam system. Although the Italian farmers had stopped using MBr for a while now, the number of agri-industries has remained the same.

Using steam to treat land before replanting vineyards and orchards is another issue. The depth of the steam injectors wouldn't be sufficient for trees whose root zones reach 4-6 feet into the ground. For such purposes, UC Riverside nematologist Mr. Mike McKenry is studying steam application,

not on the whole field, but in holes that give steam access to the full root zones of future trees. Mr. McKenry is using a steam generator, powered by propane, with an injector on a long hose. "We will pull the steam generator on a tractor, there is an auger on the front of it, we will dig down four feet and we will treat with steam prior to the planting of the tree," Mr. McKenry said. He believes that this would provide a brief period of relief from soil pests and diseases.

Mr. McKenry is also studying a fumigation alternative he named 'starve and switch'. "We kill the old roots with an appropriate systemic herbicide such as Roundup and fallow the field for a year so the microbes in the soil starve," he said. "Then we switch to a rootstock with tolerance to the rejection component." After one year of planting almond trees in a replicated trial of almond trees – where some sections were treated before planting with the fumigant Telone, other sections subjected to starve and switch, and other sections planted with no special treatment – the Telone trees are dense and tall, the starve-and-switch trees nearly as tall but with much less foliage, and the untreated tree clearly smaller and less dense. (Source: www.seedquest.com)

On-farm trials of MBr alternatives for raspberry

In the United States, researchers from Washington State University and the Department of Agriculture's Agricultural Research Service (ARS) have carried out on-farm trials of methyl bromide (MBr) alternatives for soil fumigation for raspberry nurseries. Raspberry nurseries normally rely upon pre-plant soil fumigation with MBr and chloropicrin (Pic) combinations to produce plants free from diseases and nematodes. Successful alternatives to MBr:Pic must provide full control of plant-parasitic nematodes, *Agrobacterium tumefasciens* and *Phytophthora rubi*.

Trials in commercial raspberry nurseries evaluated MBr:Pic and alternative fumigants, including: Midas® (methyl iodide:Pic), Telone® C-35 and Pic Clor 60 (Telone:Pic) under high-density polyethylene (HDPE) and virtually impermeable (VIF) films. *P. rubi* and *A. tumefasciens* control was evaluated with a greenhouse biossay; *A. tumefasciens* control was also evaluated by soil dilution planting on a selective medium. All of the treatments controlled *P. penetrans* and buried bags of perennial quackgrass and nutsedge propagules. Midas applied at 159 kg/acre under a HDPE tarp consistently provided excellent control of all weeds and pathogens. VIF film enhanced efficacy of Midas applied at 102 kg/acre and of Telone C-35 applied at 148 litres/acre for controlling *Agrobacterium* and *P. rubi*. (Source: ashs.confex.com)

Effects of reduced-rate MBr applications in crop nurseries

In California, the United States, producers of perennial crop nursery stock employ pre-plant soil fumigation to meet state phytosanitary requirements. Although methyl bromide (MBr) has been phased out in many agricultural industries, it is still the preferred treatment in the perennial nursery industry and is used under Critical Use Exemptions and Quarantine/Pre-shipment provisions of the Montreal Protocol. Scientists from the Agricultural Research Service (ARS) of the United States Department of Agriculture conducted a study to evaluate reduced-rate MBr applications sealed with conventional and low-permeability plastic films compared with the primary alternative material.

Reduced rates (100-260 kg/ha) of MBr applied in combination with chloropicrin (Pic) and sealed with a low-permeability plastic film provided weed and nematode control similar to the industry standard rate of 392 kg/ha MBr:Pic (98:2) sealed with high-density polyethylene (HDPE) film. However, 1,3-dichloropropene (1,3-D) – the primary alternative chemical – tended to provide slightly lower pest control even on sites with relatively low plant parasitic nematode, soil-borne pathogen and weed pest pressure.

If state regulations change to allow the use of low-permeability films in broadcast fumigant applications, the results of this research suggest that reduced rates of MBr in perennial crop nurseries could serve as a bridge strategy until more technically, economically and environmentally acceptable alternatives are available. *Contact: Mr. Bradley D. Hanson, Department of Plant Sciences, Mail Stop 4, University of California, Davis, One Shields Avenue, Davis, CA 95616-8780, United States of America.* (Source: www3.interscience.wiley.com)

RECENT PUBLICATIONS

Environmentally Benign Polymeric Foams

This book examines the fundamental properties, principles and applications of foaming technology using environmentally neutral carbon dioxide (CO_2) and nitrogen (N_2) agents. Foremost researchers in Japan provide invaluable insight to their most cutting-edge research and applications, including microcellular technologies and recently developed foaming resins. The book, enhanced by real-world examples and images throughout, describes foaming phenomena, polymer-CO_2/N_2 system properties, and mathematical models used to predict and estimate changes in these properties.

Contact: CRC Press, United Kingdom. Tel: +44 (1235) 400524; Fax: +44 (1235) 400525; E-mail: book.orders@tandf.co.uk.

Properties of Secondary Working Fluids for Indirect Systems

This greatly expanded 2nd edition of a booklet responds to rising use of secondary refrigerant systems used in applications ranging from solar heating at high temperatures to freezers in supermarkets. It comprises comprehensive data on a number of aqueous solutions of ethylene and propylene glycol, ethanol, glycerol, ammonia, chlorides and potassium salts. An entire chapter is devoted to freezing point, density, specific heat, thermal conductivity, viscosity, boiling point, vapour pressure, surface tension and specific conductance. The book also deals with the selection of a suitable secondary refrigerant, technical calculations and computer treatment of data. Charts make it possible to compare commercial products and to perform comparisons of fluids with respect to energy transport, pressure drop as well as heat transfer.

