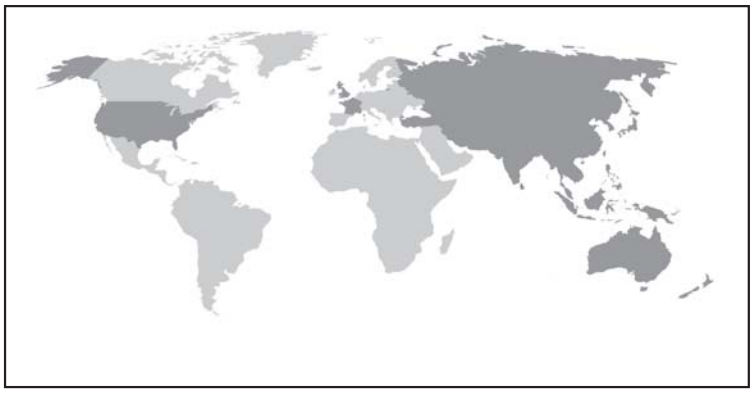
The **Asian and Pacific Centre for Transfer of Technology (APCTT)**, a subsidiary body of ESCAP, was established on 16 July 1977 with the objectives: to assist the members and associate members of ESCAP through strengthening their capabilities to develop and manage national innovation systems; develop, 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

2008 ozone hole maximum reached on
12 September 2008
(Credit: NASA, USA)

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*** Value Added Technology Information Service**

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THE SCIENCE OF OZONE LAYER

Antarctic ozone hole in 2008 larger than in 2007

The World Meteorological Organization (WMO) has reported that the ozone hole over the South Pole in 2008 is larger than in 2007. On the occasion of the International Day for the Preservation of Ozone Layer, Secretary General of the United Nations, Mr. Ban Ki-moon, stated "After decades of chemical attack, it may take another 50 years or so for the ozone layer to recover fully. As the Montreal Protocol has taught us, when we degrade our environment too far, nursing it back to health tends to be a long journey, not a quick fix."

Routine ozone measurements in all parts of the world using surface-based spectrophotometers, balloon-borne sensors, aircraft and satellites have been made by the National Meteorological and Hydrological Services of WMO members and partners worldwide since the 1950s. Thirty years later, comprehensive measurements started under coordination of the WMO Global Atmosphere Watch (GAW). These measurements have been critical to the series of Scientific Assessments of Ozone Depletion published since the mid-1980s by WMO and the Ozone Secretariat of the United Nations Environment Programme documenting progress made under the Vienna Convention for the Protection of the Ozone Layer. The most recent of these assessments came out in the spring of 2007, and the work on the next ozone science assessment will begin in the middle of 2009.

At the end of August 2008, WMO released the first of its 2008 series bi-weekly Antarctic Ozone Bulletin on the current state of stratospheric ozone in the Antarctic. These bulletins use provisional data from WMO/GAW stations operated within or near the Antarctic, where the most regular and dramatic decreases in ozone occur. According to the latest bulletin, the vortex is presently more circular than at the same time last year. This has led to an onset of ozone depletion that is close to the 1979-2007 average and somewhat later than last year, when the vortex was more elongated and more exposed to sunlight. The meteorological conditions observed so far could indicate that the 2008 ozone hole will be smaller than the 2006 hole but larger than the 2007 one. WMO is the United Nations' authoritative voice on weather, climate and water. *Contact: Ms. Carine Richard-Van Maele, Chief, Communications and Public Affairs, World Meteorological Organization, Switzerland. Tel: +41 (22) 7308 315; Or Ms. Gaelle Sevenier, Press Officer, World Meteorological Organization, Switzerland. Tel: +41 (22) 7308 417.*
(Source: www.wmo.int)

Study finds cosmic radiation causes ozone depletion

A new Canadian study reveals that cosmic rays, and not CFCs, are the main cause behind ozone depletion in the earth's atmosphere. The study also predicts that the largest ozone hole – larger than the combined size of the United States and Canada – will occur over Antarctica. Prof. Qing-Bin Lu, a professor of physics and astronomy at the University of Waterloo and a specialist in the study of ozone depletion, states that his study belies the two-decade-old theory that the earth's ozone layer is being depleted by chlorine atoms produced by sunlight-induced destruction of CFCs in the atmosphere. On the contrary, Prof. Lu said, more and more evidence points to a new theory that cosmic rays – energy particles that originate in space – play a major role in ozone destruction.

According to Prof. Lu data from several sources, including satellites of the National Aeronautics and Space Administration (NASA), confirmed a strong link between cosmic ray intensity and ozone depletion. Prof. Lu added that lab measurements also demonstrated a mechanism by which cosmic rays cause drastic reactions of ozone depleting chlorine inside clouds over Antarctica. Satellite data from 1980 to 2007, covering two full 11-year solar cycles, also demonstrated a significant link between cosmic rays and ozone depletion. "This finding, combined with laboratory measurements, provides strong evidence of the role of cosmic-ray driven reactions in causing the ozone hole and resolves the mystery of why a large discrepancy between the sunlight-related photochemical model and the observed ozone depletion exists," states Prof. Lu. (Source: www.sify.com)

ODS PHASE-OUT IN INDIA

CFCs phased out ahead of schedule

CFCs have been phased out by this August, 17 months ahead of schedule, informed the Minister of State for Environment and Forests, Mr. Namo Narain Meena. Addressing a gathering celebrating the 14th International Day for the Preservation of the Ozone Layer, he termed this as creditable achievement considering the challenges of meeting the residual requirements of CFCs within India. The most important and critical target of 85 per cent reduction of carbon tetrachloride production and consumption has also been achieved, while halons have been phased out in 2003. The 19th Meeting of the Parties to the Montreal Protocol took a historic decision to advance the phase-out of HCFCs from 2040 to 2030. (Source: www.pib.nic.in)

UNEP programme to create awareness on ozone depletion

A special programme to celebrate the International Day for the Preservation of Ozone Layer was held by the United Nations Environment Programme (UNEP) and Pune Zilla Parishad Secondary School Section. An educational tool for creating awareness about ozone depletion and climate change among students was launched on this occasion.

The educational tool from UNEP for primary school students consists of a story in which a character named Ozzy tells the story of ozone depletion and climate change. It has already been translated into Marathi, Hindi, Urdu and Bengali. The idea is to make subjects such as ozone depletion and climate change understandable for school children. The tool is available in the form of books and CDs. (Source: www.expressindia.com)

Carrier India bags HVAC project

Carrier Air-conditioning and Refrigeration Limited has bagged the contract to install the heating, ventilation and air-conditioning (HVAC) system at Delhi International Airport's upcoming Terminal 3, a company release said. Carrier will provide eight Evergreen 19XRD centrifugal chillers of 2,500 tonnes of refrigeration (TR) each for this project. The dual-compressor centrifugal chiller represents cutting-edge HVAC technology, which is ideal for large airports, commercial complexes, shopping malls, factories and district cooling plants.

