VATIS UPDATE

Ozone Layer Protection

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Highlights

- Action on HFC gases
- Packaged chiller
- Biodegradable concrete cleaner
- Compositions for azeotropic and mixed solvents
- Reverse aqueous emulsions and microemulsions
- Non-fumigant alternatives

United Nations
ESCAP

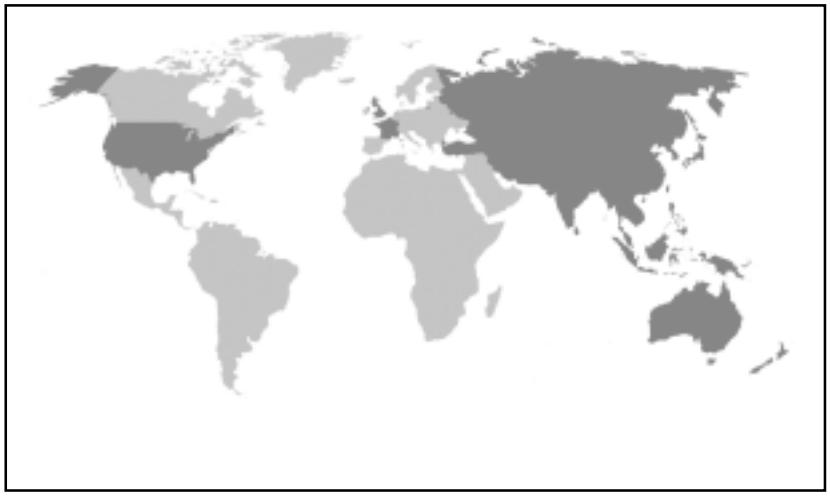
APCTT
ASIAN AND PACIFIC CENTRE FOR TRANSFER OF TECHNOLOGY

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

The new Daikin McQuay Pathfinder air-cooled chiller operating with R-134a refrigerant, which has no ozone-depletion potential. See Page 11.

(Credit: Daikin McQuay, 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.

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*** Value Added Technology Information Service**

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THE SCIENCE OF OZONE LAYER

Delay in ozone layer recovery

The stratospheric ozone layer is known to protect life on Earth from harmful ultraviolet radiation. A new study suggests that recovery of this protective shield, damaged by human-made ozone depleting substances (ODSs), could be delayed or even postponed indefinitely for some regions because of the impact of increasing amounts of greenhouse gases (GHGs). The atmospheric levels of ODSs, thought to have peaked around 2000, dropped following stringent restrictions on the manufacture and use of ODSs under the Montreal Protocol and the European Union regulations. The United Nations Environment Programme (UNEP)/World Meteorological Organization (WMO) expects ODS levels to return to pre-1980 values during the second half of the 21st century. However, climate change may affect this ozone recovery.

Researchers modelled the impact of increasing amounts of GHGs in the atmosphere on the recovery of ozone levels in the stratosphere. Two significant milestones were evaluated – ozone returning to historical values and ozone being no longer significantly influenced by ODSs. The study concluded that reaching either of these milestones was likely to occur at different times in different regions in the world. Results suggest that, by the end of the 21st century, there will be greater than pre-1980 concentrations of ozone in the upper stratosphere, but lower concentrations in the lower stratosphere in the tropics and the southern mid-latitudes. (Source: www.environmental-expert.com)

New refrigerants pose a threat

Modern refrigerants designed to protect the ozone layer are poised to become a major contributor to global warming because of their future explosive growth in the developing world. Hydrofluorocarbons (HFCs), developed to phase out ozone depleting gases in response to the Montreal Protocol, can be hundreds or thousands of times more powerful than carbon dioxide (CO_2) as greenhouse gases in trapping heat. A recent study led by Mr. Guus Velders, Netherlands Environmental Assessment Agency, analysed the latest industry trends and then modelled HFC production to 2050. Results suggest that HFC emissions may equal between 5.5 billion tonnes and 8.8 billion tonnes of CO_2 annually by 2010 – roughly 19 per cent of the projected CO_2 emissions if GHGs continue to rise unchecked. (Source: blogs.physicstoday.org)

Droplet of acid helps solve ozone puzzle

Chlorine, in its atomic form, can destroy vast amounts of ozone. But exactly how chlorine is created in the stratosphere's ultracold conditions has puzzled scientists. A team of researchers from the SLACS Laboratory of INFM-CNR, Italy, and the University of Rurh Bochum, Germany, have discovered a mechanism based on water's ability to bond with a strong acid that allows for chlorine to be formed under those circumstances. In the study, researchers observed the fundamental chemical process of acid dissociation in ultracold conditions. Dissociation is the process by which molecules split into their smaller constituents. In this case, the team investigated how hydrogen chloride (HCl) can be dissociated into a negative chloride ion and positive hydrogen ion (proton) by adding just four molecules of water (H_2O) to form a tiny droplet of hydrochloric acid. Observations have shown that this reaction mechanism can enable the formation of molecules not only in the stratosphere but also in interstellar space and even on the surface of nanocrystals of ice.

The key to the dissociation is stepwise aggregation, or adding one H_2O molecule at a time. When the molecular cluster consists of three H_2O molecules and one HCl molecule, the H_2O molecules orient themselves to accept protons from the hydrogen in the HCl, but the cluster is still undissociated. On addition of a fourth H_2O molecule, the HCl spontaneously becomes dissociated. That is, the hydrogen (proton) dissociates from chlorine and binds to a H_2O molecule to form hydronium, leaving the free negative chloride ion. "These chemical components join themselves in a peculiar structure: the hydronium on one side of a grid, the chloride on the other, and the three H_2O molecules joined as a barrier between the two," state researchers. They explain that this structure is the only stable

configuration, and also marks the smallest acid droplet possible. The team calculates that, owing to the step-by-step aggregation that takes place at low temperatures, this dissociation process can occur without the need for large amounts of energy. (Source: www.physorg.com)

Chemicals ease one woe but worsen another

According to scientists, chemicals that helped solve the last global environmental crisis – the hole in the ozone layer – are making the current one worse. Hydrofluorocarbons, introduced widely in the 1990s to replace ozone depleting gases used in air-conditioners, refrigerators and insulating foam, act like "super" greenhouse gases (GHGs) with a heat-trapping power that can be 4,470 times that of carbon dioxide (CO_2). The world must now find replacements for the replacements – or these super-emissions could cancel out other efforts to stop global warming.