Contact: International Institute of Refrigeration, 177, boulevard Malesherbes, 75017 Paris, France. Tel: +33 (1) 4227 3235; Fax: +33 (1) 4763 1798; Website: www.iifiir.org.

TECH EVENTS

12-15 Jul
West Lafayette
United States

13th International Refrigeration and Air-Conditioning Conference
Contact: Ms. Virginia Freeman,
Programme Secretariat,
Ray W. Herrick Laboratories,
Purdue University,
140 S. Martin Jischke Drive,
West Lafayette, IN 47907-2031,
United States of America.
Tel: +1 (765) 494 6078;
Fax: +1 (765) 494 0787;
E-mail: herlconf@ecn.purdue.edu.

28-30 Jul
Coral Coast
Fiji

Meeting of the Pacific Island Countries Network of Ozone Officers
Contact: Mr. Hu Shaofeng,
Programme Officer (Refrigerant Management Plan Implementation),
UNEP-ROAP,
United Nations Building,
Rajdamnern Nok Avenue,
Bangkok 10200, Thailand.
Tel: +66 (2) 288 1126;
Fax: +66 (2) 280 3829;
E-mail: shaofeng.hu@unep.org.

23-27 Aug
Baotou
China

4th International Conference on Magnetic Refrigeration at Room Temperature – Thermag IV
Contact: Baotou Research Institute of Rare Earths,
No. 36 Huanghe Street,
Rare Earth Hi-Tech Zone, Baotau,
Inner Mongolia, 014030 China.
Tel: +86 (472) 517 9253;
Fax: +86 (472) 515 2008;
E-mail: thermag4@brire.com.
Website: www.brire.com/thermag4

01-03 Sep
Singapore

REFRIGERATION ASIA 2010
Contact: IIR Exhibitions Pte. Ltd.,
205 Henderson Road,
#03-01 Henderson Industraial Park,
Singapore 159549.
Tel: +65 6319 2668;
Fax: +65 6319 2669;
E-mail: sharon.lim@iirx.com.sg;
Website: hvacrseries.com/asia/2010/

18-20 Sep
Beijing
China
(Tentative)

Joint Meeting of South Asia and Southeast Asia and Pacific Networks of Ozone Officers
Contact: Mr. Atul Bagai,
Regional Officer (Networking),
UNEP-ROAP,
United Nations Building,
Rajdamnern Nok Avenue,
Bangkok 10200, Thailand.
Tel: +66 (2) 288 1662;
Fax: +66 (2) 280 3829;
E-mail: atul.bagai@unep.org.

PUBLICATIONS from APCTT

PERIODICALS

(Free access at www.techmonitor.net)

- ❑ Asia Pacific Tech Monitor (6 issues/year) — (e-version)
- ❑ VATIS Update (6 issues/year)
  - ❍ Biotechnology — (e-version)
  - ❍ Non-conventional Energy — (e-version)
  - ❍ Food Processing — (e-version)
  - ❍ Ozone Layer Protection [#] — (e-version)
  - ❍ Waste Management — (e-version)

BOOKS

	Indian Rupees* (India, Bhutan and Nepal)	US Dollars*
❑ Managing Innovation for the New Economy: Training Manual, 2002 Volume 1: How to Guide & Quick reference materials Volume 2: Articles & Lectures	1,000.00	50.00
❑ Regional Capacity-building for the Adoption of ISO-14000 and Transfer of Environmentally Sound Technology: Training Manual, 2000	600.00	30.00
❑ Small Rural Industries in the Asia Pacific Region: Enhancement of Competitiveness of Small Rural Industries in a Liberalized Economic Environment and the Impact of Poverty Alleviation, 2000	600.00	30.00
❑ Technology Transfer and Technological Capacity-building in Asia and the Pacific		
❍ Volume 1: Big Countries and Developed Economies, 1999	600.00	30.00
❍ Volume 2: ASEAN, NIEs, SAARC and the Islamic Republic of Iran, 1999	600.00	30.00
❍ Volume 3: Least Developed and Pacific Island Countries and Economies in Transition, 1999	600.00	30.00
❍ Volume 4: Emerging Issues in Regional Technological Capability-building and Technology Transfer, 1999	600.00	30.00
❑ Rural Industrialization as a Means of Poverty Alleviation: Report of the Regional Seminar on the Enhancement of Partnerships among Governmental, Non-governmental and Private Sector Entities for the Promotion of Rural Industrialization for Poverty Alleviation, 1999	600.00	30.00
❑ Institutional Development for Investment Promotion and Technology Transfer, 1999	500.00	25.00
❑ Ozone Depletion Substances Phase-out Technologies: Problems & Issues on Technology Transfer, Absorption and Generation, 1998	300.00	15.00
❑ Development and Utilization of S&T Indicators: Emerging Issues in Developing Countries of the ESCAP Region, 1998	300.00	15.00
❑ ODS Phase-out: A Guide for Industry, 1998	500.00	25.00
❑ Proceedings of the Consultative Meeting on Technology Management Education and Training for Developing Countries, 1997	800.00	40.00

Notes: Amount less than Rs 500 should be sent through a demand draft only. Otherwise, payment should be made by cheque/ demand draft/UNESCO coupon in favour of the Asian & Pacific Centre for Transfer of Technology, payable at New Delhi.

[#] Print version supported by the Ozone Cell, Ministry of Environment & Forests, Government of India, for distribution to a select target group.

** Amount to be sent to APCTT with the order for covering costs and handling charges.*