VATIS UPDATE

Ozone Layer Protection

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Highlights

- Forced-air geothermal heating systems
- Surface modifier coating for electronic components
- Polymer foam with improved fire retardance
- Energy-saving insulation and air sealing products
- A new bronchodilator combination in HFA-MDI
- Phosphine disinfestation treatment of apples

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

APCTT
ASIAN AND PACIFIC CENTRE FOR TRANSFER OF TECHNOLOGY

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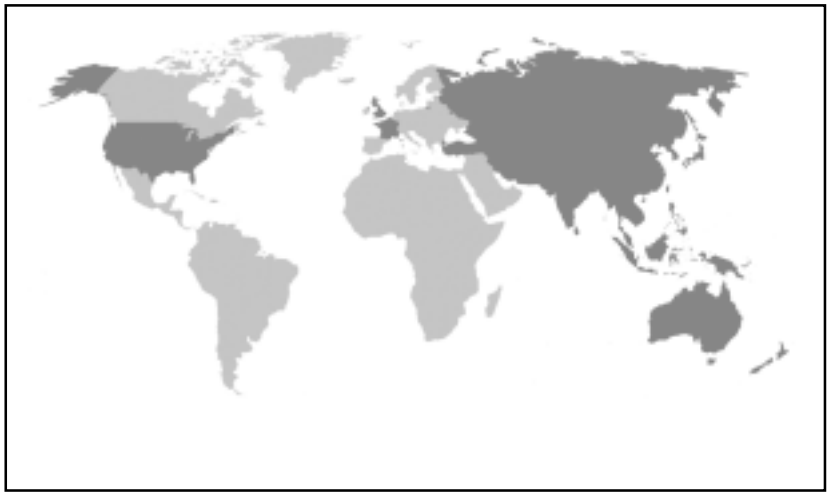
The **Asian and Pacific Centre for Transfer of Technology (APCTT)**, a subsidiary body of ESCAP, was established on 16 July 1977 with the objectives: to assist the members and associate members of ESCAP through strengthening their capabilities to develop and manage national innovation systems; develop,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

Oil Resistant Paper Coating has no ozone depleting ingredients.

(Credit: Aqua Based Technologies, the United States)

VATIS* Update
Ozone Layer Protection
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SCIENCE OF THE OZONE LAYER

Report shows ozone hole drives changes in the Antarctic

A new report entitled "Antarctic Climate Change and the Environment (ACCE)" from the Scientific Committee on Antarctic Research (SCAR), the United States, throws light on the current state of Antarctica's climate and its relationship to the rest of the globe. One finding from recent years that received prominence in the SCAR report is the effects of the ozone hole on the Antarctic climate. Unlike the coastal areas, West Antarctica in particular, the interior of Antarctica has cooled slightly, according to polar researchers cited in the SCAR report. That is because the ozone hole over the Southern Hemisphere has cooled the stratosphere.

However, the ocean around the continent and regions to the north are warming. The temperature differential has caused atmospheric circulation to intensify around Antarctica, effectively shielding much of the continent from the intrusion of warmer air to the north. But as the ozone hole heals, those westerly winds will ease, allowing warmer air to mix more easily into the Antarctic atmosphere. The SCAR report estimates a continent-wide temperature increase of 3°C by 2100. "This is what has happened in the Northern Hemisphere," said Prof. Paul Mayewski, Director of the Climate Change Institute at University of Maine, the United States. "The big questions for the Antarctic are when will it happen and how fast will it happen." He said that, based on climate records, sudden shifts in position and strength of the westerlies have created many of the abrupt climate changes of the past.

A study in the United States by Dr. Marco Tedesco from City College of New York and Dr. Andrew Monaghan at the National Centre for Atmospheric Research suggested that a 30-year record low in Antarctic snowmelt in the 2008-09 austral summer was due to intense westerlies and El Niño-Southern Oscillation. The authors suggest, in step with the SCAR report, that the healing of the ozone hole will eventually ease the westerlies, resulting in more warming in Antarctica. (Source: antarcticsun.usap.gov)

Improvement in upper level ozone hole

Monitoring of the world's upper level ozone hole created by chlorofluorocarbons (CFC) indicates that it is closing. Although this is viewed as good news by government officials around the world that banned production and use of CFCs in 1987, there appears a scientific dispute about the improvement of the upper level ozone layer.

The hole in the ozone layer created thicker than normal cloud cover in the Antarctic region, blunting the effect of temperature change. In a recent report in *Geophysical Letters,* some scientists said the reduced cloud cover will increase the effect of temperature change. Apparently, upper level ozone levels affect the earth's wind speed. Higher wind speed picks up more salt from the oceans leading to thicker cloud cover.

Scientists who wrote the paper say ozone level recovery will reduce wind speed and cloud cover, increasing the effect of temperature change. The United States government scientists say higher carbon levels in the atmosphere have the same effect on wind speed and cloud cover. So, far, the evidence on either side is incomplete. (Source: www.examiner.com)

UV radiation increase appears to have levelled off

Scientists at the National Aeronautics and Space Administration (NASA), the United States, say that the amount of ultraviolet (UV) radiation that reaches the Earth's surface has increased dramatically over the past 30 years. The reason for the increase is a continuing decrease in the protective stratospheric ozone layer, which absorbs much of the UV radiation. However, the good news is that the amount of the UV increase seems to have stabilized since the mid-1990s.

This finding backs up other research that shows UV levels are stabilizing after countries began signing the Montreal Protocol that limited the emissions of ozone-depleting gases such as chlorofluorocarbons (CFCs). "Overall, we are still not where we would like to be with ozone, but we are on the right track," said NASA scientist Mr. Jay Herman. "We do still see an increase in

UV on a 30-year timescale, but it is moderate, it could have been worse, and it appears to have levelled off." Most of the UV increase is in the mid and high latitudes, with little increase observed in tropical regions. (Source: content.usatoday.com)

Ozone hole healing could cause further climate warming

The hole in the ozone layer is now steadily closing, but its repair could actually increase warming in the southern hemisphere, say scientists at the University of Leeds, the United Kingdom. The Antarctic ozone hole was once regarded as one of the biggest environmental threats, but the discovery of a previously undiscovered feedback shows that it has instead helped to shield this region from carbon-induced warming over the past two decades.

High-speed winds in the area beneath the hole have led to the formation of brighter summer time clouds, which reflect more of the sun's rays. "These clouds have acted like a mirror to the sun's rays, reflecting the sun's heat away from the surface to the extent that warming from rising carbon emissions has effectively been cancelled out in this region during the summer time," said Prof. Ken Carslaw of the University of Leeds who co-authored the research. "If, as seems likely, these winds die down, rising carbon dioxide emissions could then cause the warming of the southern hemisphere to accelerate, which would have an impact on future climate predictions," he added.