The Evergreen 19XRD is Carrier's largest single-unit cooling capacity chiller employing the non-ozone depleting refrigerant HFC-134a. It features Carrier-patented technology designed to improve indoor air quality and offer environmental benefits. "Carrier will provide high-quality products that help create a comfortable and healthy environment for travellers and workers throughout this terminal," said Mr. Zubin Irani, Managing Director, Carrier India. The Delhi International Airport expects Terminal 3 to be operational before the Commonwealth games in 2010. Terminal 3 will be approximately 5.2 million square feet in size, with an annual capacity of 34 million passengers. (Source: www.business-standard.com)

Industries pose serious threat to ozone layer

On the occasion of World Ozone Day, a survey conducted by the Indian Chamber of Commerce (ICC), covering 113 industries in West Bengal, revealed that most of the industries use the harmful chemical carbon tetrachloride (CTC), a powerful ozone depleting substance used as a cleansing solvent mainly for electrical contact cleaning. ICC conducted the survey on industries located in Kolkata Metropolitan Area, Haldia and Hooghly areas. The survey revealed that 52 per cent of the respondents were still using CTC while less than 16 per cent had switched to using alternative products.

CTC is listed under the Montreal Protocol on ODS, signed by India in 1992 as an environmentally hazardous chemical. The World Ozone Day was celebrated to commemorate the signing of the Montreal Protocol, which requires its signatories to phase out chemical substances such as CTC within a stipulated time period. Among the 191 parties that have ratified the protocol, India has to phase out the harmful chemical CTC by 31 December 2009. (Source: www.expressindia.com)

HCFC Phase-out Management Plan (HPMP)

A historic decision was taken at the 19th Meeting of Parties (MOP) held in September, 2007 at Montreal to accelerate the phase-out of HCFCs from 2040 to 2030. The 56th Meeting of the Executive Committee (ExCom) of the Multilateral Fund (MLF) for implementation of the Montreal Protocol held in Doha, Qatar from 8th to 12th November 2008 approved US$ 573,750 for preparation of HCFC Phase-out Plan for the Stage-I (2013 Freeze and 10 per cent reduction of the baseline) in India.

National Strategy for Transition to Non-CFC MDIs

The 56th Meeting of the ExCom of the MLP for implementation of the Montreal Protocol held in Doha, Qatar from 8th to 12th November 2008 approved a proposal for an amount of US$ 10.2 million for funding National Strategy for Transition to Non-CFC Metered Dose Inhalers (MDIs) and Plan for Phase-out of CFCs in the Manufacturing of Pharmaceutical MDIs in India.

Accelerated phase-out of CFC production

The ExCom at its 56th Meeting held in November, 2008 also approved the revised agreement for accelerated phase-out of CFCs production with a funding of US$ 3.17 million which will be paid as compensation to the four CFC producers. India completely phased out the production of CFCs with effect from 1st August 2008, seventeen months ahead of Montreal Protocol schedule.

India has also phased out of use of virgin CFCs in all applications except in Metered Dose Inhalers (MDIs) manufacturing. MDIs are essential for treatment of Asthma and Chronic Obstructive Pulmonary Disease (COPD) patients.

The Montreal Protocol Who's Who

The "Montreal Protocol Who's Who" is a new web portal intended to honor the visionaries, innovators and implementers who are making the Montreal Protocol a global environmental success story.

For more information, access:

http://www.unep.fr/ozonaction/montrealprotocolwhoswho/

IN THE NEWS

SAE international standards

Two SAE standards that address refrigerant emissions from mobile air-conditioning systems (MACS) are now available. SAE J2727 HFC-134a, a Mobile Air-conditioning System Refrigerant Emission Chart, aids in estimating the annual refrigerant emissions rate (grams per year) from new production air-conditioning systems equipped with specified component technologies. It provides emission values for current component methods and can be expanded as new technologies come into use. This document provides the information to develop an Excel template "System Emissions Chart" for system emission analysis. Originally developed in 2004, SAE J2727 was first published in 2005.

A new companion document, SAE J2763 Test Procedure for Determining Refrigerant Emissions from Mobile Air-conditioning Systems, estimates system emissions (taking into account production assembly variation). SAE J2763 may be employed to quantify emissions from properly assembled units in a chamber (mini-shed) under a static temperature profile and under the California Air Resources Board's Title 13 ambient profile (CARB Profile). Currently, SAE J2727 is acknowledged by various regulatory agencies, including the United States' EPA, State of California and Minnesota. *Contact: Ms. Nancy Lewis/Mr. Shawn Andreassi, United States of America. Tel: +1 (248) 2734 092; E-mail: pr@sae.org; Website: www.sae.org.*
(Source: www.marketwatch.com)

UNDP grant for environment-related projects

Bangladesh will receive US$3.33 million as grant to implement three environment-related projects. ERD Additional Secretary Mr. Mosharraf Hossain Bhuiyan and UNDP Country Director Mr. Stefan Priesner have signed three separate agreements on behalf of their respective sides. The projects, to be coordinated by UNDP, are preparation of second national communication (SNC) of Bangla-desh, phase-out of the consumption of CFC in the manufacture of aerosol metered dose inhaler

(MDI) in Bangladesh and institutional strengthening for the phase-out of ozone depleting substances (Phase-IV). The fund for the projects would be provided by the Global Environment Facility (GEF) and Multilateral Fund under the Montreal Protocol. (Source: www.nation.ittefaq.com)

Education tool for secondary schools launched

Under the "Montreal Protocol – Global Partnership for Global Benefits" theme, a group of international agencies has launched a new OzonAction Education Pack, entitled High Sky, during the celebration of the International Day for the Preservation of the Ozone Layer. The guide is targeted at secondary school students (13 years to 16 years of age) and includes a teacher's book, a student's book and a collection of Ozzy and Zoe Ozone multimedia materials. The Education Pack was jointly produced by DTIE OzonAction Branch of United Nations Environment Programme (UNEP), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations Children's Fund (UNICEF) and the World Health Organization (WHO), with funding support from the Multilateral Fund, for the Implementation of the Montreal Protocol.

The Education Pack not only explains the complex problems related to the global environment, but also encourages children to find practical solutions. The OzonAction Education Pack is also linked to the United Nations Decade of Education for Sustainable Development, a programme led by UNESCO. *Contact: Ms. Anne Fenner, Information Officer, UNEP DTIE, OzonAction Branch, 15 rue de Milan, 75441 Paris, Cedex 09, France. Tel: +33 (1) 44 37 1450; Fax: +33 (1) 4437 1474; E-mail: afenner @unep.fr; Website: www.unep.fr/ozonaction or Website: www.ozzyozone.org.* (Source: www.media-newswire.com)

UNIDO training material for mobile air-conditioning retrofits

The Mobile Air-conditioning Society (MACS) Worldwide has been selected by the United Nations Industrial Development Organization (UNIDO) to write a training manual on mobile air-conditioning retrofit for technicians in 120 developing nations. The manual is one of three commissioned through UNIDO's Montreal Protocol Branch to address the phase-out of ODS in mobile, residential and commercial air-conditioning systems. "Given that UNIDO's evaluation criteria included 'specialized expertise in mobile air-conditioning' and the 'proven capacity in producing training material', MACS is honoured to have been selected by UNIDO to perform this important work," said MACS President and Chief Operating Officer Mr. Elvis Hoffpauir.

