VATIS UPDATE

Ozone Layer Protection

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Highlights

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United Nations
ESCAP

APCTT
ASIAN AND PACIFIC CENTRE FOR TRANSFER OF TECHNOLOGY

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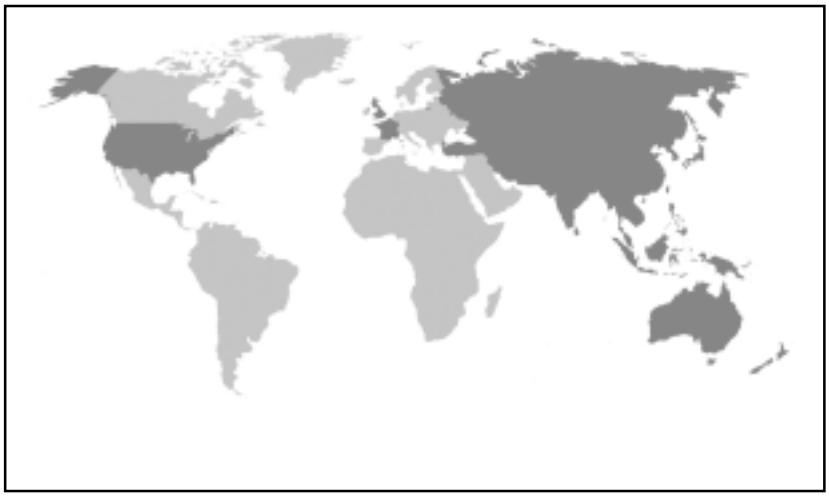
The **Asian and Pacific Centre for Transfer of Technology (APCTT)**, a subsidiary body of ESCAP, was established on 16 July 1977 with the objectives: to assist the members and associate members of ESCAP through strengthening their capabilities to develop and manage national innovation systems; develop,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

Heat pump using carbon dioxide as the working fluid
(Credit: eCO2 Technologies Pty Ltd, Australia)

VATIS* Update
Ozone Layer Protection
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SCIENCE OF THE OZONE LAYER

Cyclic ozone hole 'proves' cosmic ray theory

A scientist from the University of Waterloo, Canada, says that an observed cyclic hole in the ozone layer provides proof of a new ozone depletion theory involving cosmic rays, a theory outlined in his recent study. Dr. Qing-Bin Lu, a professor of physics and astronomy, said it was generally accepted for more than two decades that the Earth's ozone layer is depleted by chlorine atoms produced by the sun's ultraviolet (UV) light-induced destruction of chlorofluorocarbons (CFCs) in the atmosphere. But mounting evidence supports a new theory that says cosmic rays, rather than the sun's UV light, play the dominant role in breaking down ozone-depleting molecules and then ozone. Cosmic rays are energy particles that originate in the space.

In his study, Dr. Lu analyses reliable cosmic ray and ozone data in the period 1980-2007 which cover two full 11-year solar cycles. The data unambiguously show the time correlations between cosmic ray intensity and global ozone depletion, as well as between cosmic ray intensity and the ozone hole over the South Pole. "This finding not only provides a fingerprint for the dominant role of the cosmic-ray mechanism in causing the ozone hole, but also contradicts the widely accepted photochemical theory," Dr. Lu said. "These observations cannot be explained by the photochemical model. Instead, they force one to conclude that the cosmic ray mechanism plays the dominant role in causing the hole."

In the first submission of his paper to *Physical Review Letters* in August 2008, Dr. Lu predicted one of the severest ozone losses in 2008-2009, as a result of the cosmic ray cycle. His study quantitatively predicted that the mean total ozone in the October hole over Antarctica would be depleted to around 187 DU. The latest satellite data sets from the National Aeronautics and Space Administration (NASA) of the United States later showed that the mean total ozone in the ozone hole in October 2008 was 197 DU, within five per cent of Dr. Lu's prediction.