Mr. David Fahey, a physicist at the United States' National Oceanic and Atmospheric Administration states, "Whatever targets you thought you were going to make, it will be undermined by the fact that you have … additional emissions that you had not planned on." Recently a group of scientists published a paper projecting that, if unchecked, the emissions would rise rapidly over the next 40 years. By 2050, they found, the amount of super GHGs in the atmosphere might be equal to six or more years' worth of CO_2 emissions. (Source: www.washingtonpost.com)

Ozone hole reduces CO_2 uptake

According to researchers from three laboratories attached to the Institut National des Sciences de l'Univers of the CNRS (INSU-CNRS), UPMC, CEA, IRD, MNHN and UVSQ, ozone has an impact on the ocean's role as a carbon sink. The results are published on-line in the journal Geophysical Research Letters and have a considerable impact on future models of the Intergovernmental Panel on Climate Change (IPCC) that do not take ozone variations into account. Using simulations, it has been demonstrated that the ozone hole reduces atmospheric carbon uptake in the Southern Ocean and contributes to the increase in ocean acidity. By absorbing almost 15 per cent of anthropogenic carbon released every year, the Southern Ocean is one of the main sinks for atmospheric carbon dioxide (CO_2). But its effectiveness is decreasing. A collaborative team of climatologists, modellers and oceanographers was set up with the objective of developing a model that simulates the Southern Ocean's capability to act as a carbon sink more accurately. The key feature of this model is that it takes into account changes in the concentration of stratospheric ozone from 1975 until the present day. The simulations obtained with this model reproduce the oceanic observations obtained in the field over the last few years. Above all, this study highlights two major phenomena with regard to the Southern Ocean – a significant reduction in CO_2 uptake (which is not compensated in the other oceans) and acceleration in the acidification of high southern latitude oceanic water. Between 1987 and 2004, around 2.3 billion tonnes of carbon was not taken up by the oceans, corresponding to a relative reduction of nearly 10 per cent of the global oceanic carbon uptake. *Contact: CNRS, Campus Gerard-Megie, 3 rue Michel-Ange, F-75794 Paris cedex 16, France. Tel: +33 (1) 4496 4000; Fax: +33 (1) 4496 5390.* (Source: www.sciencedaily.com)

High Sky: OzonAction Education Pack for Secondary Schools, Student's Book

This activity book, meant for students in secondary schools, is divided into the following sections:

Scene 1: The ozone layer – the truth!
Scene 2: Ozone – good or bad?
Scene 3: Ozone depleting substances
Scene 4: Protecting yourself and the ozone layer
Scene 5: UV radiation and health effects
Scene 6: Climate change and ozone layer depletion
Scene 7: Time is up! Glossary

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ODS PHASE-OUT IN INDIA

Chiller project approved by World Bank

The World Bank has approved a US$6.3 million Chiller Energy Efficiency Project (CEEP) aimed at reducing greenhouse gas emissions while at the same time supporting completion of the phase out of consumption of ozone depleting substances required under the Montreal Protocol. There are four components to the project. The first is the 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 an upfront financial incentive to subsidize the cost of replacement of centrifugal chillers before end of technical life or payment on a yearly basis from a share of certified emission reductions to be generated from the actual energy savings achieved by the chillers; and an incentive for chiller manufacturers, suppliers and energy service companies to actively participate in the project. The second part of the project involves measurement, monitoring and verification. (Source: www.constructionweekonline.com)

Exemption sought for CFC-based asthma inhalers

At the Medical Technical Options Committee of Ozone Secretariat, India sought exemption for metered-dose inhalers (MDIs), based on chloro-fluorocarbons (CFCs) under the Montreal Protocol for 2010, in a bid to offer much-needed breather to millions of asthma patients as well as pharma majors. The exemption request follows five drug companies (including Sun Pharma, Cadila, Midas and Cipla) expressing their inability to switch over from CFC-based asthma inhalers to non-CFC inhalers by the target period of 2009, citing financial and technical reasons. Although CFCs were fully phased out by August 2008, India is finding it difficult in doing so with MDI inhalers that need CFCs as propellants. The new CFC-free MDIs use hydrofluoroalkane (HFA) as the propellant and are almost 20 per cent costlier than conventional ones. The final decision in the matter will be taken in November when the Conference of Parties meet. (Source: www.zeenews.com)

2009 stratospheric ozone protection awards

The Centre for Environment Education (CEE), India, has been awarded the 2009 stratospheric ozone protection award for its contribution towards protecting the ozone layer. CEE worked with the Ozonaction Programme of the United Nations Environment Programme (UNEP) since 1995 and has consistently provided technical assistance for the benefit of national ozone units, industry and other stakeholders in Article-5 countries; aligned with the targeted approach of UNEP's compliance assistance programme. It has also developed an educators' kit to help teachers and environmental communicators in creating awareness about the science of depletion, impacts and management aspects worldwide to protect the ozone layer. A set of slides and a script help teachers and other communicators present information to audiences. An information supplement helps presenters with information to answer questions. Location-specific materials can be used to involve audiences through interactive learning. CEE also played an important role in the development of the global and regional awareness strategies. (Source: www.epa.gov)

CTC-free India

India would become free of carbon tetrachloride (CTC) by year-end, a NGO involved in implementing the national CTC phase-out plan has stated. Efforts were taken to stop complete usage of CTC as a solvent and cleaning agent in various industries, and it would be totally phased out by 31 December this year, states Mr. Susanta Deb, Field Consultant representing German NGO, GTZ-Proklima, which is implementing the phase-out plan in the country in coordination with the government. However, CTC for dead starch use will continue beyond 2010. The Ozone Cell in the Union Ministry of Environment and Forests is coordinating CTC phase-out. It had put in place a regulatory framework and a national phase-out plan to ensure that domestic production and imports of CTC progressively decrease in compliance with the national targets. (Source: economictimes.indiatimes.com)

IN THE NEWS

Action on HFC gases

A scientific paper that highlights the requirement for accelerating action over hydroflurocarbons (HFCs) as part of the climate change agenda was recently welcomed by the Head of the United Nations Environment Programme (UNEP). The authors argue that HFC use could climb sharply in the coming years in products such as insulation foams in air-conditioning units and refrigeration as replacements for the ones being phased out to protect the ozone layer. Under a scenario where carbon dioxide (CO_2) emissions are pegged at 450 ppm, HFCs could reach 9 gigatonnes – equal to around 45 per cent of total CO_2 emissions – by 2050 if their growth is unchecked. Conversely, rapid action to freeze and cut emissions annually alongside fostering readily available alternatives could see HFC emissions fall to under 1 gigatonne.

The United Nations' Under-Secretary General and UNEP Executive Director Mr. Achim Steiner stated, "Dramatically cutting CO_2 emissions from society's inefficient energy usage is the key to catalysing a transition to a low-carbon, resource-efficient green economy. It is also central to delivering a stabilization of the atmosphere, as outlined by the assessments of the Intergovernmental Panel on Climate Change. But there are other low-hanging fruits in the climate change challenge and this new scientific paper spotlights one of them – HFCs. By some estimates, action to freeze and then reduce this group of gases could buy the world the equivalent of a decades worth of CO_2 emissions." The projected growth in production and consumption of HFCs is in part linked to the success of UNEP-administered Montreal Protocol on Substances that Deplete the Ozone Layer.