The key to this new feedback is aerosol – tiny reflective particles suspended in the air. Greenhouse gases absorb infrared radiation from the Earth and release it back into the atmosphere as heat, causing the planet to warm up. Aerosol works against this by reflecting heat from the sun back into space, cooling the planet as it does so. But beneath the Antarctic ozone hole, high-speed winds whip up large amounts of sea spray, which contains millions of tiny salt particles. This spray forms droplets and then clouds. The increased spray over the last two decades has made these clouds more reflective. As the ozone layer recovers it is believed that this feedback mechanism could decline in effectiveness, or even be reversed, leading to accelerated warming in the southern hemisphere. (Source: www.sciencedaily.com)

ODS PHASE-OUT IN INDIA

Guidelines for CTC phase-out released

"India is ahead of schedule in the implementation of the provisions of the Montreal Protocol against substances that deplete the ozone layer," said Dr. A. Duraisamy, director of the Ozone Cell of the Ministry of Environment and Forests, while speaking at the recent launch of manuals for the national phasing out of carbon tetrachloride (CTC) in industries. CTC – used as cleaning agent in a wide range of industries, such as refrigeration, power, textile, leather and jewellery – contribute to the depletion of the ozone layer. Signatories to the Montreal Protocol have to start phasing out CTC from 1 January 2010.

The new manuals aim at proposing alternatives for industrial use apart from outlining safety standards. The manual was compiled by the Department of Environmental Health Engineering of Sri Ramachandra Univeristy in collaboration with the German Technical Cooperation programme, GTZ-Proklima. (Source: www.expressbuzz.com)

Programme on stain removal without CTC in textiles

The Vidarbha unit of the Textile Association (India) in association with GTZ, a German development assistance organization tasked by the German Ministry for Economic Co-operation and Development, held one-day Training of Trainers (ToT) Programme on "Stain Removing without Carbon Tetra Chloride (CTC) in Textiles" for textile faculty and textile professionals from industry of Nagpur region, Maharashtra. The 15 participants of the programme were from Raymond Limited's Textile Division at Chhindwara, Government Polytechnic of Nagpur, Nikalas Mahila Mahavidyalaya, Government Engineering College in Chandrapur, and R.S.R. Mohota Mills in Hinganghat.

Experts and state focal points on the national CTC phase-out team – Ms. Neelima D'silva-Dalvi, Prof. Saravanak Kumar and Ms. Meghna Udgire –

made presentations on the objectives and status of CTC phase-out, the common uses of CTC, environmentally benign and cost-effective CTC alternatives available and their characteristics, and the need for training all those associated with handling CTC on the alternatives available to CTC and their proper usage.

Sessions on stain removing techniques, good work practices, relevance of standards, technical assessment of stain removers, etc. were a part of the training programme. Practical session on use of stain removal materials and equipment with demonstration were useful for the participants to understand the concepts. (Source: www.indiantextilejournal.com)

World Bank aid for pollution-free environment

The World Bank provides aid for the growth of pollution-free environment. The following two World Bank-supported projects in India specifically pursue this objective.

1. The Montreal Protocol Phase-out Programme for the phase-out of Ozone Depleting Substances (ODS). The programme that commenced in 1994 with a financial envelope of about US$186 million disbursed over five sub-programmes, is scheduled for financial closure by December 2011. The details of sub-programmes, their year of commencement and allocation are given below:

- ODS-I, 1994, US$1.25 million;
- ODS-II, 1995, US$48.5 million;
- ODS-III-CFC Gradual Phase-out Project, 1999, US$2 million;
- Halon Closure Plan, 2001, US$2.3 million; and
- ODS-IV-CTC National, 2003, US$52 million.

2. Chiller Energy Efficiency Project: Approved in 2009 for US$7.3 million (US$6.3 million from Global Environment Facility and US$1 million under the Montreal Protocol). The project aims at accelerating the replacement of 370 chlorofluorocarbon-based inefficient chillers employed in commercial buildings and industrial establishments.

The above information was provided to the Lok Sabha by Mr. Jairam Ramesh, the Minister of State for Environment and Forests (independent charge). (Source: pib.nic.in)

IN THE NEWS

Climate Action Reserve releases standards for ODS destruction

The Climate Action Reserve, the premier United States-based offset registry for the North American carbon market, adopted two new offset project standards that could lead to reductions of millions of tonnes of greenhouse gas emissions. Targeting the destruction of ozone depleting substances (ODS), the United States ODS Project Protocol and the Article 5 ODS Project Protocol provide financial incentive for the destruction of ODS in the United States and developing countries.

“The Montreal Protocol is a significant development because it is the first protocol to provide co-benefits that protect both the ozone layer and the climate system. And because of the potency of ODS as greenhouse gases, projects developed under these protocols will provide substantial environmental benefits while generating offset credits to the carbon market,” stated Ms. Linda Adams, Chair of the Climate Action Reserve Board of Directors and Secretary of the California Environmental Protection Agency, the United States.

Both the United States ODS Project Protocol and the Article 5 ODS Project Protocol address the destruction of ODS as the means of preventing emissions. The former includes refrigerants and foam blowing agents sourced from the United States, while the latter includes refrigerants from Article 5 countries (developing countries as defined under the United Nation’s Montreal Protocol).

Whether ODS originates from the United States or an Article 5 country, the substances are required to be destroyed in the United States or its territories, where destruction practices are closely regulated. If destruction of a substance is already required under the Montreal Protocol or United States law or it has not been phased out of production in the country of origin, it is not eligible for inclusion under the ODS protocols. Projects that qualify under the ODS protocols will be issued offset credits, Climate Reserve Tonnes (CRTs), for the quantity of ODS that would otherwise have been released over a 10-year period had they not been destroyed.

The Climate Action Reserve is a private non-profit organization representing international interests in addressing climate change and bringing together participants from the government, environment and business sectors. *Contact: Ms. Jennifer Weiss, Climate Action Reserve, 523 W. Sixth Street, Suite 428, Los Angeles, CA 90014, United States of America. Tel: +1 (213) 891 6934; E-mail: jennifer @climateactionreserve.org; Website: www.climate actionreserve.org.* (Source: www.businesswire.com)

Major research project on depletion of the ozone layer

An international scientific consortium co-ordinated by the Jülich Research Centre, Germany, is undertaking a major atmospheric research project to assess the effects of climate change on the ozone layer. Cryogenic gases – liquid helium and nitrogen – and other specialty gases – including helium, carbon monoxide and medical-grade oxygen – required for the project will be supplied by AGA the Swedish subsidiary of Linde Gases, Germany.

The project, named RECONCILE, will be carried out as a series of ten flight missions between January and March 2010 from the Arena Arctica base, near Kiruna in northern Sweden. The flights will be undertaken in a Russian supplied M55 ex-reconnaissance plane, Geophysica, which is capable of reaching altitudes exceeding 20 km. The research project will provide insight into how these ozone-climate feedback loops work together and make long-term predictions about ozone and climate change possible. Sophisticated scientific instruments – including a helium-cooled telescope and spectrometry system jointly operated by Jülich Research Centre and University of Wuppertal, Germany – will be carried by Geophysica to probe chemical composition and particle properties by measuring infrared emissions.