The MACS manual is part of UNIDO's work to help developing countries to comply with their obligations under the Montreal Protocol. Within this context, UNIDO is implementing a number of terminal phase-out management plans designed to eliminate the use of CFCs by the year 2010, according to MACS. UNIDO observed that some service workshops were simply charging R-134a into existing R-12 systems without changing oil in those systems or taking other steps necessary to fend off system contamination, to preserve performance and to guard against system failures. UNIDO felt retrofit training was required and chose MACS Worldwide. Content for the UNIDO Mobile A/C Retrofit Manual was drawn from a number of existing MACS training manuals, which were adapted for international use and updated to include lessons learned in the North American market, as it went through its transition from R-12 to R-134a. *Contact: Website: www.macsw.org.* (Source: www. search-autoparts.com)

Maldives has implemented many steps to protect ozone layer

The President of Maldives, Mr. Maumoon Abdul Gayoom, has stated that many steps had been taken in the country to protect the ozone layer. The President made this statement while speaking at a ceremony held at the President's office to present to the President a special stamp set issued on the occasion of the World Ozone Day. The stamp set features the award-winning posters of the poster drawing competition for primary school students held last year, and was presented to the President by Mr. Abdulla Majeed, Deputy Minister of Environment, Energy and Water. Speaking at the ceremony, the President said that the Maldives

participated well in the worldwide efforts to protect the ozone layer. The President also highlighted that this phenomenon was very closely linked to world environment, and as Maldives is extremely vulnerable to environmental threats, the effects of such threats would be particularly strong. (Source: www.miadhu.com.mv)

Biofumigation is gaining world acceptance

The phase-out of methyl bromide for soil fumigation under the Montreal Protocol indicates to the world that pesticides that damage the environment will no longer be tolerated. The treaty or agreement has been adopted the world over. Former United Nations Secretary General Mr. Koffi Annan said it is "perhaps the single most successful international agreement to date". The treaty has been revised seven times, until its final version in 1999.

Soil fumigation is a practice of freeing the soil of bad micro-organisms. Chemicals such as methyl bromide are generally utilized for this purpose. Scientists have looked into biofumigation as a possible alternative.

At the 3rd International Biofumigation Symposium in Australia, Dr. Luciana Villanueva, Director of the Semi-temperate Vegetable Research & Development Centre, the Philippines, described biofumigation employing bioactive brassicaceous plant products for pest, disease and weed control. An example of this is mustard. The phenomenon has been known for centuries, but has gained increasing interest recently due to the phase-out of synthetic soil fumigants and a general interest in environmentally conscious plant production systems the world over. The concept is based on capturing benefits from the bioactive products of plants' glucosinolate-myrosinase system, which had evolved as part of the plant's own defence system. Dr. Villanueva's paper, co-authored by Ms. Nordalyn Pedroche, examines organic amendments and host resistance as components of integrated disease management strategy for root knot nematode (*Meloidogyne incognita*) in lettuce. Biofumigation could be a method of shifting into organic agriculture. It needs to be considered as a broader concept, which accounts for all the physical, chemical and biological changes that occur in the soil to achieve crop production and improve soil health. (Source: www.sunstar.com.ph)

New cell to monitor ozone depletion

In Pakistan, the Punjab Environmental Protection Department (EPD) has set up an "Ozone Gas and Global Warming Cell" at the Environment Protection Agency (EPA) to help save the ozone layer. According to EPD Secretary Mr. Zafar Iqbal, the cell would consist of three members – a deputy director and two chemical engineers – as research officers. The cell would function under the supervision of the director general of the department and the EPA would play its role in maintaining liaisons with the Environment Protection Ministry (EPM). EPD would also create awareness among the people about the impact of employing ODS. Furthermore, it would evaluate and review reports prior to giving recommendations to the EPA for issuing no objection certificates to stakeholders for setting up industries so that there is minimum emission of ODS. A cell has already been set up at the EPM, under the sponsorship of the United Nations Development Programme. (Source: www.dailytimes.com.pk)

Import of CFCs and halons banned

Sri Lanka's Cabinet has approved a memorandum submitted by the Minister of Environment and Natural Resources, Ms. Champika Ranawaka, to prohibit the import and export of virgin CFCs with effect from 1 January 2008 and virgin halons with effect from 1 January 2010 with exemptions for essential and critical uses. The Cabinet also agreed to direct the Import and Export Controller to introduce appropriate regulations under the Import and Export Controls Act. (Source: www.news.lk)

Pakistan takes stock on International Ozone Day

The International Day for the preservation of the Ozone Layer was celebrated in Pakistan to

mark the date of the signing of the Montreal Protocol on substances that depleted the ozone layer. The country ratified the Montreal Protocol in 1992. The Environment Ministry's Ozone Cell, funded by Multilateral Fund for Montreal Protocol became operational in 1996 to facilitate coordination between industry and the government, and between the government and the implementing agencies. The Ozone Cell reported the implementation of several projects in both the foam and refrigeration sectors for converting ODS-based technologies into non-ODS technologies. It also trained customs officers and technicians to build their capacity in retrofitting CFCs-based air-conditioners and refrigerators. A licensing system was introduced to regulate import of CFCs, halons, methyl chloroform and methyl bromide, while import of carbon tetrachloride (CTC) was banned in May 2007. (Source: www. thenews.com.pk)

Forane-427a successfully used in refrigeration equipment

Leonidas has chosen Arkema's Forane®-427a refrigerant fluid, a 100 per cent HFC blend, for the conversion of existing equipment running on R-22, an HCFC generation refrigerant fluid. The retrofit operation was carried out at the Leonidas Brussels plant, Belgium, by contractor Dehon Climalife Belgium. Forane-427a is a zero-ODP refrigeration fluid and can be used at low, medium and high temperature. It allows a quick and trouble-free retrofitting of existing air-conditioning and refrigeration equipment running on HCFC-22.

The retrofit was undertaken in anticipation of the ban on virgin HCFC-22 for refrigeration equipment maintenance (set to enter into force on 31 December 2009) as directed by the European regulation 2037/2000. The equipment in question, a refrigeration tunnel maintained at -4°C, is used in the end process of the chocolates manufacture. Following the successful operation of the retrofitted equipment, Leonidas subsequently retrofitted a further two items of equipment at its plant, one used for the air-conditioning of the zone and the other used for the packaging facility. (Source: www.wnibi.com)

REFRIGERATION/ AIR-CONDITIONING

Green, modular chillers

Dometic Corporation, the leading supplier of marine air-conditioning systems in the United States, has unveiled a new series of modular, multi-tonne chillers that have been engineered for optimal use of environmentally safe R-410a refrigerant. The Cruisair MTD series is designed for installation flexibility, reliability, maximum performance and easy accessibility for maintenance.