Over recent years, research has outlined that global efforts to protect the ozone layer has also delivered climate benefits as many chemicals that damage the ozone layer – such as chlorofluorocarbons – also cause global warming. *Contact: Mr. Nick Nuttall, Spokesperson/Head of Media, UNEP, 15 rue de Milan, 75441 Paris Cedex 09, France. Tel: +33 (1) 4437 1450; Fax: +33 (1) 4437 1474; E-mail: nick.nuttall@unep.org.* (Source: www.uneptie.org)

Bhutan to phase out hydrochlorofluorocarbons

Bhutan is scheduled to phase out hydrochlorofluorocarbons (HCFCs) starting in 2013. HCFC is both an ozone depleting substance (ODS) and a global warming substance that all signatories to the Montreal Protocol have agreed to phase out. As a signatory to the Protocol, Bhutan will have to phase out HCFCs by 2030. National ozone officer Ms. Peldon said that HCFCs are used in refrigerators, air-conditioners, chillers and many cooling appliances in use after the import of chlorofluorocarbon (CFC) emitting appliances was banned in 2005. Ms. Peldon stated that Bhutan is well on track to completely phase out CFCs by the January 2010 deadline.

To start with the phase-out plan, a baseline survey will be conducted to identify the uses and HCFC stocks in the country. A licensing system will also be put in place to allow for registered enterprise access to HCFCs on a quota basis to keep in with the phase-out schedule. Further, the phase-out will be carried out in close consultation with all affected sectors, such as the private and agriculture sectors. Policy and legislative actions will be framed by the national environment commission by adjusting existing ODS legislations, quotas and licenses for domestic trade, export and import of all products that contain HCFCs. (Source: www.bhutanwilderness.com)

Reduction of ozone depleting substances in Pakistan

Inaugurating a stakeholders' workshop on Hydrofluorocarbons Phase-out Management Plan, or HPMP, Pakistan's National Project Director of Ozone Cell Mr. Abid Ali stated that Pakistan is fully committed towards global efforts aimed at conservation of environment. Mr. Ali pointed out that Pakistan is successfully heading towards 100 per cent phase-out target of ozone depleting substances (ODSs) by 1 January 2010 with the aim to reinforce the initiatives being taken for the preservation of the ozone layer. The workshop was organized by the Ozone Cell, Ministry of Environment, together with the United Nations Environment Programme (UNEP), United Nations Industrial Development Programme (UNIDO) and

national stakeholders. The objective of the workshop was to make preparations for an HPMP for the country. National and international partners participated in the interactive sessions of the workshop with aim to develop collaborative mechanism for the transition of HCFC-based air-conditioning, refrigeration and foam industry into the ozone- and climate-friendly technology.

The Government of Pakistan has already converted its industry in the foam, refrigeration, metal cleaning and fire-fighting sectors from ODS-based technologies into ozone-friendly technologies through implementing agencies like UNDP, UNIDO and the World Bank. As per the accelerated HCFC phase-out schedule, the parties to the Montreal Protocol have to freeze their consumption in 2013 at the average of 2009-2010 and then gradually phase it out in 2015-2030. (Source: www.nation.com.pk)

Illegal ODS trade in Asia-Pacific

Illegal trans-boundary trade in ozone depleting chemicals has increased dramatically in the Asia-Pacific region, a new study by the United Nations Environment Programme (UNEP) reveals. The scourge of illegal ODS has developed into one of the major obstacles in achieving their "timely and efficient phase-out" said the report, noting that the Earth's ozone layer remains "fragile and under threat". Comparing figures between nations trading in ozone depleting chlorofluorocarbons (CFCs) shows "a discrepancy between what is being legally exported into a particular country and the actual legal import figures of the country", said Mr. Ludgarde Coppens, Policy and Enforcement Officer for UNEP Division of Technology, Industry and Economics. "The figures just do not match," Mr. Coppens noted. "A good 55 per cent of these goods are unaccounted for."

The size of the black market in developed nations for CFCs in the mid-1990s was estimated at about 16,000-38,000 tonnes, says a study released before the Earth Day. Illegal trade in the Asia-Pacific region has increased dramatically. An analysis of CFC exports and imports between key importing countries – including Thailand, the Philippines, Malaysia, Indonesia, Viet Nam and Iran – and major exporting countries – such as China, India and Singapore – in 2004 found over 4,000 t of CFCs unaccounted for in the importing nations. Nearly 51 per cent of legal exports from China and 47 per cent of legal exports from India into Thailand, Malaysia, the Philippines, Viet Nam, Malaysia and Iran are not found in the import statistics of the importing countries, the study reveals. No import licence was given. The study reveals that the main routes used by smugglers are India/China-Viet Nam-Laos/Cambodia-Thailand, Bangladesh-India, Nepal-India, China-Philippines, China-Malaysia, China-Indonesia, Singapore-Malaysia and Malaysia-Thailand. Among the reasons cited for illegal trade are the high costs of substitutes, the long lifespan of equipment using CFCs, the high demand for CFCs in the servicing sector and the "often paltry penalties for smuggling these illegal substances". The report singled out Malaysia, the Philippines and Indonesia for taking action to reduce suspicious shipments and review the licensing system. (Source: www.nationmultimedia.com)

Iraq sets sights on compliance with ozone protection treaty

At its 58th meeting, the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol had approved Iraq's country programme strategy to eliminate substances that harm the ozone layer. Iraq wants to eliminate ODS such as CFCs from its refrigeration and foam industries by 1 January 2010 in accordance with the target set under the Montreal Protocol. The Multilateral Fund will provide Iraq with about US$6.3 million to finance its plans to phase out CFCs, halons, carbon tetrachloride and trichloroethane. UNEP and UNIDO, the Multilateral Fund's implementing agencies, will work together with the Government of Iraq and Iraqi enterprises and will discuss the choice of alternative technologies to explore whether new ozone-friendly technologies with additional climate benefits can be utilized to make the finance Iraq receives work on two environmental protection fronts.

Iraq is working on plans to lower its consumption of HCFCs employed in air-conditioning appliances, acoording to the Montreal Protocol's accelerated phase-out schedule agreed in 2007. In 2008, Iraq received finance from the Multilateral Fund to prepare a plan to address the freeze on consumption of HCFCs in 2013 and reduce consumption by 2015, and expects to submit a full HCFC phase-

out management plan to the Executive Committee. *Contact: Ms. Julia Anne Dearing, Information Management Officer, Multilateral Fund Secretariat, 1800 McGill College, 27th Floor, Montreal, QC, Canada H3A 3J6. Tel: +1 (514) 2821 122; E-mail: secretariat@unmfs.org; Website: www.multilateralfund.org.* (Source: www.multilateralfund.org)

Co-processing ODS gases

Geocycle Indonesia operates Southeast Asia's first facility for the destruction of ODS. For over a year, the facility has been serving customers who care about CFC emissions and environmental impact. In addition to eliminating CFCs, Geocycle aims to raise local awareness of the dangers of releasing ODS gases into the atmosphere through a series of seminars and workshops. Geocycle Indonesia participated in 15 seminars and workshops since the ODS facility opened, informing potential customers who were not aware of the facility and raising awareness of environmental hazards, available solutions and best practices.

Prior to 2005, the only ODS disposal option available to waste producers in the region was expensive – exporting to Australia, with the associated high costs of insurance, destruction and transportation. Following discussions with the Indonesian and Japanese environment ministries, a memorandum of understanding was signed in May 2006. The three parties assessed the recommendations of the UNEP Technology & Economic Assessment Panel 1 (TEAP 1) report and agreed to install an ODS facility at the Narogong-2 cement kiln in West Java. Modifications to the plant had three winning advantages – the costs were relatively small, the modification yielded a large destruction capacity and the facility could be used on demand.