RECONCILE and the subsequent analysis of its research data is being carried out by a consortium of 17 partners from nine countries, including the Jülich and Karlsruhe Research Centres and the German Aerospace Centre in Germany, the University of Cambridge in the United Kingdom, the National Aeronautics and Space Administration (NASA) in the United States, and the Norwegian Institute for Air Research. (Source: www.pollution solutions-online.com)

China approves draft ODS laws

China's State Council, or cabinet, stated that it has given in-principle approval for new regulations on ozone depleting substances (ODS). The new regulations will establish systems including quotas to limit the use of ODS, the statement said. It will also establish penalties for the illegal use, import and export of ozone-depleting substances. (Source: www.nasdaq.com)

Pakistan allows CFC-based inhalers for two more years

Pakistan's pharmaceutical companies manufacturing medicines for treatment of asthma and lung-related diseases have been allowed to use chlorofluorocarbons (CFCs) in the preparation of metered-dose inhalers (MDIs) and to market the inhalers for two more years. As a signatory to the Montreal Protocol, Pakistan had to phase out the use of CFCs by 31 December 2009. After some allowances given by the Ozone Secretariat for Essential Use Nominations, it has now, allowed the MDI manufacturers to continue the import of CFC propellants in a quantity they need to maintain their existing rate of production – that is about four million MDI units per year.

Joint Secretary (International Cooperation) of the Ministry of Environment Mr. Abid Ali said that in consideration of the thousands of asthma and bronchitis patients who cannot afford the cost of imported hydrofluoroalkane-based MDIs and the inability of the pharma firms to switch to the non-CFC-based inhalers by the target period, the Ministry had sought exemption from the international forum concerned for CFC-based MDIs for a couple of years. He said companies were being allowed to import the CFC collectively up to 35 tonnes for 2010, and any additional increase or decrease in the import would be allowed to the companies involved in the preparation of CFC-based inhalers only after reviewing their roles in setting up a CFC-free alternative and the phasing out of CFC-based MDIs.

Mr. Ali said that the Pakistan government, which had already achieved the target of eliminating the commercial use of CFC, including in the refrigeration industry, was committed to a transition to non-CFC MDIs. (Source: www.dawn.com)

Bhutan accelerates ODS phase-out efforts

In an urgency to meet the deadline of phasing out ozone depleting substances (ODS), the National Environment Commission (NEC) of Bhutan is vigorously training stakeholders to take actions. A group of customs officers attended a recent training of trainer's workshop organized by NEC in Thimphu to help implement the ODS curbing strategy.

The issue of ozone depletion was highlighted during the training session where participants were briefed on the Montreal Protocol. The main objective is to discourage the use of ODS such as chlorofluorocarbons (CFCs) and other ODS used in refrigerators, freezers, air-conditioning systems, firefighting equipment and other cooling appliances and encourage the shift to alternatives and technologies that are ozone-friendly, said Mr. Sonam Yangley, the Director General of NEC. Bhutan has been able to comply with the obligations of the phase-out schedule, i.e. meeting 50 per cent reduction of ODS by 2005, 85 per cent by 2008 and complete phase-out by 2010.

Challenges and issues like technical capacity, best practices equipment, workforce, ODS detector equipment and lack of laboratory facilities were pointed out during the training. However, NEC is set on meeting the challenge. "Trainers will carry out the training for the National Customs Workshop and detail procedural steps for import/export of ODS consignments," said Mr. Paldon Tshering, National Ozone Officer of NEC. Hydrochlorofluorocarbons (HCFCs) are also ODS, but Bhutan needs to phase them out only by 2030. HCFC-related appliances are reportedly restricted for use in Bhutan. (Source: www.bhutantoday.bt)

China imposes additional requirements on ODS trade

China's Ministry of Environmental Protection has released two directories of substances requiring additional certifications and permitting for import and export. The directories address 154 chemicals and 16 ozone depleting substances. The 'Chemicals Directory for which Import and Export are Strictly Controlled' updates a previous list to include nine more chemicals than the previous edition of 2008. The additional chemicals are tributyltin oxide, tributyltin fluoride, tributyltin chloride, chlorotributylstannane, tri-n-butyltinmethacrylate, tributyltin benzoate, tributyltin linoleate and tributyltin naphthenate.

The Directory, released on 6 January 2010, requires companies seeking to import or export a listed substance to apply for the approval from the National Administration on Import/Export of Ozone Depleting Substances, apply for an import/export permit from licensing organizations authorized by the Ministry of Commerce, and then present the permit to clear customs. (Source: www.environmentallawresource.com)

Philippines steps up effort to end ozone depleting substances

In efforts to address global warming and climate change that are already being felt worldwide, the Philippine government, through the Department of Environment and Natural Resources (DENR), is banning the importation of chlorofluorcarbon (CFC) products, equipment and appliances starting 1 January 2010. DENR Secretary, Mr. Lito Atienza explained that the ban on CFCs is in consonance with the Montreal Protocol as well as the National CFC Phase-out Plan.

According to DENR, 69 per cent of CFC users are those who have motor vehicles. DENR's CAR Regional Executive Director Mr. Regidor De Leon therefore encourages all motor vehicles to convert the air-conditioning unit of their cars or motor vehicles to environmentally harmless chemicals, such as hydroflourocarbons or aircon Freon. The Department of Transportation and Communication, Bureau of Customs, and the Department of Trade and Industry are among the government agency partners of DENR in implementing this programme.

The Cordillera Association of Aircon and Refrigeration Shops (CAARS), composed of 16 aircon and refrigeration sale and service shops, stated their support to the DENR's CFC phasing-out programme.

The implementation of the government's energy efficiency project in Davao City and the rest of the franchise area of Davao Light, is now on its third week. The Aboitiz-owned electric distribution

utility, the main partner of the Department of Energy (DOE) in undertaking the project in Davao and Panabo Cities, and in the Municipalities of Carmen, Dujali and Sto. Tomas, stated that the project requests residential consumers to change their incandescent bulbs with the energy-efficient and environment-friendly compact fluorescent lamps. (Source: www.zimbio.com)

Maldives plans to be the first carbon-neutral nation

On 4 February 2010, the Maldives pledged to phase out hydrochlorofluorocarbons (HCFCs) – a group of chemicals which are ozone-depleting and powerful greenhouse gases – by 2020, two decades ahead of the Montreal Protocol phase-out schedule. This decision is in line with the country's pledge to go carbon neutral by 2020 as its contribution to tackling climate change.

The Maldives is in the front line of the global environmental issues. It is perhaps the most vulnerable country in the world as a number of scientists have warned that if nothing was done to reduce global carbon emissions, the country would soon sink beneath the rising seas. "You cannot cut a deal with Mother Nature. And we don't intend to try. This is why, in March (2009), the Maldives announced plans to become the first carbon neutral country in the world," stated President of the Maldives, Mr. Mohamed Nasheed.