A flexible hose improves alignment for customer connections and reinforced stainless steel sea water connections provide added strength. Thermal expansion valves optimize performance over a wide range of conditions, while a hot gas by-pass valve maintains heating performance in cold sea water and helps prevent water freezing in the heat exchanger. With heating performance effective in cold sea water temperatures as low as 3.5ºC, the need for separate fossil fuel or electric water heaters is eliminated in most applications.

The Cruisair MTD comes standard with a scroll compressor and includes larger drain fittings for faster condensate drainage. Removable sea water manifolds enable easy cleaning of condenser tubing. Optional variable frequency drives eliminate power surges at start-up and run the unit at full 60 Hz capacity, even on a 50 Hz power source. A reverse-cycle unit, the MTD provides cooling or heating. It is available in capacities ranging from 24,000 to 120,000 BTUs; multiple modules can be used in any combination to achieve the total desired capacity. Custom frame and water-manifold installation for multiple units is also available. (Source: www.bymnews.com)

CO_2 solutions as alternatives to harmful refrigerants

Global metals manufacturing and technology firm Luvata has further developed the use of carbon dioxide (CO_2) as a refrigerant in its new solutions. From an environmental point of view, CO_2 is a superior alternative to environmentally damaging

HFCs, apart from being non-inflammable, non-toxic and less expensive. According to Luvata, in addition to potentially offering zero ozone depletion and less effect on global warming, the use of CO_2 can also allow more efficient operation of the system than traditional refrigerants. The technology, developed by Luvata's coils and coolers division, was selected by the Coca-Cola Company for use in environmentally friendly vending machines for the 2008 Beijing Olympics, as part of the global beverage company's commitment to sustainability.

Mr. Giovanni Simeoni, Head of Sales and Marketing, Product Development and R&D for the company's ECO-Heatcraft division, states: "In addition to the environmental advantages, it has a higher heat-transfer coefficient than traditional refrigerants, which can lead to increased efficiency in those heat transfer equipment it is used in. The higher volumetric efficiency of CO_2 refrigerant (known as R-744) also means that the cross-sectional area of pipes used in heat transfer equipment can be reduced. As a result, equipment has the potential to be smaller, lighter, more efficient and better for the environment."

Until recently, CO_2 had been used as a refrigerant in commercial applications only. Luvata believes the promising results seen from its technology will mean that, over the coming years, its market will expand to include refrigerated transport, automotive and residential air-conditioning, as well as commercial and marine applications. *Contact: Mr. Chloe Joint, Porter Novelli, United Kingdom. Tel: +44 (1295) 224 573; E-mail: chloe.joint@porternovelli.co.uk; Or Ms. Natasha House, Porter Novelli, United Kingdom. Tel: +44 (1295) 224 432; E-mail: natasha.house@porternovelli.co.uk.* (Source: www.luvata.com)

Energy-efficient refrigerators

Electrolux announced the launch of its new energy-efficient and environment-friendly refrigerators that will be five- and six-star rated under the existing labelling standards. Further, these models contain efficient technology to cut energy use and reduce greenhouse gas (GHG) emissions. The family-sized refrigerators will return annual savings of US$45-$60, depending on their capacity, by using up to 50 per cent less energy than their 10-year-old counterparts. The refrigerators use the natural refrigerant gas R-600a which breaks down quickly in the environment and significantly decreases carbon emissions. (Source: www.current.com.au)

Circulating heat transfer fluids through closed loop cycles

Mr. Shailesh Doshi of Canada and Mr. Enrico Simonato of Italy have developed new method for the circulation of refrigerants within closed loop systems using flexible hoses. The new method is capable of handling high-pressure fluids and providing high barrier against permeation loss. The hoses used comprise (from innermost to outermost layer) a thermoplastic veneer, a tie layer, a metal-polymer laminate, a braid under-layer of a thermoplastic/thermosetting elastomer, a reinforcing braid layer and an outer layer of an elastomeric material.

The invention patented also relates to the use of flexible, high-pressure barrier hoses in systems requiring the transport of high-pressure fluids, including air-conditioning and refrigeration. *Contact: Mr. Shailesh Doshi, 866 Old Colony Road, Kingston, Ontario K7P 1S5, Canada; Or Mr. Enrico Simonato, Str. Pellerino 22/15F, I-10146 Torino, Italy.* (Source: www.wipo.int)

Integrated solar-assisted residential heating and cooling

Lennox Industries, a subsidiary of Lennox International, has unveiled SunSource, the industry's first integrated solar-assisted residential heating and cooling system, at the Association of Energy Services Professionals (AESP) 4th Technology Symposium in California, the United States. The system will be available in 2009.

Utilizing a patent-pending technology developed specifically for use in residential applications, SunSource can easily help reduce peak demand, increase energy efficiency and maintain home-owner comfort. SunSource integrates solar power by using a single 190 W solar panel, which provides power to assist the fan motor that moves air across the outdoor coil, a critical component in any home comfort system. Even on days with limited sunlight, SunSource takes advantage of the available solar resources and reduces energy

usage. To match the expected gains in energy efficiency, a conventional outdoor residential air-conditioning unit would have to be almost double in size. Integrating solar power into the other components of a typical home comfort system – including indoor motors, compressors, indoor air quality products and thermostats – is currently being evaluated.

"The Lennox SunSource is another step towards the acceptance of single-point solar technology applications," said Mr. Doug Young, President and COO. This unique application specifically targets reducing peak demand, while improving energy efficiency and maintaining comfort. *Contact: Lennox Industries, 2100 Lake Park Boulevard, Richardson, TX 75080, United States of America.* (Source: www.refrige.com)

Silica gel-water adsorption chiller

Researchers at the Energy Research Centre of the Netherlands (ECN) are investigating small-scale thermally driven chillers that have gained a lot of interest because of their potential to save primary energy, reduce electricity peaks on the grids and improve cost-benefit ratio of micro-CHP units when combined into trigeneration systems. ECN has developed a small-scale (output <5 kW) silica gel-water adsorption chiller for comfort cooling for both stationary and mobile applications. At the moment, a prototype is being built (output 2.5 kW) for application in a micro-trigeneration system for residential application. The adsorption chiller would be driven by heat from a Stirling micro-CHP. The total system will be installed in an ECN research house, including the option of so-called solar cooling with solar collectors, and monitored extensively. (Source: www.polysmart.org)

Einstein's green refrigerator making a comeback

In 1930, physicist Einstein and his student Mr. Leo Szilard designed a refrigerator that required no electricity and had no moving parts. However, as refrigerator technology became more efficient, Einstein's design was nearly forgotten. Now, Mr. Malcolm McCulloch, an electrical engineer at Oxford, is trying to bring Einstein's refrigerator back. Mr. McCulloch explains that the design is environmentally friendly and could prove especially useful in developing countries, where demand for cooling appliances is increasing. Mr. McCulloch's team recently built a prototype of Einstein and Szilard's refrigerator. In place of compressing the greenhouse gases called Freons, as a typical refrigerator does, it uses pressurized gas to keep items cold. The refrigerator just requires a way to heat the liquids, and Mr. McCulloch has been working on developing a solar energy system to meet this requirement. The refrigerator is based on the idea that liquids boil at low temperatures when the surrounding air pressure is low.