CFC chains crack at around 900°C-1,000°C. In a kiln at 1,500°C with gas temperatures of up to 2,000°C, CFCs decompose quickly and completely. The gases decompose into hydrochloric as well as hydrofluoric acids that are neutralized with alkaline calcium and go into non-toxic and harmless clinker material. Co-processing ODS does not affect the normal operating conditions of the kiln. Since the facility opened, 9,600 kg of ODS have been destroyed – this is equivalent to the global warming potential of approximately 44,313 t of carbon dioxide. (Source: www.holcim.ch)

Celebrities influence ozone layer protection

Pop star Ms. Tata Young, Art of Living Guru Sri Sri Ravi Shankar, Mr. Doraemon and the Beijing Olympics mascots have pitched in for protecting the ozone layer. These celebrities took a major step towards helping the environment by being a presenter in "My Ozone Wish" video public service announcements (PSAs) to raise awareness on ozone layer protection developed by UNEP DTIE Ozonaction Compliance Assistance Programme, Regional Office for Asia-Pacific. The Foreign Correspondents' Club of Thailand hosted the launch of "My Ozone Wish" PSAs followed by a panel discussion featuring one of the famous PSA presenter, Ms. Young, who expressed her resolve to help make a difference and to outreach ozone story to her audiences. This effort of CAP team fits in very well with UNEP's proposed "Music and Environment" initiative.

The event was joined by various international correspondents who are based in Thailand and neighbouring nations, international organizations like UNDP and related partners such as Sweden. Many interesting questions were raised during the Q&A session. Ms. Young explained about what she was planning to help protect the environment, especially the ozone layer on her day-to-day life. Mr. Atul Bagai, Regional Coordinator for South Asia Network, Compliance Assistance Programme UNEP-DTIE Ozonaction, responded to questions about ODS alternatives and ensured that UNEP, other implementing agencies, governments and various stakeholders were working together to find the best solutions for ozone layer protection and climate change issues. To watch the PSAs on the Ozonaction website, visit www.unep.fr/ozonaction/information/video/index.htm. (Source: www.uneptie.org)

DENR's phase-out campaign

In the Philippines, the Department of Environment and Natural Resources (DENR) recently reminded the public to be very careful when purchasing refrigerators or air-conditioners, as the country is presently taking part in the National CFC Phase-out Plan, which is a strategy to phase out the remaining consumption of CFCs in the Philippines

following the Montreal Protocol phase-out schedule. During the Philippine Information Agency's (PIA's) TV programme "Panindugan", hosted by PIA-8 Regional Director Mr. Erlinda Olivia P. Tiu, DENR Information Officer Ms. Purificacion Daloos and Forester Mr. Ramon Calumbay said that the DENR is currently involved in reducing and eventually eliminating the production and consumption of ODS. This is a measure passed to mitigate the effects of climate change, Ms. Daloos said. She added that just complying with this measure is a very great contribution towards saving the Earth's environment. (Source: www.pia.gov.ph)

Gearing up for a seamless transition of CFC-free inhalers

UNEP has launched the "Transition to CFC-free inhalers Awareness Package" for National Ozone Units (NOUs) in developing countries during the Open-Ended Working Group of the Parties of the Montreal Protocol to help NOUs in Article 5 nations raise awareness on CFC metered dose inhaler (MDI) phase-out and also facilitate seamless transition to CFC-free inhalers in their countries. Some CFC productions and consumptions will continue after the 2010 phase-out deadline for the essential use of CFC-based MDI in certain nations, therefore the package has been developed in a way to make it contextual to the situation of all nations. (Source: www.uneptie.org)

Saving the Ozone Layer: Phasing Out Ozone Depleting Substances in Developing Countries

This second edition training manual for customs officers is updates the 2001 edition. The latest edition takes into account the developments in international trade and also provides new material to reflect changes in the Montreal Protocol, harmonized codes, licensing systems and other relevant information.

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REFRIGERATION/ AIR-CONDITIONING

R-744 performs best: A Green-Mac LCCP finding

Latest calculations using Green-Mac LCCP® have shown that carbon dioxide (CO_2) outperforms both R-134a and HFO-1234yf in mobile air-conditioning (MAC) systems in most climate conditions. Green-Mac LCCP was developed by General Motors, the United States, to compare the life cycle climate performance (LCCP) of MAC appliances. The comprehensive model integrates a wide set of parameters to calculate the environmental impact of MAC systems and different refrigerants, taking into account both direct and indirect emissions over a car's life cycle.

The natural refrigerant CO_2 (R-744) will not only lead to the lowest GHG emissions in MAC in an European scenario, but will also outperform current and proposed refrigerants at the global scale. This is the result after real-life data for CO_2 had been entered into the latest agreed version of the Green-Mac LCCP model. In the second version of the Alternative Refrigerant Cooperative Research Programme, CO_2 leads to considerably lower emissions at relevant ambient temperatures below 35°C. Depending on the manufacturer and system used – from small to big and from simple system layout to complex ones – this point will range from temperatures in the high 20°C to above 40°C. (Source: www.r744.com)

Field-tested CO_2 gas cooler system

Danfoss A/S, Denmark, has introduced its carbon dioxide (CO_2) gas cooler system that needs only one controller to run both high- and medium-pressure valves. The new system offers the well-known Danfoss quality featuring high efficiency and cost optimization while being easy to install and adjust. Its high quality and maximum system efficiency have been proven in extensive field test and during tests in Danfoss labs and customer facilities. Components of the CO_2 gas cooling system are:

- Controller for CO_2 gas cooling, type EKC 326A;
- High-pressure expansion valve, type ICMTS;
- Intermediate pressure valve, type ETS;
- Servo-operated control valve, type ICS; and
- High-pressure pilot valve, type CVP-XP.

Contact: Danfoss A/S, Nordborgvej 81, 6430 Nordborg, Denmark. Tel: +45 7488 2222; Fax: +45 7449 0949; Website: www.danfoss.com. (Source: www.r744.com)

R-744 coolers launched

Frigoglass, Greece, has launched a new range of R-744 beverage coolers. Using only natural substances as refrigerants and in the insulation process, the Ecocool range is designed to reduce the impact on the environment in terms of both greenhouse emissions and energy consumption. The range makes use of natural refrigerants R-744, R-290 or R-600a and consumes up to 50 per cent less energy than equivalent units produced 10 years ago. The Ecocool range offers cold drink availability with a minimum environmental impact. Key features of this range are:

- Depending on the application, the coolers will use R-744, R-290 or R-600a – while conventional refrigerants exhibit an average global warming potential of 1,300 (over a period of 100 years), these new cutting edge alternatives have less than 3;
- The HFC-free insulation in combination with the use of HFC-free refrigerants makes the Ecocool range completely HFC-free; and
- Advanced assembly techniques and the use of less materials contribute to increased recyclability of the coolers.