The Maldives' decision to stop the consumption of this group of chemicals earlier than the phase-out deadline is considered the first major concrete step to make the carbon neutral declaration a reality. "Small Island States can also be at the frontline in the battle to save the planet," said Minister of Housing, Transport and Environment of the Maldives, Mr. Mohamed Aslam. When the plan succeeds, the Maldives would be the world's first most eco-friendly and ozone-friendly country. (Source: www.unep.fr)

Afghanistan joins the United Nations to fight illegal ODS trade

Senior Afghanistan officials and the United Nations Environment Programme (UNEP) have signed a memorandum of understanding (MoU) in Bangkok, Thailand, to work together to fight the illegal trade in banned chemicals, particularly ozone depleting substances (ODS) and those that contribute to climate change.

Deputy Minister for Customs and Revenue in the Ministry of Finance, Mr. Sa'id Mubin Shah, says the United Nations will help train Afghan customs officials to identify the dangerous chemicals. The MoU sets up a framework for helping Afghan customs officers implement the Montreal Protocol.

UNEP Regional Director Mr. Young Woo Park said the agreement will help reduce illegal trade in the banned chemicals in South Asia. The trade is difficult to curb, as the chemicals are cheap and there is easy access to supplies outside Afghanistan. But the Afghan government has pledge to halt the trade within its borders despite the ongoing war, Mr. Park added.

UNEP estimates that local and international crime syndicates earn up to US$30 billion annually from the illegal trade in environmentally sensitive commodities such as ozone-depleting substances, toxic chemicals, hazardous waste and endangered species. (Source: www1.voanews.com)

Vanuatu to ban import of ozone-depleting substances

Mr. Albert William, who recently took up office as Director of the Vanuatu government's Environment Unit, vowed to introduce tougher environment protection regulations. As a signatory to the Montreal Protocol, Vanuatu is already working together with the officials of the United Nations Environment Programme (UNEP) to return to compliance on the protection of the stratospheric ozone layer.

The return to compliance will be beneficial not only for Vanuatu but also to the global environment. Vanuatu ratified the Montreal Protocol in 1994, which meant that from 1995 it will not import items containing chlorofluorocarbons (CFCs). Mr. William said that from 1995 up to 2007 the country reported, as part of its obligation under the international treaty, that it has a phase-line of zero for CFCs. "In 2007 or 2008 when we were providing the report for 2006 and 2007 we saw that it was not true that we have a phase-line of zero," Mr. William added. This prompted UNEP to put Vanuatu on the non-compliance list, which it is now working to rectify. (Source: pidp.eastwestcenter.org)

REFRIGERATION/ AIR-CONDITIONING

Environment-friendly refrigerant composition

Researchers from Daikin Industries Ltd., Japan, have patented a new refrigerant composition that is non-inflammable, and ensures low life cycle climate performance (LCCP) and less burden on the environment. The new refrigerant composition contains difluoromethane (HFC-32), pentafluoroethane (HFC-125) and 2,3,3,3-tetrafluoropropene (HFO-1234yf) in specific ratios.

When a refrigerant having a high boiling point is used at a low operating pressure, the vapour compression refrigeration cycle has an insufficient capacity. Therefore, it is necessary to increase the size of the device to ensure the desired cooling or heating capacity, which normally results in a deteriorated indirect impact owing to pressure loss. Moreover, if the refrigerant is inflammable, a highly safe material must be used in the electrical system, and an upper limit is set on the amount of the refrigerant to be charged into the apparatus.

The inventors conducted extensive research in view of the above-mentioned problems, and found that these problems can be solved by using, in an apparatus that circulates a refrigerant via a compressor to form a refrigeration cycle, a refrigerant composition comprising HFC-32, HFC-125 and HFO-1234yf, with the ratio of the components being in a range surrounded by points 0:21:79 mass%, 16.6:25.3:58.1 mass% and 0:28.4:71.6 mass%, respectively. *Contact: Daikin Industries Limited, Umeda Centre Building, No. 4-12, Nakazaki-Nishi 2-Chome, Kita-ku, Osaka-shi, Osaka 5308323, Japan.* (Source: www.wipo.int)

Carbon dioxide refrigerant vapour compression system

Researchers at Carrier Corporation, the United States, have patented a carbon dioxide refrigerant vapour compression system and its method of operation. The refrigerant vapour compression system includes:

- A compression device;
- A flash tank receiver disposed in the refrigerant circuit intermediate to a refrigerant heat rejection heat exchanger and a refrigerant heat absorption heat exchanger;
- A compressor unload circuit, including a refrigerant line establishing refrigerant flow between an intermediate pressure stage of the compression device and the refrigerant circuit at a location downstream of the refrigerant heat absorption heat exchanger and upstream of a suction inlet to the compression device; and
- An unload circuit flow control device disposed in the unload circuit refrigerant line.

In an aspect of the invention, the carbon dioxide refrigerant vapour compression system includes:

- A refrigerant circuit having a refrigerant compression device;
- A refrigerant heat rejection heat exchanger for passing refrigerant received from the compression device at a high pressure in heat exchange relationship with a cooling medium;
- A refrigerant heating heat exchanger for passing refrigerant at a low pressure refrigerant in heat exchange relationship with a heating medium; and
- An expansion device disposed in the refrigerant circuit downstream of the refrigerant cooling heat exchanger and upstream of the refrigerant heating heat exchanger.

The invention also provides a method for controlling operation of carbon dioxide refrigerant vapour compression system. In response to one or more system operating parameters sensed by one or more sensors, a controller selectively positions the unload flow control device to maintain the refrigerant vapour compression system operating below a pre-selected high pressure limit. The sensed operating parameter may, for example, be the refrigerant discharge pressure or the refrigerant discharge temperature. *Contact: Carrier Corporation, One Carrier Place, Farmington, CT 06034, United States of America.* (Source: www.wipo.int)

Geothermal heat pumps

Ecocity Group, Canada, manufactures geothermal heat pumps for commercial and residential projects. The water-to-air geothermal heat pumps

employ non-ozone depleting R-410A refrigerant, and consist of a dual stage Copeland scroll compressor, an electronically commutated motor with a direct drive, and a de-superheater. The de-superheater is used for producing hot water for domestic use. These Boreal heat pumps are with a side or top discharge configuration and designed to withstand severe climatic conditions. They are also available in water-to-water and combo water-to-water/water-to-air series.

Boreal water-to-water series heat pumps can be used on a closed ground loop or on an open well system. These pumps are used in applications where hot water is required in large quantities, such swimming pool heating and concrete in-floor heating systems. This series of heat pumps consists of dual compressors to provide three stages of capacity to work with higher efficiency. Boreal water-to-water series heat pumps are available in the following capacities: 3 t with 36,000 BTU, 4 t with 48,000 BTU, 5 t with 60,000 BTU, and 6 t with 72,000 BTU. *Contact: L&L Ecocity, #3745 St-Jacques West, Suite 226, Montreal, Quebec, Canada H4C 1H3. Tel: +1 (514) 798 2444; Fax: +1 (514) 798 4905; E-mail: info@ecocity-group.com.* (Source: www.azocleantech.com)

Forced-air geothermal heating systems

GeoFurnace Manufacturing, the United States, has developed different models of geothermal heat pumps for harsh colder climates. The MTex Series forced-air heating system available from the company is a single-stage water-to-water heat pump designed for commercial or residential buildings. It is available in horizontal or vertical configuration and in 1-6 t sizes.