In their refrigerator prototype, Mr. McCulloch's team filled a flask with liquid butane (which is also commonly sold as a liquid in cigarette lighters and as a gas for cooking). The team then introduced a new vapour to decrease the air pressure, which decreases the liquid boiling temperature, causing the butane to boil. As the butane boils, it takes energy from the surroundings, and lowers the temperature inside the refrigerator. Even though Einstein and Szilard's original design was not as efficient as the Freon refrigerators that replaced them, Mr. McCulloch plans to improve the design by using different kinds of gases and predicts these improvements could quadruple the refrigerator's efficiency. The fact that the refrigerator has no moving parts could also be advantageous: it would require minimal maintenance, making it ideal for rural areas. Mr. McCulloch emphasizes that the refrigerator is still just a prototype. The work is part of his team's three-year project to develop robust appliances for use in locations without electricity. (Source: www.physorg.com)

Co-fluids for use with CO_2 refrigerant

In the United States, Visteon Global Technologies and Ford Global Technologies Inc. have obtained a United States patent for a carbon dioxide (CO_2)/co-fluid mixture for use in a refrigeration cycle in which the CO_2 is alternately absorbed and desorbed from the co-fluid. The mixture includes from 50 per cent to 95 per cent co-fluid and from 5 per cent to 50 per cent CO_2. The patent also relates to a process of screening a co-fluid to produce the CO_2/cofluid mix. (Source: www.freepatentsonline.com)

SOLVENTS

Ultrasonic stencil/PCB cleaners

Youngjin Astech Co. Ltd., the Republic of Korea, is a leading manufacturer and exporter of etching products and metal printing products. The firm has developed PCB cleaner and ultrasonic cleaner for metal mask. Notable feature of these high-quality products are:

- It is possible to perform collective work of all cleaning materials, such as metal mask, PCB, squeegee, jig, etc.;
- Cleaning device that anybody can handle easily;
- Adopt the ultrasonic and dipping process; and
- Improve the working environment.

Contact: Youngjin Astech Co. Limited, 300-5, Gongdan-2 dong, Gumi-city, Kyongsangbuk-do, Republic of Korea. (Source: www.alibaba.com)

High-performance vapour degreasers

High-performance vapour degreasers are specially designed for use with the new generation of eco-friendly, non-ozone depleting cleaning solvents. To make the use of these solvents economically feasible, a technologically advanced vapour degreaser (more efficient than standard chlorinated solvent degreasers) is used. Tiyoda-Serec Corp., the United States, offers such technologically advanced degreasers designed specifically to utilize the new solvents with the absolute maximum in vapour retention efficiency.

High-performance vapour degreasers are designed to accept nearly any non-inflammable degreasing solvent. They can be utilized as either a single-solvent system or a co-solvent system. Single-solvent degreasing systems parts can be cleaned with the single-solvent degreasing method with either a pure solvent or, more commonly, with a solvent azeotrope. Normally, the workpiece is suspended in the vapours directly above the wash compartment, where it is exposed to the pure solvent vapours created by the boiling solvent. When the warm vapours touch the comparatively cool workpiece, a condensing action occurs that dissolves the contamination and flushes it away as it pours off the part. This cleaning action will continue until the workpiece and solvent vapour have reached the same temperature. The workpiece is then immersed in the somewhat cooler rinse sump, where any residual contaminants left on the part are dissolved. For particularly stubborn pollutants, ultrasonics are added to this compartment. After immersion cleaning, the part is raised back into the vapour zone, where a final condensate rinse takes place.

Co-solvent degreasing is a unique combination of two distinct classes of non-ozone depleting cleaning agents. This system is most appropriate for applications where pure fluorinated solvents or their azeotropes are not aggressive enough to clean the workpiece. The cleaning process is similar to single-solvent degreasing, except that in the initial cleaning stage, the part is completely immersed in the wash compartment. A solvating agent in the wash sump dissolves contaminants from the workpiece. The liquid in the wash sump is constantly filtered to remove any solid particulate. Next, the part is immersed in the rinse enclosure, which contains pure liquid solvent, and is then raised into the vapour zone, where it receives a final vapour rinse. Ultrasonics may be provided in either or both compartments, depending on the cleaning application. Further, the solvating agent can be specifically formulated for the contaminant being removed, and the ratio of solvating agent to fluorinated solvent can be adjusted, enabling this cleaning system to meet nearly any cleaning requirement. *Contact: Tiyoda-Serec Corporation, 342 Compass Circle, North Kingstown, RI 02852, United States of America. Tel: +1 (401) 6677 370; E-mail: sales@tiyoda-serec.com.* (Source: www.tiyoda-serec.com)

Azeotrope-like and mixed solvent compositions

Two researchers at Asahi Glass Co. Limited, Japan, report an invention with the objective of providing a solvent composition that is capable of removing soils without damaging it. The invention by Mr. Michiomi Nagase and Mr. Masaaki Tsuzaki provides an azeotrope-like solvent composition consisting of 38-41 mass percentage of (2,2,2-trifluoroethoxy)-1,1,2,2-tetrafluoroethane 59-62

mass percentage of perfluorohexane. The boiling point of this azeotrope-like solvent composition at a pressure of 1.011 × 105 Pa is 47ºC-48°C. The azeotrope-like composition is defined as a mixed solvent composition having a relative volatility within the range of 1.00±0.04. Further, the present invention provides a mixed solvent composition comprising 30-60 mass percentage of (2,2,2-trifluoroethoxy)-1,1,2,2-tetrafluoroethane and 40-70 mass percentage of perfluorohexane. Perfluorohexane denotes perfluorohexane containing n-perfluorohexane and/or perfluoroisohexane as the main component. Further, the total content of n-perfluorohexane and perfluoroisohexane in perfluorohexane is preferably at least 90 mass percentage. HFE-347 refers to (2,2,2-trifluoroethoxy)-1,1,2,2-tetrafluoroethane. Both the mixed and azeotrope-like solvent compositions have the ability to readily remove contaminants such as oils, dusts, particles and resin shavings, droplets of a solvent having a high surface tension and a small specific gravity, water droplets, and so forth, attached to the surface of articles to be cleaned. *Contact: Mr. Michiomi Nagase and Mr. Masaaki Tsuzaki, Asahi Glass Co. Limited, 10, Goikaigan, I chihara-shi, Chiba 2908566, Japan; Or Asahi Glass Co. Limited, 12-1, Yurakucho 1-chome, Chiyoda-ku, Tokyo 100-8405, Japan.* (Source: www.freepatentsonline.com)

New contact cleaner

Krylon Products Group, the United States, offers 3-2-1 Contact™ cleaner, which cleans sensitive equipment and precision instruments quickly without temperature control issues. Instant evaporation eliminates trapping of airborne contaminants and allows parts to be handled immediately. It is packaged with extension tube for hard-to-reach areas. Further, because it is non-conductive, equipment can be cleaned while operating. Key features of 3-2-1 Contact are:

- Non-conductive and non-inflammable;
- Safe on metal and many plastics;
- Alternative to Freon TF113® and HCFC-141b;
- Dielectric strength of 26,800 V; and
- Leaves no residue.