(Source: www.r744.com)

Energy-saving method checks refrigerant level

In the United States, a team comprising Prof. James Braun and mechanical engineering graduate student Mr. Woohyun Kim have employed a new technique designed to save energy and servicing costs by indicating when air-conditioners are low on refrigerant, thereby preventing the units from working overtime. Technicians servicing home air-conditioners can simply plug a personal digital assistant into the unit to read the refrigerant-charge information. The conventional method for accurately learning how much charge is in a system involves removing all of the refrigerant and weighing it, a time-consuming procedure that requires a vacuum pump.

The "virtual refrigerant charge sensor" is particularly practical for automotive air-conditioners that tend to leak refrigerant more than other types of units, and also for household central air-conditioning units. The technology uses sensors to monitor the temperature of the refrigerant at various points along the tubing in an air-conditioning unit. The sensors are simply attached to the outside of the tubing. Maintaining the proper "charge", or amount of refrigerant in a system, saves energy because air-conditioners low on refrigerant must operate longer to achieve the same degree of cooling as properly charged units. Purdue University, the United States, has applied for a patent on the technique, developed by researchers at its Ray W. Herrick Laboratories. (Source: www.physorg.com)

Eco-fridge to be patented

A team of five students at the Century Foundation Matriculation Higher Secondary School, India, plan to obtain a patent for their eco-fridge. Various tests at recognized laboratories have proved that vegetables stored in the eco-fridge for a period of three days contain higher levels of nutrients than when preserved in commercial models or at room temperature. Eco-fridge is based on the principle of evaporative cooling. It consists of double-layered frustum-shaped earthen vessels with a lid. Wet sand is used to fill the gap between the two layers of vessel, bringing the temperature about 8°C below that of the surroundings. The "zero energy" fridge eliminates spoilage of contents due to erratic power supply. Lab results indicate higher values of Vitamin A, C, riboflavin and thiamine in vegetables stored in the eco-fridge compared with those stored in commercial fridges. (Source: www.hindu.com)

New chiller

Pathfinder from Daikin McQuay is the first in a new family of products designed to exceed HVAC industry standards for operating efficiency and low sound levels, providing optimum operating costs and comfort throughout the life of the chiller.

The chiller's quiet operation makes it ideal for sound-sensitive environments and other facilities located in residential neighbourhoods. The unit capacities range from 175-515 t in 50 and 60 Hz. The Pathfinder chiller operates with R-134a refrigerant, which has no ozone depletion potential. The chiller helps owners qualify for Leadership in Energy and Environmental Design (LEED) Green Building Rating System certification through optimizing efficiency and refrigerant management.

The standard efficiency model meets ASHRAE 90.1 requirements, while the premium model has best-in-class efficiency. The unit's compressor controls use precise control logic for optimum operating efficiencies at both full and part load. Designed using low-speed fans with patented blade profile and a unique, single-rotor compressor to minimize mechanical vibration, the chiller's sound pressure level is rated as low as 67 dBA at a distance of 30 ft per ARI Standard 370, which is a 6 dBA reduction compared with previous models. Ideal for retrofit projects, the chiller's small unit footprint allows the maximum condenser heat transfer per foot of unit length. Key components are located on the unit's periphery, allowing easy access to the most commonly serviced parts. (Source: www.constructionweekonline.com)

Packaged chiller

Star Refrigeration, the United Kingdom, announced the launch of an ammonia packaged chiller with zero ozone depletion potential and zero global warming potential. Azanechiller, developed for environmentally conscious end-users, is suitable for cooling both water and glycol. It is ideal for applications in food processing, temperature-controlled storage and building services. Increased interest in natural refrigerant solutions is the result of uncertainty over the availability of recycled R-22, coupled with questions over the long-term viability of HFC replacement gases. Operating on a naturally occurring refrigerant, Azanechiller is available as an air-cooled or water-cooled unit with cooling capacity from 200-850 kW. Both chillers include floating header pressure control which optimizes efficiency at part load conditions and low ambient temperatures. *Contact: Star Refrigeration, Thornliebank Industrial Estate, Glasgow G46 8JW, United Kingdom. Tel: +44 (141) 6387 916; Fax: +44 (141) 6388 111.* (Source: www.refrige.com)

SOLVENTS

Biodegradable concrete cleaner

Daimer Industries Inc., the United States, offers a fast-acting, biodegradable concrete cleaner as part of its Eco-Green® series of products. Eco-Green concrete cleaner with rust stain remover emulsifies organic matter to dissolve and remove hydrocarbon residues. Micro-Blasting® technology uses nanoparticles, 1/80,000th the thickness of human hair, to penetrate dirt molecules for removal of industrial-strength stains on concrete. The non-toxic solution can be used either straight from the container or diluted with water. It removes rust stains, dirt, grease, grime, oil, mildew, algae and various other substances from common concrete surfaces, including sidewalks, driveways, parking lots, garages, basements, pavers, brick and other masonry surfaces. *Contact: Mr. Matthew Baratta, Daimer Industries Inc., 16 Tower Office Park, Woburn, MA 01801, United States of America. Tel: +1 (781) 3934 900; Website: www.daimer.com.* (Source: news.thomasnet.com)

Compositions for azeotropic and mixed solvents

Asahi Glass Co. Ltd., Japan, has applied for a European patent for its new solvent compositions. The non-inflammable solvent compositions are capable of removing soils, such as oils attached to electronic components such as ICs, precision machine components or glass substrates, or flux and dusts attached on, for example, printed boards. The mixed solvent composition comprises from 40 to 90 mass per cent of 1,1,1,2,2,3,3,4,4,5,5,6,6-tridecafluorooctane and from 10 to 60 mass per cent of isopropanol, whereas an azeotropic solvent composition is made up of 62 mass per cent of 1,1,1,2,2,3,3,4,4,5,5,6,6-tridecafluorooctane and 38 mass per cent of isopropanol. Furthernore, a mixed solvent comprising 1,1,1,2,2,3,3,4,4-nonafluorohexane (HFC-569sf) and 2-propanol has been proposed as a solvent to be used for degreasing/cleaning or flux cleaning.

The solvent composition of the present invention shows excellent cleaning performance in removing oils and flux. Particularly, the azeotropic solvent

composition or mixed solvent composition close to an azeotropic composition, of the present invention, undergoes no or little change in composition even if it is used repeatedly by recycling it to steam cleaning and distillation. Thus, it may be used as it is for a cleaning device which used to employ a solvent consisting of one component. That is, no substantial modification of the cleaning device is required. *Contact: Asahi Glass Co. Ltd., Japan, 12-1, Yurakucho 1-chome, Chiyoda-ku, Tokyo 100 8405, Japan.* (Source: www.freepatentsonline.com)

Replacement solvents with improved properties

Mainstream Engineering Corp., the United States, has applied for a patent for its CFC replacement solvents that include a main component (first solvent) and a property-modification component (second solvent). The resulting solvent mixtures meet or exceed the solvency, inflammability and compatibility needs for CFCs, while providing similar or improved environmental and toxicological properties. These solvent mixtures can be used in conjunction with refrigeration or heat pumps, electronics, implantable prosthetic devices, oxygen systems and optical equipment.