The MTex Series forced air heating system uses R-410A refrigerant, which is non-ozone depleting. It incorporates scroll compressors that have a few moving parts, and are hermetically sealed to provide silent operation. They can be mounted on vibration isolators. This water-to-water heat pump is equipped with variable speed electronically commutated motor with belt-driven or direct-driven blowers. These fan motors are isolated by rubber grommets from the housing. The cabinet frame of this heat pump is made of heavy-gauge stainless steel and access panels that are constructed with galvanized stainless steel. There are removable access panels for accessing the compartment from all sides.

The heat pump has LED diagnostics for timely servicing. The horizontal unit is incorporated with a condensate trap. The heat pump also has brass swivel earth loop connections and a return air filter rack. Cupronickel coaxial or stainless steel flat plate heat exchangers are available as option. This water-to-water heat pump also includes 5 kW, 10 kW and 15 kW resistance strip heaters as option. *Contact: GeoFurnace Manufacturing Inc., 605 4th St. SE, De Smet, SD 57231, United States of America. Tel: +1 (605) 854 9205; Fax: +1 (605) 854 9285; E-mail: info@geofurnacemfg.com; Website: www.geofurnacemfg.com.* (Source: www.azocleantech.com)

Air-cooled chillers with variable frequency drive option

Daikin McQuay in the United States has introduced the Pathfinder™ air-cooled chiller with a variable frequency drive (VFD) option on high and premium efficiency models. The new VFD option is claimed to make the Pathfinder the industry-leading model for part load efficiency and the quietest performance (as low as 65 dBA).

Chiller capacities range from 175 to 530 tonnes, with three operating efficiencies – Standard, High and Premium. Operating with R-134a refrigerant, which has no ozone depletion potential and no phase-out schedule, the Pathfinder chiller allows building owners to specify a heating, ventilation and air-conditioning system that exactly meets their requirements. The Standard efficiency model meets ASHRAE 90.1 energy requirements, while the High and Premium models have best-in-class efficiency, according to McQuay. The optional VFD provides impressive cost savings at part load on the High and Premium efficiency models. Ideal for retrofit projects, the chiller's small unit footprint can accommodate existing structures such as installation pad, walls and fences. It allows easy access to the most commonly serviced components with key components located on the unit's periphery. *Contact: McQuay International, P.O. Drawer 1551, Minneapolis, MN 55440, United States of America. Tel: +1 (763) 553 5330; Fax: +1 (763) 553 5177.* (Source: news.thomasnet.com)

SOLVENTS

Azeotrope-like solvent and mixed solvent compositions

Asahi Glass Company Limited, Japan, has been assigned a United States patent on a solvent composition capable of removing soils such as dusts and oils attached to the surface of an article made of an acrylic resin or an article coated with an acrylic resin, without damaging it. The azeotrope-like solvent composition comprises from 38 to 41 mass% (2,2,2-trifluoroethoxy)-1,1,2,2-tetrafluoroethane and from 59 to 62 mass% perfluorohexane. The mixed solvent composition consists from 30 to 62 mass% of (2,2,2-trifluoroethoxy)-1,1,2,2-tetrafluoroethane and from 40 to 70 62 mass% of perfluorohexane.

The boiling point of this azeotrope-like solvent composition at a pressure of 1.011×10^5 Pa is from 47° to 48°C. The azeotrope-like solvent composition is defined as a mixed solvent composition with a relative volatility within a range of 1.00±0.04. The perfluorohexane could contain perfluoroisohexane and/or n-perfluorohexane as the main component. The total content of perfluoroisohexane and n-perfluorohexane in perfluorohexane is preferably at least 90 mass%.

These solvent compositions are used for cleaning articles made of an acrylic resin or articles coated with an acrylic resin without cracking or haze. Further, the solvent compositions can readily remove contaminants such as oil, dust, particles and resin shaving, droplets of a solvent having a high surface tension and a small specific gravity, water droplets, etc. attached to the surface of articles. (Source: www.freepatentsonline.com)

Oil-resistant paper coating without ozone depletion potential

The high oil- and grease-resistant (OGR) Aqualene® 5001, from Aqua Based Technologies, the United States, contains zero volatile organic compounds (VOCs) and is designed for paper converting and packaging industry. The water-based coating is repulpable, biodegradable and environmentally safe. Product can be used for coating microwave popcorn bags, food wrappers, paper cups, ice cream boxes, or any food packaging product which requires high OGR properties.

Aqualene 5001 was specifically developed as a safe alternative to harmful fluorocarbon coatings, which were used extensively for OGR before environmental hazards, such as ozone depletion, and health concerns were identified. In laboratory tests, Aqualene 5001 has passed demanding tests for OGR (pass 10 kit) while containing zero ozone depleting ingredients.

Aqualene 5001 is formulated from ingredients cleared by the Food and Drug Administration for direct food contact. *Contact: Aqua Based Technologies, 224 Pegasus Avenue, Northvale, NJ 07647, United States of America. Tel: +1 (201) 767 6040; Fax: +1 (201) 784 0620; E-mail: tech @aquabased.com; Website: www.aquabased.com.*
(Source: news.thomasnet.com)

Surface modifier coating for electronic components

3M, the diversified technology company based in the United States, has launched Novec EGC-2702, a surface modifier coating that provides rapid and economic protection against moisture and corrosion in electronics manufacture and assembly. A cost-effective, high-performance alternative to traditional conformal coatings, Novec EGC-2702 can be applied and dried within seven minutes, which is less than a third of the time of leading existing competitive products. The non-inflammable coating is designed to help electronics companies adhere to environmental, health as well as safety requirements.

Novec EGC-2702 is aimed at electronics environments involving coating of sensitive components, such as circuit boards. It removes the need to mask surface areas – such as connection points – during the coating process, saving labour and associated costs. It cures in just 40 minutes, at room temperature or with the aid of additional heat, which compares favourably with alternatives such as acrylic, silicone and urethane-based coatings, which can take from 3 hours to one week to cure.

Once applied, Novec EGC-2702 forms a transparent layer of just one micron, yet is waterproof and repellent against aqueous solutions, oils and

synthetic fluids, up to temperatures of 200°C. In addition, future repairs can be carried out to the electronics component without the need to remove the coating. Novec EGC-2702 is non-inflammable, which eliminates the need for electrical equipment used in the drying process to be classified as flameproof. It is a fluoropolymer dissolved in Novec 7200 hydrofluoroether (HFE), with zero ozone-depleting potential and high occupational exposure limit of 200 parts per million (ppm). (Source: www.mynewsdesk.com)

Aqueous fibre optic cleaner

In the United States, Illinois Tool Works Inc. and Mr. Paul M. Blair have jointly filed for patent on a solvent cleaner for fibre optic connector end faces. The end faces are cleaned effectively just by exposing them to the predominantly aqueous solution and wiping them dry. Besides water, the cleaning solution contains water-soluble organic solvents, propylene glycol ethers and isopropanol. The component ratio, approximately by weight, is 4 per cent propylene glycol n-butyl ether, 2 per cent propylene glycol methyl ether, 1.2 per cent tripropylene glycol methyl ether, 1.5 per cent isopropanol and 91.3 per cent deionized water. *Contact: Illinois Tool Works Inc., 3600 West Lake Avenue, Glenview, IL 60026, United States of America.* (Source: www.wipo.int)