Recent scientific assessments of ozone depletion by the World Meteorological Organization and the United Nations Environment Programme, using photochemical models, had predicted that global ozone will recover (or increase) by 1-2.5 per cent between 2000 and 2020 and that the Antarctic springtime ozone hole will shrink by 5-10 per cent between 2000 and 2020. In sharp contrast, the cosmic ray theory predicted one of the severest ozone losses over the South Pole in 2008-2009 and another large hole around 2019-2020. (Source: www.exchangemagazine.com)

Ozone recovery to be uneven

In the United States, new research by scientists from the National Aeronautics and Space Administration (NASA) and University of Maryland (UM) suggests that the ozone layer of the future is unlikely to look much like the past because greenhouse gases are changing the dynamics of the atmosphere.

Previous studies had shown that while the build-up of greenhouse gases makes it warmer in troposphere, it actually cools the upper stratosphere. This cooling slows the chemical reactions that deplete ozone in the upper stratosphere and allows natural ozone production in that region to outpace destruction by chlorofluorocarbons (CFCs). Accumulation of greenhouse gases also changes the circulation of stratospheric air masses from the tropics to the poles, NASA scientists note. In Earth's middle latitudes, that means ozone is likely to "over-recover," growing to concentrations higher than they were before the mass production of CFCs. In the tropics, stratospheric circulation changes could even prevent the ozone layer from fully recovering.

Dr. Feng Li, an atmospheric scientist at UM's Goddard Earth Sciences and Technology Centre and lead author of the study, says that circulation is just as important as cooling. "It is not one process or the other, but both," he adds. The findings are based on a detailed computer model that includes atmospheric chemical effects, wind changes and solar radiation changes. Dr. Li's experiment is part of an ongoing international effort organized by the United Nations Environment Programme's

Scientific Assessment Panel to assess the state of the ozone layer. Dr. Li, working with Dr. Richard Stolarski and Dr. Paul Newman of NASA's Goddard Space Flight Centre, found that greenhouse gases alter a natural circulation pattern that influences ozone distribution. The Brewer-Dobson circulation is like a pump to the stratosphere, moving ozone from the lower parts of the atmosphere, into the upper stratosphere over the tropics. Air masses then flow north or south through the stratosphere, away from the tropics towards the poles.

The Arctic would benefit from the surplus ozone in the northern hemisphere and from the overall decline of ODS to recover by 2025. The globally averaged ozone and Antarctic concentrations would catch up by 2040, as natural atmospheric production of ozone resumes. However, Dr. Li's model shows a continuing ozone deficit in the stratosphere over the tropics. In fact, when the model run ended at year 2100, the ozone layer over the tropics still showed no signs of recovery. (Source: www.sciencedaily.com)

Sweden's ozone layer now thickest in decades

The ozone layer over Sweden was thicker in this February than it has been in decades, just a year after the second-thinnest level was recorded, the Swedish Meteorological and Hydrological Institute (SMHI) has said. Measurements taken at SMHI's Norrkoeping station showed the ozone layer was 426 Dobson units (DU) in February, the thickest since recordings there began in 1988. At the Vindeln station in northern Sweden, where measurements began in 1991, a record high of 437 DU was recorded.

"We have to go as far back to the measurements taken in Uppsala between 1951 and 1966" to find levels that high, SMHI said in a statement. There, the highest level for February was in 1957, when a value of 439 DU was recorded.

The circumpolar whirl over the Arctic – a polar high-pressure system formed of a distinct column of cold air that develops during the long polar night – disappeared very quickly in mid-January, and the stratosphere warmed up quickly in the space of a few days, SMHI explained. As a result, "the low temperatures that usually cause rapid depletion of the ozone layer did not take place," it said. The ozone layer over Sweden usually is at its thickest level during the spring, before thinning during the summer and reaching a minimum during the winter, says SMHI. (Source: www.google.com)

Model relates South Pole's ozone levels and wind patterns

The dominant mode of climate variability across the Southern Hemisphere is the Southern Hemisphere Annular Mode (SAM), which describes the strength of the circumpolar zonal winds. Observations and models have linked stratospheric polar ozone depletion with trends in SAM.