The solvent mixtures as per the present invention preferably have improved cleaning effectiveness or solvency with respect to the CFC targeted for replacement, a boiling point greater than about 40°C, compatibility with common elastomers and metals, toxicity less than or similar to the CFC targeted for replacement, an ODP value less than about 0.02 and a flashpoint greater than 40°C. The main component (first solvent) is preferably selected from the group consisting of alcohols (e.g., ethanol, isopropanol or butanol), terpenes (d-limonene), glycols (tetraglyme, propylene glycol), alkanes, alkenes, aromatics, esters, ethers, haloaromatics, ketones, haloalkenes and cycloalkanes. (Source: www.freepatentsonline.com)

Aqueous cleaning cuts sheet metal finishing costs

Propak, the United Kingdom, has achieved cost reductions in component cleaning, degreasing and painting after replacing a trichloroethylene (TCE) dip tank with a Turbex aqueous cleaning and phosphating machine. With the Turbex AC-2.5-3 water-based cleaning machine, the cost of TCE is eliminated. After aqueous cleaning, the machine applies an iron phosphate coat to all parts that will be painted, which accounts for around 70 per cent of throughput. Only around 25 l of etch prime is now used, mainly for priming stainless steel that cannot be iron-phosphated. According to Propak, after the price of aqueous consumables have been taken into account, savings in TCE and etch prime result in an annual reduction in cleaning and priming costs of up to US$19,200. The amount of heat used is equivalent in the solvent- and water-based processes, so this was a neutral factor in the calculations.

The degreasing efficiency of the aqueous, spray wash cleaning machine is equivalent to that of TCE and overall lead time to prepare components for painting is similar with both systems. With the Turbex process work is ready to paint, as it is already pretreated with iron phosphate. A typical cycle in the front-loading AC-2.5-3 takes around 20 minutes, including 60°C-75°C detergent wash, 50°C-55°C phosphating, final 60°C-75°C water spray rinse and steam extraction. A benefit of the multi-stage Turbex machine is the precision with which components can be cleaned because all parameters are variable from the control panel. (Source: www.manufacturingtalk.com)

Replacement for trichloroethylene

Eco FS, the United Kingdom, has developed non-VOC replacements for trichloroethylene (TCE). These inventions, formulated by Mr. John Neale, include a solvent recycling process, which is up to five times more energy efficient than hermetically sealed vapour degreasers. The firm has also developed a novel drying technique that ensures a level of cleanliness that has matched the performance of TCE and in some cases outperformed it. Eco FS products are designed to ensure 100 per cent conformity to the Solvent Emissions Directive (part of Integrated Pollution Prevention and Control) and the more recent REACH legislation. A filtration system that employs membrane separation technology to separate solvents from a liquid allows the solvent to be reused. Eco FS is in talks with businesses in Europe for commercialization (Source: www.manufacturingtalk.com)

FOAMS

Zero ozone depleting extruded polystyrene insulation

Owens Corning, the United States, offers zero ozone depleting Foamular® Extruded Polystyrene (XPS) rigid foam insulation. The new blowing agent technology complies with the requirements of the Montreal Protocol stipulating the phase-out of HCFC-142b by January 1, 2010. Foamular XPS insulation products are designed for use in various above- and below-grade as well as load-bearing applications to provide exceptional thermal and moisture resistance along with long-term energy efficiency. Benefits of Foamular insulation are:

- Insulating performance of R-5 per inch, based on real-time aging;
- Virtually impervious to moisture penetration, preventing loss of R-value;
- Twenty years' thermal performance warranty;
- Recyclable and reusable; and
- Minimum 20 per cent certified recycled content.

Utilizing Foamular insulation can help builders achieve green building certifications, including the Environmental Protection Agency's ENERGY STAR®, National Association of Home Builders' National Green Building certification and United States Green Building Council's Leadership in Energy and Environmental Design certification. (Source: www.foxbusiness.com)

CO_2 helps cut costs

KraussMaffei Technologies, Germany, supplies reliable and cost-effective systems for mass-flow regulated carbon dioxide (CO_2) nucleation. CO_2 – a low-cost, environment-friendly blowing agent – has several technical and cost advantages as a physical blowing agent for polyurethane. It produces low-density flexible foams with outstanding mechanical properties. Foaming systems that work with conventional blowing agents can be easily retrofitted to use CO_2 and offer the same benefits.

KraussMaffei CO_2 nucleation units can be easily and quickly integrated with minimal effort. The simplest solution – recommended for extremely low to medium CO_2 concentrations – is a batch system that is linked directly to a day tank. For very high CO_2 concentration applications, KraussMaffei offers batch systems where nucleation takes place in a buffer tank. The third approach is an on-line system where CO_2 is metered in at the mixing head. This variant allows CO_2 concentrations to be varied from shot to shot. In all three variants, CO_2 metering is mass-flow regulated – that is, the concentration of CO_2 in the PUR components is not affected by pressure or temperature. The process is engineered to ensure that the gas dissolves completely in the PUR component. (Source: www.plastemart.com)

Blowing agent impregnation enhancement in bead foam

Dow Global Technologies Inc., the United States, reports an invention that is a result of discovering that certain additives, when present in alkenyl aromatic polymer beads, can facilitate impregnation of the polymer beads with the blowing agent. As a result, impregnation time and amount of blowing agent required for impregnation can be unexpectedly reduced over current impregnation processes while still achieving similar or more desirable densities and compressive strengths. Desirable blowing agents include one or more hydrocarbons having from three to six carbons, preferably one or more isomer of butane (isobutane and/or n-butane) and/or one or more isomer of pentane (e.g., isopentane and/or n-pentane and/or cyclopentane). *Contact: Dow Global Technologies Inc., 2040, Dow Centre, Midland, MI 48674, the United States.* (Source: www.wipo.int)

Flame-retardant rigid foam

Clariant GmbH, Germany, has applied for a United States patent for its invention on a halogen-free, pentane-blown, flame-retardant rigid polyurethane (PU) foam, wherein oxalkylated alkylphosphonic acids are present. The invention also relates to the use of oxalkylated alkylphosphonic acids as halogen-free flame retardants for the production of flame-retardant rigid PU foams. The process is preferably executed by reacting organic polyisocyanates with compounds having at least two hydrogen atoms capable of reaction with isocyanates, with pentane as blowing agent, with

stabilizers, with activators and/or other conventional auxiliaries and additives, in the presence of oxalkylated alkylphosphonic acids. (Source: www.freepatentsonline.com)

Zero ODP, VOC-free foaming agent technology

Dow Building Solutions, the United States, has converted a second facility manufacturing Styrofoam Brand Extruded Polystyrene (XPS) foam insulation into its new zero ozone depleting, no-VOC foaming agent process. Dow's Ohio plant is the second one to phase out the use of HCFC-142b. The proprietary foaming agent technology was developed by a team led by Mr. Simon P. Lee, who was recognized by the Intergovernmental Panel on Climate Change for his contribution to the 2007 Nobel Peace Prize. The firm's building envelope products was awarded the National Association of Home Builders Research Centre Green Approved mark, making Dow the first to have its line of energy saving insulation and air sealing products eligible for meeting mandatory requirements or earning points under the National Green Building Standard. (Source: www.adhesivesandsealants.com)