Cleaning and rinsing method

Asahi Glass Company Ltd., Japan, has secured a United States patent on a method for cleaning and rinsing an article, with excellent cleaning and rinsing performance. The cleaning method comprises contacting the article to be cleaned with a hydrocarbon solvent, followed by contacting it with fluorinated ether (hydrofluoroether, HFE). HFE is a compound represented by the formula: R^1–O–R^2, wherein R^1 and R^2 are both fluorinated alkyl group, wherein the number of fluorine atoms in each of R^1 and R^2 is at least one, and the total number of carbon atoms in R^1 and R^2 is from 4 to 8. The invention uses a method for cleaning and rinsing an article using HFE, which was so far difficult because of HFE's insufficient solubility in a hydrocarbon solvent, such as the one containing an aromatic hydrocarbon or glycol ether that the invention uses. (Source: www.freepatentsonline.com)

FOAMS

A blowing agent for thermosetting foams

Arkema Ina., the United States, has filed for patent on a blowing agent for thermosetting foams. The main portion of the blowing agent is a hydrofluoroolefin (HFO), preferably HFO-1234ze, together with a hydrochlorofluoroolefin (HCFO), preferably one selected from HCFO-1233zd, HCFO-1223, HCFO-1233xf and mixtures thereof. The blowing agent composition can further contain an additional HFO, a hydrofluorocarbon, a hydrocarbon, an alcohol, an aldehyde, a ketone ether/diether, an ester, carbon dioxide and/or mixtures thereof.

HFO materials have low or zero ozone-depletion and low global warming potential. The blowing agent shows superior quality including decreased density and improved k-factor. The foaming agent dissolves in thermosetting polymers, and provides a degree of plasticization sufficient to produce acceptable foams. The preferably selected combination of HFO (HFO-1234ze) and HCFO (HCFO-1233zd, HCFO-1223 and HCFO-1233xf) exhibits good solubility in polyol mixture used in producing polyurethane and polyisocyanurate foams. The invention also relates to foam, particularly closed cell foam, prepared from a polymer foam formulation using a blowing agent with the composition of the invention. (Source: www.freepatentsonline.com)

Polymer foam with improved fire retardance

Atofina Chem Inc., the United States, has filed for a European patent on a method for producing polymer foams with improved fire retardance properties. The method comprises using HFC-365mfc as the blowing agent, as well as polyurethane (PUR) foam compositions comprising a polyol, an isocyanate and HFC-365mfc.

This invention relates to polymer foams having improved fire performance, that is, to polymer foams that, upon ignition, exhibit reduced smoke development and reduced mass loss rate (an indication of the rate of heat release). It relates especially to methods for producing hydrofluoro-

carbon (HFC) blown, closed cell polymer (insulation) foams – such as polystyrene, phenolic and PUR foams – having improved fire performance properties in contrast to foams blown with known HFC blowing agents such as 1,1,1,3,3-pentafluoropropane (HFC-245fa), the improvement resulting from the use of a foam blowing agent comprising 1,1,1,3,3-pentafluorobutane (HFC-365mfc).

The patent-pending method comprises using as the blowing agent from about 0.5 to about 25 wt%, preferably 1.5 to 18 wt%, of HFC-365mfc, as well as PUR foam compositions comprising a polyol, an isocyanate and from about 0.5 to about 25 weight per cent, preferably 1.5 to 18 per cent, based on the weight of the composition, of HFC-365mfc.

It has been found that polymer foams made with 0.5-25 wt% of HFC-365mfc exhibit improved fire performance relative to foams made with HFC-245fa. The preferred PUR foams can be made by conventional techniques. Auxiliary blowing agents may also be present. The other components of the premix and foam formulations may be those that are conventionally used – for example, fire retardant, surfactant, polyisocyanate and polyol. (Source: www.freepatentsonline.com)

XPS foam dispensing system

OMS Group, Italy, has always maintained a close eye on innovative technology, continuously updating its production processes to meet the ever increasing demand for prime quality standards, reliability and output, yet not forgetting environmental issues. The group has been a pioneer in the implementation of new technological applications for manufacturing environment-friendly plants for expanded polyurethane (XPS) production, paying close attention to safety issues. OMS plants use cyclopentane as an alternative blowing agent, and cover the full refrigerator production process: from storage tanks to premixing systems, foaming machines, cabinet fixtures and rotary drums; from safety systems with continuous air recirculation to electrical control and alarm panels.

The company can also custom-design plants, using standard parts certified by international quality and safety bodies, which fully meet the specific requirements and needs of end-users. *Contact: Impianti OMS S.p.A., Via Sabbionetta, 4, 20050 Verano Brianza, Italy. Tel. +39 (362) 9831; Fax +39 (362) 983217; E-mail: impianti.oms@oms group.it.* (Source: www.directindustry.com)

High-pressure pentane metering

The high-pressure pentane metering system, from KraussMaffei Technologies GmbH in Germany, is a totally enclosed unit for introducing pentane into polyurethane (PUR) components. The system allows the required amount of pentane to be fed to the PUR component stream and homogeneously mixes using static mixers. The pentane-charged PUR component can be fed at a pressure of up to 220 bar. In this way, the mixture can be fed directly into a high-pressure line, such as that used for double-belt technology. High-pressure pumps are employed for metering pentane. High metering accuracy is achieved even at very low feed rates. The pentane concentration in the polyol is monitored by means of a pentane flow meter. A gas warning sensor can be installed optionally. Customer benefits include: fully automatic operation that reduces labour costs, and a constant, high product quality. *Contact: KraussMaffei Technologies GmbH, Krauss-Maffei-Strasse 2, 80997 München, Germany. Tel: +49 (89) 88 99 0; Fax: +49 (89) 88 99 22 06.* (Source: www.krauss-maffei.de)

Pour-in-place replacement for HCFC-22 in rigid PUR foams

The use of HCFC-22, which had been widely accepted as an alternative to CFC-11 and HCFC-141b in polyurethane foam blowing, has been phased out across North America on 1 January 2010, raising the issue of a suitable alternative. The main alternative to HCFC-22 for pressure/froth applications is HFC-134a since it is non-inflammable and provides acceptable foam properties. However, HFC-134a is difficult to handle due to its low solubility in polyols and this can negatively influence foam quality. Besides this, with HFC-134a, higher loadings can produce a thick “froth” when the foam is dispensed from machines. HFC-245fa is expensive to use not only because of its high raw material cost but also because of its lower blowing effectiveness. Hydrocarbons perform well overall but require significant modifications to existing production equipment and facilities in terms of safety. These

modifications are expensive and may not always be feasible due to existing plant layouts.