However, the general circulation models used in the Intergovernmental Panel on Climate Change assessment can only investigate how ozone influences atmospheric circulation, not vice versa. In the United States, scientists from Earth System Research Laboratory (ESRL) of the National Oceanic & Atmospheric Administration and Goddard Space Flight Centre of the National Aeronautics and Space Administration analysed records dating from 1962 to 2004 to investigate the two-way ozone-SAM relationship. They found a significant correlation between the austral spring total column ozone above the South Pole and SAM, with delay times of up to four months.

The austral spring SAM is also linked to polar ozone concentrations into the early summer. The ozone-SAM relationship is then investigated in a coupled chemistry climate model (CCM). Led by Dr. Ryan L. Fogt of ESRL, the scientists have shown that the observed relationship can be represented in the CCMs, suggesting CCMs are important tools to investigate future Southern Hemisphere climate change involving ozone recovery and greenhouse gas increases. (Source: www.sciencemode.com)

Rocket launches may need regulation to prevent ozone loss

The global market for rocket launches may need more stringent regulation in order to prevent significant damage to Earth's stratospheric ozone layer in the decades to come, according to a new

study by researchers in the United States. Future ozone losses from unregulated rocket launches will eventually exceed ozone losses due to chlorofluorocarbons (CFCs), said Dr. Martin Ross from The Aerospace Corporation and the chief author of the study. The study, with participation from the University of Colorado at Boulder (UCB) and Embry-Riddle Aeronautical University, provides a market analysis for estimating future ozone layer depletion based on the expected growth of the space industry and known impacts of rocket launches.

"If left unregulated, rocket launches by the year 2050 could result in more ozone destruction than was ever realized by CFCs," warned Prof. Darin Toohey of UCB's atmospheric and oceanic sciences department. Since some proposed space efforts would require frequent launches of large rockets over extended periods, the new study was designed to bring attention to the issue in the hope of sparking additional research.

Current global rocket launches deplete the ozone layer by no more than a few hundredths of 1 per cent annually, said Prof. Toohey. But as the space industry grows and other ozone-depleting chemicals decline in the Earth's stratosphere, the issue of ozone depletion from rocket launches would move to the forefront. Just a handful of space shuttle launches by the United States' National Aeronautics and Space Administration release more ozone-depleting substances in the stratosphere than the entire annual use of CFC-based medical inhalers used to treat asthma and other diseases in the United States and which are now banned, said Prof. Toohey.

Highly reactive trace-gas molecules known as radicals dominate stratospheric ozone destruction – a single radical in the stratosphere can destroy up to 10,000 ozone molecules. Microscopic particles, including soot and aluminium oxide particles emitted by rocket engines, provide chemically active surface areas that increase the rate such radicals "leak" from their reservoirs and contribute to ozone destruction, said Prof. Toohey.

The research team is optimistic that a solution to the problem exists. "We have the resources, we have the expertise, and we now have the regulatory history to address the issue in a very powerful way," he said. (Source: www.sciencedaily.com)

ODS PHASE-OUT IN INDIA

Training programme to stop using CTC in textile industry

The Infrastructure Leasing and Financial Services Limited (IL&FS), India, recently launched a nationwide trainer's training programme series to phase out use of carbon tetrachloride (CTC) in the textile sector. The training was mooted under IL&FS's Cluster Development Initiative (CDI) with the support of Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ), a German enterprise for sustainable development.