3-2-1 Contact is recommended for use on printed circuits, relays and switches, radar equipment, meters, X-ray equipment, precision instruments, cameras, hydraulic systems, timing devices, office machines, electronics, satellite communication equipment, TV-video and computer systems, and memory devices

Sprayon® environmental contact cleaner is a non-ozone depleting cleaner that removes oil, grease and dirt from sensitive equipment and precision instruments leaving no residue. It is non-conductive and safe on most plastics. A high-velocity spray valve quickly penetrates delicate electrical/electronic parts and leaves no residue. Key features are:

- Heavy-duty degreaser and quick-drying cleaner;
- Ideal for sensitive equipment and precision instruments;
- Fast-evaporating; and
- No CFCs or HCFCs.

Sprayon can be used on printed circuits, vacuum tube parts, office machines and computer systems. *Contact: Krylon Products Group, 101 W. Prospect Ave., Cleveland, OH 44115, United States of America.* (Source: www.kpg-industrial.com)

Special cleaners

Petroferm UK Ltd., the United Kingdom, offers specialty cleaners for use in a variety of cleaning applications. The product offerings are:

- *Lenium IPS:* This rinsing agent is formulated for removing electronic flux residues in the co-solvent process, patented by Petroferm, which is designed to replace CFC, HCFC-141b and n-propyl bromide.
- *Lenium FEC:* Designed for use in electronic cleaning, Lenium FEC is a binary azeotrope of fluorocarbons, chlorocarbons and methanol specially formulated to remove solder flux, paste and ionic residues from circuit assemblies. The fluid has physical properties and solvency traits that are similar to chlorinated solvents such as 1,1,1-trichloroethane and trichloroethylene. This vapour degreasing solvent is suitable for removing a wide variety of soils in immersion and vapour cleaning applications.
- *Lenium FMC:* Intended for application in general cleaning uses, this vapour degreasing solvent is specially formulated to remove contaminants such as oils, greases, adhesives, resins and organic

residues. The fluid has physical properties and solvency characteristics very similar to chlorinated solvents such as 1,1,1-trichloroethane and trichloroethylene. It is suitable for removing a wide variety of soils in immersion and vapour cleaning applications.

- *Lenium FHD:* This reliable and ozone-safe precision cleaner is designed to clean heavy hydrocarbon soils. It delivers speedy cleaning for the toughest hydrocarbon soils – including waxes and buffering compounds – in a non-inflammable and affordable solvent package.
- *Lenium DF:* A proprietary blend of 3M™ Novec HFE-7100, octam ethyltrisiloxane and isopropanol, this silicon deposition fluid is suitable for use as a diluent and carrier fluid for silicone base lubricants. It has excellent solubility for silicone lubricants, but does not attack sensitive plastic components. For this reason, it may be used in a variety of medical applications.
- *Lenium TS:* This silicon tube swelling fluid is a proprietary blend of 3M NOVEC HFE-7100, and octam ethyltrisiloxane. The product is designed for use at room temperature as a swelling fluid for silicone tubing. Although the product will swell silicone tubing, it does not attack sensitive plastic components.

Contact: Petroferm UK Limited, Heron Chemical Works, Moor Lane, Lancaster LA1 1QQ, United Kingdom. Tel: +44 (1524) 65222; Fax: +44 (1524) 381 805. (Source: www.axarel.eu)

Ozone-safe degreasers

Abra Electronics Inc., the United States, offers an HFE supercleaner degreaser that allows to maintain the cleaning power, non-inflammability, non-conductivity and environmental friendliness while dramatically reducing the cost. It is suitable for removing flux, greases, oils, oxides, silicones, carbon, dirt, smoke film and grime, where a non-inflammable, non-conductive solvent is required. Testing for plastic compatibility is recommended before use. If sprayed too liberally, liquid left behind may separate and become inflammable. Salient features include:

- Non-conductive and non-corrosive;
- Excellent cleaning strength;
- Fast dry and leaves no residue; and
- Significantly lowers cost than standard HFE blends.

Abra also offers a supercleaner degreaser for use when an azeotropic, non-inflammable and non-conductive cleaner is required. This product cleans and degreases energized circuits, contacts, motors and other electronic equipment. It is used for removing greases, oils, oxides, silicones, flux, carbon, dirt, smoke, film and grime, and is an 1,1,1, TRICH and HCFC solvent replacement. Key features of this product are:

- Approved by SNAP without restrictions;
- Non-inflammable and non-conductive;
- Fast dry and leaves no residue; and
- A variable valve allows greater user control.

Contact: Abra Electronics Inc., 1320 Route 9, Champlain, NY 12919, United States of America. (Source: www.abra-electronics.com)

New cleaners

Magna Chemical Canada Inc., Canada, is offering new cleaners for use in electrical and electronic systems. The new products are:

- *Vappro 870CB:* Specially engineered to protect printed circuit boards from corrosion in electrical and electronic systems, this product is known to enhance manual and robotic soldering processes. It is packaged in a specialty spray bottle, which atomizes the liquid for effective application.
- *Vappro 870CB Electro-Spray:* This product's dual functionalities simplify the maintenance of electrical and electronic systems: it cleans and protects in one application. Made of premium quality electrical contact cleaners, the Electro-Spray is fortified with specialty electronic corrosion inhibitors known as VAPPRO V.C.I. It eliminates galvanic corrosion commonly found in electrical systems, and is extremely effective in protecting silver components from corrosion in printed circuit boards. Moreover, it does not contain any ozone depleting substances.

Contact: Magna Chemical Canada Inc., 15 Bowman Avenue, P.O. Box 534, Matheson, Ontario P0K 1N0, Canada. Tel: +1 (705) 2733 353; Fax: +1 (705) 2733 352; E-mail: magna@vappro.com. (Source: www.vappro.com)

FOAMS

Low-GWP blowing agent

Honeywell International, the United States, has begun selling its blowing agent with low global warming potential (GWP) for one-component foam and aerosol applications in Europe. Honeywell received clearance from the European Union last year to import the product in limited commercial quantities. According to industry estimates, in 2007, there were more than 200 million cans of one-component foam sold throughout Europe. One-component foam is easily dispensed from a can and requires no mixing.