In the United States, Mr. Ian A. Wheeler, Arkema Inc., and Mr. Michael J. Cartmell, a Foam Applications Consultant, have proposed the use of a blend of HFC-134a and Transcend® (trans-1,2-dichloroethylene or TDCE) additive technology as a replacement for HCFC-22 in a generic pour-in-place formulation. Parameters examined include the ease of adding the gaseous blowing agent to the polyol blend, flow, thermal conductivity, dimensional stability and adhesion of the foam to thin steel. It is shown that the use of a combination of TDCE and HFC-134a can produce foams having at least equivalent and in some cases superior overall performance compared to HCFC-22 and HFC-134a, and offers foam manufacturers a new, viable option. *Contact: Mr. Ian A. Wheeler, Arkema Inc., 900 First Avenue, King of Prussia, PA 19406, United States of America.* (Source: www.arkema-inc.com)

Energy-saving insulation and air sealing products

Dow Chemical, based in the United States, has concluded its two-year project in North America to transform its line of energy-saving insulation and air sealing products to a more sustainable manufacturing technology. The Blue™ Styrofoam™ insulation helps conserve energy as well as reduce carbon dioxide emissions from buildings and homes. Currently, the emissions from buildings and homes account for more than 40 per cent of all greenhouse gas emissions.

Dow claims to be the first insulation manufacturer in North America to develop a next-generation foaming agent solution that meets all mandatory requirements. It has converted all production facilities in North America to the new foaming agent technology, which is zero ozone-depleting and contains no volatile organic compounds (VOCs). Styrofoam™ extruded polystyrene foam insulation is a part of the Dow Building Solutions business unit under the Performance Plastic segment. The business unit offers building science expertise to help builders, designers, architects and homeowners reduce energy costs, while contributing to the reduction of greenhouse gas emissions. (Source: www.plastemart.com)

AEROSOLS

A new bronchodilator combination in HFA-MDI

Pearl Therapeutics Inc., the United States, has announced positive results from a Phase 1 safety and pharmacokinetics study of PT003, its lead combination therapeutic for the treatment of chronic obstructive pulmonary disease (COPD). Based on these results, and previously announced positive results from Phase 2a studies of PT003's individual components, the company has advanced PT003 into a Phase 2b trial.

PT003 is an inhaled combination bronchodilator product comprised of glycopyrrolate, a long-acting muscarinic antagonist, and formoterol, a well-known, established, long-acting beta2 agonist, delivered via a hydrofluoroalkane metered dose inhaler (HFA-MDI). PT003 is the first and only such dual, long-acting rapid bronchodilator combination product in development in an HFA-MDI formulation, the most widely used inhalation drug delivery format. *Contact: Pearl Therapeutics Inc., 200 Saginaw Drive, Redwood City, CA 94063, United States of America. Tel: +1 (650) 305 2600; +1 (650) 568 1804; E-mail: info@pearltherapeutics.com; Website: www.pearltherapeutics.com.* (Source: www.pharmaceuticalonline.com)

Room temperature-stable formulation for HFA pMDI

Researchers at Ranbaxy Laboratories Limited, India, have developed a room temperature-stable formulation of formoterol fumarate and beclomethasone dipropionate with extra fine part size of hydrofluoroalkane (HFA) pressurized metered dose inhalers (pMDI). The particle size distribution of HFA-pMDIs was evaluated using Twin Stage Glass Impinger and Anderson Cascade Impactor. Tetrafluoroethane and/or heptafluoropropane were evaluated for preparation of the HFA-pMDIs. The fine particle fractions delivered from HFA propellant suspension of the pMDIs can be predicted on the basis of formulation parameters and is dependent of metering chamber of valve and orifice size of actuators, the researchers conclude. The results of the study showed the importance of formulation

excipients with formulation of pMDIs – namely, canister, valve and actuators used in formulations. *Contact: Mr. D. Purohit, Research & Development Centre, Ranbaxy Laboratories Ltd., Plot No. 20, Sector 18, Udyog Vihar Industrial Area, Gurgaon 122 015, India.* (Source: www.ijpsonline.com)

Pharmaceutical aerosol composition containing HFAs

Chiesi Farmaceutici S.p.A., Italy, has applied for a United States patent on a composition for use in an aerosol metered dose inhaler (MDI). The composition consists of an active material, a propellant containing two hydrofluoroalkanes (HFA), a co-solvent and optionally a low volatility compound. The use of a mixture of HFA 134a and HFA 227 as the propellant allows the modulation of the mass median aerodynamic diameter (MMAD) of the aerosol particles on actuation of the inhaler to target specific regions of the respiratory tract. Moreover, the fine particle dose (FPD) of the active ingredient in the composition increases by reducing the metering chamber volume.

HFAs, also known as hydrofluorocarbons (HFCs), do not contain chlorine and are considered less destructive to ozone and these are proposed as substitutes for CFCs. HFAs, in particular 1,1,1,2-tetrafluoroethane (HFA 134a) and 1,1,1,2,3,3,3-heptafluoropropane (HFA 227), have been acknowledged to be the best candidates for non-CFC propellants. Many applications, in which HFAs are used as propellant, propose the addition of one or more adjuvants, including compounds acting as co-solvents (alcohols such as ethanol and polyols such as propylene glycol), surface active agents including fluorinated and non-fluorinated surfactants, dispersing agents and stabilizers. (Source: www.freepatentsonline.com)

Transition to CFC-free inhalers

This awareness package aims to assist National Ozone Units and other major national stakeholders in developing countries to develop appropriate materials to ensure the seamless transition to CFC-free inhalers in each country. For more information, contact:

UNEP Regional Office for Asia and the Pacific
UN Building, Rajdamnern Avenue
Bangkok 10200, Thailand
Tel: +66 (2) 288 1662; Fax: +66 (2) 288 3041
E-mail: uneproap@un.org; Website: www.roap.unep.org

FUMIGANTS

Azeotropic fumigant compositions of methyl iodide

Honeywell International Inc., based in the United States, has secured a United States patent on 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). At temperatures of about 30°C or below, the compositions are present as a gas. The inventive compositions serve as a non-ozone-depleting gaseous fumigant, which is useful in a variety of applications in place of methyl bromide (MBr). These compositions serve as a drop-in replacement for gaseous MBr, providing the benefits of a methyl iodide fumigant while also utilizing existing MBr equipment. (Source: www.freepatentsonline.com)

Methyl bromide alternatives for disinfestation of walnuts

In-shell California walnuts may be infested with field pests (navel orange worm and codling moth) or with storage pests (Indian meal moth or red flour beetle). For disinfesting these, processors have historically relied on fumigants, particularly ozone-depleting methyl bromide (MBr). Phase-out requirements under the Montreal Protocol and the growing popularity of organic farming have pushed for fumigant alternatives.