Pentane-blown foams

Arkema Inc., the United States, has applied for a European patent for its method to improve pentane-blown foam. The method comprises incorporating into the foam composition Trans-12 in an amount effective to suppress the smoke generation of the blown foam, as well as pentane-based foam blowing agent compositions containing Trans 12 in an amount effective to suppress the smoke generation of the blown foam; polyurethane foam compositions consisting of a polyol, an isocyanate and aforesaid blowing agent composition; and foam premix compositions comprising a polyol and the aforesaid blowing agent composition. One or more pentanes are used in these processes and compositions, such as one or more of n-pentane, iso-pentane and cyclopentane. Among the pentane blends to which the Trans 12 can be added are blends of n-pentane with iso-pentane and of cyclopentane with iso-pentane. The amount of Trans 12 found to be effective for smoke suppression is about 10-60 mole per cent (preferably 10-50 mole per cent). (Source: www.freepatentsonline.com)

AEROSOLS

Propellant for Asthma inhaler

A low-grade asthma inhaler powered by a new propellant is safe and effective, but the cost to consumers could be nearly triple until a generic construct hits the market. A review in *The New England Review of Medicine* – conducted by Prof. Leslie Hendeles of University Florida, Prof. Gene Colice of George Washington University School of Medicine, and Dr. Robert J. Meyer, Director, Office of Drug Evaluation II at the Food and Drug Administration, the United States – looks at the consequences of using to hydrofluoroalkane (HFA) that is replacing CFC as a key ingredient in albuterol, a medicine that relieves asthma attacks, inhalers designed to relieve asthma. The analyses show that inhalers with CFC and the new brands that contain HFA are equally effective at treating asthma. Three inhaler brands have albuterol with the new propellant – Ventolin, ProAir and Proventil.

The new inhalers are as effective as their traditional CFC counterparts, with a few differences. One brand, for example, comes sealed in a protective pouch. After that pouch is opened, the drug carries a shelf-life of just two months while most inhalers can typically be stored for 15-24 months. Also, only the Ventolin brand of HFA inhaler comes with a counter to track how much medicine is left. The review also reports that some HFA inhalers tend to clog more easily; therefore, the devices' metal canister must be removed once a week and the plastic actuators cleaned with warm water. (Source: blogschool101.com)

CFC-free beclomethasone MDIs with advanced HFA technology

Beximco Pharmaceuticals, Bangladesh, offers the nation's first CFC-free beclomethasone MDI, which is based on advanced hydrofluoroalkane (HFA) technology. Azmasol® HFA (Salbutamol 100 µg) is used as a bronchodilator and provides quick relief. The advanced HFA formulation provides improved MDI performance compared with CFC salbutamol, as its reduced spray force and smaller particle size (below 3 µm) than CFC salbutamol ensures improved drug deposition in small airways.

Azmasol HFA is a preparation of Salbutamol as sulphate. Some advantages of Azmasol HFA are:

- Less priming – less loss of drugs;
- Consistent dosing owing to better end-of-can delivery (improved tail-off profile); and
- Patients in the CFC salbutamol group use an average of 1.3 more canisters per year compared with patients in the HFA salbutamol group.

Salbutamol is a short-acting ß-2 adrenoceptor agonist. Stimulation of airway ß-2 adrenoceptors causes relaxation of smooth muscles that have tightened around the airways. Thus, salbutamol is highly effective for the treatment of reversible airways obstruction associated with bronchitis and emphysema. *Contact: Beximco Pharmaceuticals Ltd., 19 Dhanmondi R/A, Road No. 7, Dhaka 1205, Bangladesh. Tel: +88 (2) 8619 151; Fax: +88 (2) 8613 888/9663 579; E-mail: info@bpl.net.* (Source: www.beximco-pharma.com)

Stabilizing suspension-based formulations in HFA propellants

Researchers at Wayne State University in the United States have developed a new method for engineering porous drug particles with enhanced physical stability and aerosol characteristics in hydrofluoroalkane (HFA) propellants for use in pressure metered-dose inhaler (pMDI) formulations. The approach consists of preparing drug particles containing excipients that are later removed and result in the generation of a porous drug structure. The HFC propellant is capable of penetrating into porous drug particles, thus enhancing the physical stability of the otherwise unstable formulation. This stabilization effect is a significant improvement over existing commercial formulations. Further, this invention enables a wide variety of drugs to be formulated free of environmentally toxic CFCs. (Source: www.ibridgenetwork.org)

Pharmaceutical propellant

Dymel® 227ea/P from Dupont™, the United States, is a CFC-free alternative propellant for pharmaceutical applications. Available for commercial use, Dymel is manufactured in full compliance with the current Good Manufacturing Practices (cGMP) of the United States Food and Drug Administration (FDA) and meets the requirements of health authorities worldwide. Dymel is supplied from Dupont's plant in Texas, which has been approved by the FDA for supplying propellants of pharmaceutical grade. The chemical composition of Dymel 227ea/P is 1,1,1,2,3,3,3-heptafluoropropane (HFA-227) and the pharmaceutical grade has stringent purity and handling prerequisites. Dymel 227ea/P is a non-inflammable, non-ozone depleting, medium pressure fluorocarbon propellant. It is permitted by worldwide governmental bodies for use in metered-dose inhalers and other pharmaceutical purposes. (Source: www2.dupont.com)

Reverse aqueous emulsions and microemulsions

Researchers at the Wayne State University, the United States, have studied *in situ* high-pressure tensiometry for screening non-ionic ethoxylated surfactants at the 1,1,1,2,3,3,3-heptafluoropropane (HFA-227) propellant|Water (HFA-227|W) interface. The EO(n)PO(30)EO(n) series, where EO stands for ethylene oxide, PO stands for propylene oxide and n is the number of repeat EO units, was selected for this study based on the favourable interactions reported between HFA propellants and the PO moiety. Surfactants used in pressurized metered-dose inhaler formulations approved by the United States Food and Drug Administration were also investigated. The tension measurements not only provide information on the relative activity of the different surfactants in the series, but they also serve as a guide for selecting an appropriate candidate in order to form reverse aggregates based on surfactant natural curvature.