Honeywell is a pioneer in developing hydrofluoro-olefin technology, which is the next-generation, low global warming potential product for blowing agent, propellant and refrigerant uses. The new blowing agent, hydrofluoroolefin or HFO-1234ze, has zero ozone depletion potential and meets EU regulatory requirements for reducing the use of high GWP substances. This fourth-generation technology from Honeywell is a direct replacement for the hydrofluorocarbon R-134a in one-component foam and aerosol applications. The product enables one-component foam to expand in order to seal gaps and crevices around doors and windows which can help home and building owners save energy. The blowing agent can also serve as a propellant for aerosols, which are used in a wide range of applications such as warning systems and marine navigation.

Honeywell is currently partnering with the global automobile industry in a bid to launch a low GWP refrigerant solution to replace R-134a. *Contact: Ms. Nina Krauss, Honeywell International, 101 Columbia Road, Morristown, NJ 07962, United States of America. Tel: +1 (973) 455 4253; Fax: +1 (973) 455 4807; E-mail: nina.krauss@honeywell.com; Website: www.honeywell.com.* (Source: www.itnews.it)

PU system delivers improved efficiency and high productivity

When evaluating polyurethane (PU) systems for household appliance applications, short demould times have typically forced processors to choose between strong insulation performance and higher productivity levels. Now, driven by the twin global needs for improved energy efficiency and high performance, the Dow Chemical Co. has developed new foam systems using various blowing agents – with a strong focus on hydrocarbons (HCs) – that allow refrigerator manufacturers to achieve both enhanced insulation performance and high productivity, reducing costs and specifying the best product solution for any given geographic region.

The foam system, christened System A, offers the lowest thermal conductivity and highest energy efficiency using HCs as blowing agents in a conventional single-shot injection foaming process. The new system design was aimed at maximizing the advantages of using Polyol X – a new base polyol that Dow developed for rigid appliance foam-systems – in the formulation in terms of thermal insulation properties. System A, blown with pure cyclopentane, shows good processing characteristics and is giving an average 6 per cent improvement in Lambda performance, compared with DOW's reference product Voratec SD-308 Polyol. It also addresses specific technical issues of the refrigeration industry around the world. The insulation efficiency of the refrigerator cabinet could be improved by more than 3 per cent on average, bringing the performance of HC-blown foams closer to that of HFC-245fa-blown foams. The new PU system resulted from a study started by Dow Europe GmbH and completed within the framework of a joint development programme with Bosch und Siemens Hausgeräte GmbH. (Source: www.appliancedesign.com)

Composition for preparing rigid PU foam

LG Electronics Inc., the Republic of Korea, has obtained a United States patent for a composition for preparing a rigid polyurethane (PU) foam with improved adhesive strength and the rigid PU foam made therefrom. The composition for preparing a rigid PU foam is prepared using cyclopentane system as a physical blowing agent, and polyols having a low viscosity, and has an increased adhesive strength without detrimental effect on other properties. (Source: www.freepatentsonline.com)

AEROSOLS

HFA inhaler for asthma patients

Teva Specialty Pharmaceuticals, the United States, offers ProAir® HFA, an albuterol sulphate inhaler. Albuterol is a bronchodilator, a medicine that opens up the airways in lungs during an asthma attack. ProAir HFA can be used to help relieve sudden asthma symptoms when they occur. Like many asthma medicines delivered from a metered dose inhaler, ProAir HFA uses a CFC-free propellant – hydrofluoroalkane-134a – to deliver albuterol. (Source: www.proairhfa.com)

Aerosol drug formulations for use with non-CFC propellants

Abbott Laboratories, the United States, reports an invention that provides a pharmaceutical composition for aerosol delivery, comprising: a drug; a non-CFC, halogenated alkane propellant; and a protective colloid from the group consisting of sodium lauryl sulphate, tripalmitin, cholesterol, decanesulphonic acid, stearic acid, caprylic acid and taurocholic acid. It has now been found that certain non-conventional pharmaceutical excipients, called protective colloids, can stabilize MDI formulations using the propellants HFC-134a and HFC-227ea to prevent aggregation and provide uniform doses without a surfactant or co-solvent. These protective colloids are amphiphilic agents that – unlike most surfactants – do not dissolve, but instead are finely dispersed solids. It is believed that their action is due to molecular size and surface properties, such as charge and lipophilicity.

Protective colloids described are biocompatible and present no known toxicologic or pathologic consequences at the concentrations proposed for their use. Non-CFC formulations that include protective colloids do not require the addition of co-solvents or even of conventional surfactants such as sorbitan trioleate (SPAN 85), sorbitan monooleate and oleic acid, yet provide high lung deposition efficiencies and respirable fractions comparable to those obtained with known CFC-propellant formulations. It is thus expected that non-CFC formulations comprising protective colloids will be useful for the delivery of both peptide and non-peptide pharmaceutical medicaments for which MDI delivery is favourable. *Contact: Abbott Laboratories, 100 Abbott Park Road, Abbott Park, Illinois, 60064 3500, United States of America.* (Source: www.freepatentsonline.com)

HFA transition provides opportunity to improve MDI

Trudell Medical International, the United States, announced the selection of the Aerocount® dose indicator for use with Forest's proprietary product containing the active ingredient flunisolide in an HFA formulation. As the CFC to HFA transition deadline for pressurized metered dose inhalers (MDIs) approaches, flunisolide, an existing CFC-based inhaled corticosteroid branded as Aerobid® has been reformulated with a hydrofluoroalkane (HFA) propellant for transition through the CFC phase-out. A key change in Forest's flunisolide HFA product will be the integration of the Aerocount dose indicator to remind patients the quantity of medication remaining in their inhalers. *Contact: Ms. Kelly Armstrong, Trudell Medical International, United States of America. Tel: +1 (519) 4557 060; E-mail: tmi@trudellmed.com.* (Source: www.marketwatch.com)

Formulation for HFA-driven MDI

Boehringer Ingelheim Pharmaceuticals Inc., the United States, reports to have determined that a minimum amount of water is needed to ensure adequate re-dispersion of the suspended active ingredient in a metered dose inhaler (MDI). This discovery provides a solution to the problem of actuation variability in formulations used in MDIs having at least one HFA as propellant where: the formulation has a suspended, solid medicament; and the valve is designed to include a metering chamber to hold the formulation between dosings. Provided these two conditions are met, there is the potential that the addition of a small, controlled amount of water can improve the re-dispersibility of the formulation in the metering chamber. This is regardless of whether an active ingredient is dissolved in the formulation. *Contact: Boehringer Ingelheim Pharmaceuticals Inc., 900 Ridgebury Road, P.O. Box 368, Ridgefield, Connecticut 06877 0368, United States of America.* (Source: www.freepatentsonline.com)

FUMIGANTS

Azeotropic fumigant compositions of methyl iodide

Honeywell International Inc., the United States, reports azeotropic and azeotrope-like compositions of methyl iodide and at least one fluorocarbon or hydrofluorocarbon, such as 1,1,1,3,3-pentafluoropropane (HFC-245fa). These compositions are present as a gas, at temperatures of about 30°C or below. The inventive compositions serve as a non-ozone depleting gaseous fumigant, which is useful in a variety of applications, in place of methyl bromide. These compositions serve as a drop-in replacement for gaseous methyl bromide, providing the benefits of a methyl iodide fumigant while using existing methyl bromide equipment. (Source: www.freepatentsonline.com)