In the United States, Ms. Judy Johnson, from San Joaquin Valley Agricultural Sciences Centre of the United States Department of Agriculture (USDA), and co-researchers, from the Washington State University and University of California-Davis, have studied non-chemical alternatives to fumigation. One treatment uses RF energy to rapidly heat walnuts to an average temperature of 60°C for 5 minutes. Large-scale tests using an industrial RF heater successfully disinfested walnuts of navel orange worm without affecting product quality. A second alternative treatment is the use of cold storage (0°C to 5°C) to either disinfest product or prevent reinfestation of clean product. At temperatures of 0°C and 5°C, 95 per cent mortality of test insects was achieved at 10 and 18 days,

respectively. Storage at 10°C prevented reproduction, product damage and reinfestation, but 127 days' exposure was required to kill 95 per cent of Indian meal moth larvae. A third alternative treatment exposes product to a low pressure (vacuum) environment of 50 mm Hg in flexible polyvinyl chloride containers. Temperature and moisture content of the product strongly affects treatment efficacy, with complete mortality of test insects achieved at treatment exposures of 48 hours or less under optimal conditions. (Source: www.ars.usda.gov)

Application of Vapormate on banana

Methyl bromide (MBr) fumigation is the most common treatment for imported and exported plants in the Republic of Korea. However, MBr has been tagged as an ozone-depleting chemical, and its use restricted in accordance with the Montreal Protocol. The amount of MBr used for agricultural purposes has been dwindling, but has been static in the case of quarantine and pre-shipment use.

In view of the phase-out of MBr, researchers from the National Plant Quarantine Service (NPQS) and AgroLife Research Institute have studied the use of Vapormate as an alternative to MBr in the fumigation of imported bananas. Vapormate, developed in Australia and whose main ingredient is ethyl formate (16.7 per cent by weight), is widely used to fumigate dried fruits and cereals. The study was conducted to carry out the application test on citrus mealybugs (*Planococcus citri*) using 15 m^3 tarpaulin polyvinyl chloride tent. The fumigant concentration was 210 g/m^3, the treatment time 4 hours and the treatment temperature 17°C.

The concentration of ethyl formate was 16.33 g/m^3 right after treatment and turned out to be 6.50 g/m^3 4 hours after treatment. In the atmosphere at points of 3 m and 5 m distant from the tarpaulin, no ethyl formate was detected with a detection limit of 0.05 ppm, which is 0.05 per cent of the threshold limit value (TLV) of 100 ppm. All the live stages of citrus *P. citri* proved to be controlled and the fumigated bananas did not show significant discolouration. The firmness after 9 days of fumigation was slightly higher in fumigated bananas in comparison with control bananas, and this might be attributed to the lesser ripening.

The result of Vapormate residue analysis showed that when treated with 420 g/m^3, only 0.320 ppm, which is less than the Australian standard of 1 ppm, was detected. No residue was detected (less than detection limit of 0.05) when treated with 210 g/m^3. This application test result could be an important data to prepare for the related fumigation system. (Source: mbao.org)

Phosphine disinfestation treatment of apples

Researchers from Julius Kuehn-Institute, Institute for Ecological Chemistry, Plant Analysis and Stored Product Protection, Germany, and the New Zealand Institute for Plant & Food Research Limited have studied the efficacy and residue levels of phosphine (PH_3) disinfestation treatment of apples.

One study monitored PH_3 residues after fumigation on apples (cv Royal Gala). Apples were fumigated with PH_3 using magnesium phosphide (Mg_3P_2) with an average concentration in air of 1,274 ppm for 48 hours at 5°C. PH_3 content in fumigated apples immediately after the fumigation (0.25 mg/kg), significantly exceeded the maximum residue level (MRL) of 0.01 mg/kg, dropping below the MRL during storage at 5°C within 24 hours.

In another study, apples (cv Jazz) were infested with codling moth *(Cydia pomonella* L.) fifth instar larvae by drilling three holes into each apple, introducing one larva per hole, and sealing the hole with agar. About 100 eggs laid on plastic were placed into containers. One container of eggs and 30 infested apples were placed in sealed chamber for fumigation treatment. PH_3 concentrations were 1,000 and 2,000 ppm in air. Fumigation was carried out at 0.5°C for 24 h, 48 h, 72 h and 96 h. It was found that unlike methyl bromide, PH_3 does not remain a stable residue in fumigated fruit and is transformed into harmless phosphoric acid and phosphates by sunlight after its release into the atmosphere. The other potential advantages of PH_3 are that the treatment is less likely to damage fruit and that it can be applied during cold storage. *Contact: Mr. Dagmar Klementz, Julius Kuehn-Institute, Institute for Ecological Chemistry, Plant Analysis and Stored Product Protection, Königin-Luise-Straße 19, D-14195 Berlin, Germany. E-mail: dagmar.klementz@jki.bund.de.* (Source: mbao.org)

RECENT PUBLICATIONS

Properties of Secondary Working Fluids for Indirect Systems

This greatly expanded 2nd edition of a booklet entitled "Thermophysical Properties of Liquid Secondary Refrigerants" responds to rising use of secondary refrigerant systems used in applications ranging from solar heating at high temperatures to freezers in supermarkets. It comprises comprehensive data on a number of aqueous solutions of ethylene and propylene glycol, ethanol, glycerol, ammonia, chlorides and potassium salts. An entire chapter is devoted to: freezing point, specific heat, thermal conductivity, boiling point, viscosity, density, vapour pressure, surface tension and specific conductance. The book also deals with the selection of a suitable secondary refrigerant, technical calculations and computer treatment of data. Vital issues such as toxicity, the environmental impact and corrosion are covered. Dozens of tables and charts enable readers to obtain data on 14 working fluids.

7th International Conference on Compressors and Coolants

The proceedings of the 7th International IIR Conference on Compressors and Coolants, held in Casta Papiernicka, Slovak Republic, in October 2009, comprise 61 papers on a broad range of themes related to compressors, refrigeration technologies, inspection, diagnosis, coolants and oils. The topics covered include: compressors and trends; design, modelling and simulation; regulations governing refrigerants; new refrigerants; replacement of R22; absorption technology; hermetic and scroll systems; heat pumps, energy and the environment; propane and centrifugal compressors; and diagnosis and inspection.

For the above two books, *contact: International Institute of Refrigeration, 177, boulevard Malesherbes, 75017 Paris, France. Tel: +33 (1) 4227 3235; Fax: +33 (1) 4763 1798; Web: http://www.iifiir.org.*

TECH EVENTS

05-08 May
Istanbul
Turkey

ISK/SODEX Istanbul 2010 International HVAC & Refrigeration Exhibition
Contact: Hannover-Messe Sodeks Fuarcilik A.S.,
Beybi Giz Plaza, Dereboyu Cad.
Meydan Sok., 28, Kat. 2, Daire. 3-4,
Maslak - Istanbul, Turkey.
Tel: +90 (212) 290 3333;
Fax: +90 (212) 290 3331-32;
E-mail: info@sodex.com.tr.

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.

7-9 Jun
Tokyo
Japan

ACRA 2010 – 5th Asian Conference on Refrigeration and Air-conditioning
Contact: Prof. Masafumi Katsuta,
Japan Society for Refrigeration and Air-conditioning Engineers,
San-ei Bldg., 8 San-ei-cho,
Shinjuku-ku, Tokyo 160-0008, Japan.
E-mail: acra2010@jsrae.or.jp.

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.

12-15 Jul
West Lafayette
United States

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

01-03 Sep
Singapore

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

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.*