PO-based amphiphiles can significantly reduce the tension of the HFA227|W interface. Small angle neutron scattering and UV-vis spectroscopy results also reveal that a selected ethoxylated amphiphile [EO(13)PO(30)EO(13) at 1 mM concentration], when in the presence of ethanol, is capable of forming stable cylindrical reverse aqueous microemulsions. EO(13)PO(30)EO(13) is also capable of forming emulsions of water-in-HFA227 which are fairly stable against coalescence. *Contact: Department of Chemical Engineering and Materials Science, Wayne State University, 5050 Anthony Wayne Drive, Detroit, MI 48202, United States of America.* (Source: www.ncbi.nlm.nih.gov)

FUMIGANTS

Non-fumigant alternatives

At the Horticultural Research Laboratory, the United States, researchers conducted two field trials to examine the effects of solarization and reduced-risk pesticides on weeds, nematodes, soil-borne diseases and yield of snapdragon *(Antirrhinum majus)*. Five treatments were replicated five times in a randomized complete block design: fumigation with 80:20 methyl bromide:chloropicrin, solarization, solarization + Kodiak® (a product with *Bacillus subtilis*), solarization + Biophos™ (a product with dipotassium phosphonate and dipotassium phosphate) and non-treated control. Although methyl bromide was superior for managing pest problems, integrating solarization with Biophos also provided benefits similar to methyl bromide in some instances. *Contact: Mr. Erin N. Rosskopf, United States Horticultural Research Laboratory, 2001 South Rock Road, Fort Pierce, FL 34945, United States of America. Tel: +1 (561) 4625 887; Fax: +1 (561) 4625 986; E-mail: Erin.Rosskopf @ars.usda.gov.* (Source: www.ars.usda.gov)

Grafting to control pests in field tomato production

In the United States, researchers from North Florida Research and Education Centre and University of Florida studied grafting as an alternative to methyl bromide in tomato production. A determinate heat-tolerant tomato cultivar "Bella Rosa" was grafted on to a commercially available interspecific rootstock "Multifort" recommended for open field production. Grafted plants and the controls of non-grafted Bella Rosa and self-grafted Bella Rosa were grown under three soil conditions, including non-treated soil, soil treated with pre-emergent herbicides and soil fumigated with methyl bromide and chloropicrin (50:50), in a split plot design with four replications.

In the summer experiment, grafted Bella Rosa with Multifort showed improved growth vigour in both treated and non-treated soils; however, the yield of grafted tomato was compromised by mismanagement of suckers grown from the rootstock. Fruit quality was not affected by grafting with the interspecific rootstock. Further studies are needed to update the economic analysis of costs and returns associated with use of grafted transplants and to select rootstocks for solving targeted on-site disease problems. (Source: ashs.confex.com)

Methyl iodide: Substitute for structural fumigation

Researchers at the University of California (UC), the United States, have identified methyl iodide as an alternative compound suitable for use as a methyl bromide substitute. Comparable or even superior to methyl bromide in efficacy on a molar basis, methyl iodide has been proven effective in controlling a number of organisms and is expected to be effective in the control of pests such as household insects and termites. Methyl iodide has a higher solubility and lower vapour pressure than methyl bromide, making it less hazardous to workers. The UC compound is significantly more photolabile than methyl bromide, making it much less harmful to the ozone layer. (Source: www.ibridgenetwork.org)

Alternatives to methyl bromide for raspberry nurseries

In the United States, researchers at Washington State University and Horticultural Crops Research Lab have investigated the feasibility of using alternatives to methyl bromide in raspberry nurseries. Raspberry nurseries use preplant soil fumigation with methyl bromide:chloropicrin (MB:Pic) in order to produce disease- and nematode-free plants. Successful alternatives to MB:Pic must provide full control of plant-parasitic nematodes, *Agrobacterium tumefasciens* and *Phytophthora rubi*. In trials conducted over two years, the alternative fumigants evaluated include Midas® (methyl iodide: cloropicrin), Telone® C-35 and InLine® (Telone: cloropicrin), solarization and a solarization + Inline combination. Midas applied at 350 lb/A under a conventional (HDPE) tarp consistently provided excellent control of all weeds/pathogens. Reduced (175 lb/A) rates of Midas were less effective than full rates. All treatments except for solarization controlled root lesion nematode *(Pratylenchus penetrans)*, and all of the treatments enhanced marketable yield of the nursery plants. (Source: ashs.confex.com)

RECENT PUBLICATIONS

Proceedings of the Symposium for the 20th Anniversary of the Montreal Protocol

This book includes articles presented by leading scientists in the ozone field at the Symposium for the 20th Anniversary of the Montreal Protocol, held in Athens in September 2007. It provides the history, science and lessons learned by applying of the Montreal Protocol over the past 20 years. Expressed views come from three Nobel laureates, 60 scientists and representatives of international organizations and industry. Interesting aspects of ongoing ozone research are also presented.

Contact: Springer Asia Ltd., Unit 1703, Tower I, Enterprise Square, 9 Sheung Yuet Road, Kowloon Bay, Hong Kong. Tel/Fax: +852 2723 9698/2724 2366; E-mail: maurice.kwong@springer.com.

Blowing Agents and Foaming Processes 2009 – Conference Proceedings

Foamed substances are now being sourced as an alternative substance for applications which previously had an established material. Blowing agents or blowing gases are excellent "fillers" and have the dual benefits of saving material and reducing weight, the latter minimizing shipping and other related expenses. Today there are a number of solutions on offer – new methods, processes, technology and additives. All technical papers that were presented at the Blowing Agents and Foaming Processes, 2009 are included in the proceedings and focus on: blowing agents and gases specialities, nano structures, foam injection moulding, new extrusion findings and microcellular foams.

Contact: Ms. Laura Wood, Senior Manager, Research and Markets, Guinness Centre, Taylors Lane, Dublin 8, Ireland. Tel: +353 (1) 4811 716/ 6531 571; E-mail: press@researchandmarkets.com.

TECH EVENTS

6-8 Nov
Manila
Philippines

Refrigeration Philippines 2009
Contact: Global-Link Marketing and Management Services Inc., Unit 1003,
Antel 2000 Corporate Centre,
121, Valero St. Salcedo Village,
Makati City, Metro Manila,
The Philippines.
Tel: +63 (2) 7508 588;
Fax: +63 (2) 7508 585;
E-mail: jing@globallinkph.com.

10-13 Nov
San Diego
United States

2009 Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reductions
Contact: Methyl Bromide Alternatives Outreach, 6556 N. Dolores Avenue,
Fresno, CA 93711,
United States of America.
Tel: +1 (559) 4499 035;
Fax: +1 (559) 4499 037;
E-mail: gobenauf@agresearch.nu;
Website: www.mbao.org.

19-21 Nov
Jakarta
Indonesia

HVACR Indonesia 2009
Contact: IIR Exhibitions Pte. Ltd.,
205 Henderson Road, #03-01,
Henderson Industraial Park,
Singapore 159549,
Singapore.
Tel: +65 6319 2668;
Fax: +65 6319 2669;
E-mail: sharon.lim@iirx.com.sg.

2-4 Dec
Belgrade
Serbia

International Congress on Heating, Refrigerating and Air-Conditioning
Contact: Mr. Branislav Todorovic,
Serbia.
E-mail: todorob@EUnet.yu.

2009

19-20 May
Cologne
Germany

Blowing Agents & Foaming Processes 2010
Contact: iSmithers, Shawbury,
Shrewsbury, Shropshire SY4 4NR,
United Kingdom.
Tel: +44 (1939) 252 421;
E-mail: conferences@ismithers.net.

15-18 Jun
Kuala Lumpur
Malaysia

REVAC 2010
Contact: AMB Exhibitions Sdn. Bhd.,
1701, 17th Floor, Plaza Permata (IGB), 6, Jalan Kampar, Off Jalan Tun Razak, 50400 Kuala Lumpur,
Malaysia.
Tel: +60 (3) 4045 4993;
Fax: +60 (3) 4045 4989;
E-mail: support@ambexpo.com.

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.*