Alternatives to control black shank disease

Cultural, biological and physical alternatives were investigated by researchers in Cuba as methyl bromide and some other fungicides (e.g. metalaxyl) have been shown to be ineffective in preventing epidemics of Black Shank disease (*Phytophthora nicotianae* Breda de Haan) in tobacco in Cuba. Soil solarization for 30 days, the use of *Glomus* spp. and the use of *Trichoderma harzianum* according to *P. nicotianae* soil infection levels, were all highly effective in reducing *P. nicotianae* inoculum levels and incidence of disease. Disease incidence was also reduced by selecting areas for the seedbeds free of this disease and by using crop rotation in the seedbed production areas. *Contact: Mr. A. Fernandez Morales, Instituto de Investigaciones de Sanidad Vegetal, Ciudad de La Habana, Cuba. E-mail: afernandez@inisav.cu.* (Source: www.ec.europa.eu)

New solution to damaging crop worm rooted in Israeli soil

In the United States, Israel's AgroGreen is set to help American farmers say goodbye, once and for all, to the nasty chemicals used to kill damaging nematodes (roundworms) feeding on fruit orchards and field crops. Mr. Doron Yonay, the Business Development and Marketing Manager for Agro-Green, reports that the company is negotiating with a number of American firms to help distribute its star product BioNem.

BioNem is a safe, naturally derived solution that is not only safe, but also provides a solution that competes in efficacy with the chemical solutions on the market. The organism used in BioNem is a bacterium, which occurs naturally in Israel's soil. (Source: www.israel21c.org)

Biofumigation tests in vineyards yield positive results

Biofumigation in wine grape vineyards could prove to be a natural, effective and economical way to rid soils of pests and diseases while eliminating the growing disdain from policy-makers over chemical fumigant use, including methyl bromide. In the United States, four vineyard management firms and wineries at Napa Valley are currently testing natural fumigation (biofumigation) in conjunction with holistic practices in 12 to 15 acre Cabernet Sauvignon wine grape vineyards under guidance from Mr. Bob Shaffer, agronomist, Soil Culture Consulting. Biofumigation involves planting brassica genus plants with high levels of glucosinolates which decompose into isothiocyanate to disrupt the life cycles of soilborne pests, including plant parasitic nematodes, parasitic fungi and weed seeds. (Source: www.westernfarmpress.com)

Trends Analysis: Consumption and Production of Ozone Depleting Substances in Developing Countries

The UNEP report "Trends Analysis: Consumption and Production of Ozone Depleting Substances in Developing Countries" presents updated information for CFCs, Halons, and Methyl Bromide. For the first time, it also includes an analysis of the HCFC consumption and production trends in developing countries.

For more information, contact:

UNEP DTIE OzonAction Branch
15 rue Milan
75441 Paris Cedex 09
France
Tel: (+33 1) 4437 14 50
Fax: (+33 1) 4437 14 74
E-mail: ozonaction@unep.fr
Web: http://www.unep.fr/ozonaction

RECENT PUBLICATIONS

OzonAction Education Pack for Secondary Schools

The Education Pack for Secondary Schools, comprising Teacher's Book and Student's Book, was developed by the UNEP OzonAction Programme with support from the Multilateral Fund for the Implementation of the Montreal Protocol. The pack forms an integral part of the global Ozzy Ozone campaign and it is a follow-up activity to the OzonAction Education Pack for Primary schools, which was developed in 2006.

Contact: UNEP DTIE OzonAction Branch, 15 rue Milan, 75441 Paris Cedex 09, France. Tel: +33 (1) 4437 1450; Fax: +33 (1) 4437 1474; E-mail: ozonaction@unep.fr.

Energy efficiency in refrigeration and global warming impact

This comprehensive guide provides information on topics such as: natural refrigerants; cycloid compressors, electronic injection, water, two-phase ice, oil-refrigerant balances, thermophysical properties of substitutes, modelling and automatic devices, and glides in mixtures.

Saving Energy in Refrigeration, Air-conditioning and Heat Pump Technology

This guide presents, in a concise and didactic manner, solutions that make it possible to reduce the energy consumption of refrigeration and air-conditioning systems, including heat pumps. This is a vital issue as these systems consume about 15 per cent of worldwide electricity. Many practical cases of highly energy-efficient systems have been presented as well as an extensive bibliography.

For the above two books, *contact: International Institute of Refrigeration, 177, blvd. Malesherbes, 75017 Paris, France. Tel: +33 (1) 4227 3235; Fax: +33 (1) 4763 1798.*

TECH EVENTS

18-21 Mar
Koyang City
Korea

Heating, Air-Conditioning, Refrigeration and Fluid Exhibition
Contact: HARFKO Secretariat, Korea Refrigeration and Air-Conditioning Industry Association (KRAIA), 161-7, Samsung-dong, Kangnam-gu, Seoul, 135-090, Republic of Korea.
Tel: +82 (2) 5582 541;
Fax: +82 (2) 3697 515;
E-mail: yhk@ref.or.kr;
Website: www.harfko.com.

31 Mar-2 Apr
Ho chi Minh
Viet Nam

HVACR Viet Nam 2009
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.

19-20 May
Hamburg
Germany

Blowing Agents and Foaming Processes 2009
Contact: Conference Department, Smithers Rapra Technology Limited, Shawbury, Shrewsbury, Shropshire SY4 4NR, The United Kingdom.
Tel: +44 (1939) 250 383;
E-mail: conferences@rapra.net.

20-22 May
Taiwan
China

The 4th Asian Conference on Refrigeration and Air-conditioning 2009
Contact: Prof. Yang-Cheng Shih, Secretary General of ACRA 2009, Department of Energy and Refrigerating Air-conditioning Engineering, National Taipei University of Technology, 1, Sec. 3, Chung Hsiao E Road, Taipei 10608, Taiwan, China.
Tel: +886 (2) 2771 2171, ext. 3501;
Fax: +886 (2) 877 33713;
E-mail: acrataipei@acrt.org.tw.

23-26 Jun
Boulder
United States

IIR Conference on Thermophysical Properties and Transfer Processes of Refrigerants
Contact: Conference Secretariat, United States of America.
Tel: +1 (301) 9755 868;
E-mail: david.yashar@nist.gov.

7-11 Sep
Bangkok
Thailand

RHVAC 2009
Contact: Thai Trade Fair, 22/77, Rachadapisek Road, Chatuchak, Bangkok 10900, Thailand.
Tel: +66 (2) 5116 020;
Fax: +66 (2) 5116 008-10;
E-mail: titfd@depthai.go.th.

PUBLICATIONS from APCTT

PERIODICALS

(Free access at www.techmonitor.net)

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

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