The project is aimed at stopping the use of CTC in the textile industry before 31 December 2009 to comply with the norms laid under the Montreal Protocol on substances that deplete ozone layer, said Mr. N.V.R. Nathan, Vice-President, IL&FS (CDI). He said that owing to the phasing out of CTC, which was mainly used for stain removing in the export-oriented apparel industry, the enterprises would be told to switch over to water-based detergents and non-ozone depleting alternatives. The training programmes would be conducted at all the 55 training centres of IL&FS in the country. (Source: www.thehindu.com)

Eco-friendly stain remover-cum-scouring agent

An R&D project was undertaken by Man-made Textiles Research Association (MANTRA) to phase out carbon tetrachloride (CTC), an ozone depleting substance that is often used in stain remover formulations, from the decentralized textile processing sector. Under the project sponsored by Gujarat government's Department of Industries & Mines, and Colourtex Pvt. Ltd., MANTRA developed an eco-friendly stain remover-cum-scouring agent called MANTRA CTC Substitute. This product does not contain CTC and other harmful solvents.

The product is: non-ozone depleting; effective in removing stain and oily impurities from grey fabric; ideal for polyester and its blends; and has 38 per cent solids content. *Contact: Dr. S.K. Basu,*

Director, Man-made Textiles Research Association, Near Textile Market & Telephone Exchange, Ring Road, Surat 395 002, Gujarat, India. Tel: +91 (261) 232 3211, 233 7062; Fax: +91 (261) 232 2500; E-mail: director@mantrasurat.org. (Source: www.mantrasurat.org)

Handling of open-type compressors

The institutional and similar cluster-oriented refrigeration and air-conditioning (RAC) applications in India have been identified during the formulation of the National CFC Consumption Phase-out Plan (NCCoPP). The refrigeration systems in these applications, especially pre-2003 ones, use CFC-12. Most of these units, with open-type compressors (OTC), have high refrigerant leakage rate.

There are several applications for OTC-based systems, such as ice candy plants, cold rooms, cold storages, menthol plants and railway air-conditioning systems. The poor servicing procedures used – like topping-up of refrigerant in leaking systems, venting out the refrigerant, using system compressor or single-stage vacuum pump for evacuation, etc. – release of large amounts of CFCs into the environment.

Much of the CFC emissions could be arrested by adopting good practices during operation, servicing and decommissioning of RAC plants, such as preventive maintenance, refrigerant recovery, flushing and leak testing with dry nitrogen, and evacuation and charging of refrigerant in the system. Retrofitting these plants with low-ODP or zero-ODP solutions is another option to reduce the CFC demand for servicing of such units. Training on good service practices and retrofitting of OTC-based CFC-12 refrigeration systems would help reduce the CFC consumption in this sub-sector.

To this end, a two-fold approach was followed. First, an ice candy plant working on CFC-12 was retrofitted with HCFC-22, changing only a few system components during the conversion. The retrofitted unit's performance was excellent, with the unit providing 20 per cent more cooling than the CFC-12 system. This has encouraged the ice candy plant owner, as his production increased by 20 per cent. The other system parameters were similar to CFC-12 unit. (Source: www.nccopp.info)

IN THE NEWS

ExCom meeting approves 116 projects and activities

The 56th Meeting of the Executive Committee of the Multilateral Fund was not only its final meeting of 2008 but also the final of the 2006-2008 triennium. High on the agenda was further work on the guidelines for costing of the accelerated phase-out of hydrochlorofluorocarbon (HCFC) consumption and production in a number of sectors. The final report on the evaluation of institutional strengthening (IS) projects was also presented and had particular significance regarding future discussions on post-2010 funding of IS projects.

The Executive Committee approved 116 projects and activities for 65 countries amounting to US $57,347,247 plus US$9,956,600 support costs. Funding for HCFC phase-out management plan (HPMP) preparation was approved for 17 countries, including India, one project in Jordan for the preparation of a demonstration project for the conversion of HCFC to non-HCFC technology in the manufacturing sector and two projects (Brazil and Mexico) to optimize and validate the use of methyl formate as a replacement of HCFC-141b in foam applications. So far, the Executive Committee has approved funding for the preparation of HPMPs in 115 Article 5 countries.

Other projects approved at the 56th Meeting included new terminal phase-out management plans (TPMPs) for Guatemala, Guinea-Bissau, Mozambique, Nicaragua, Suriname and Swaziland; tranches of TPMPs or CFC phase-out plans for 13 countries; projects for methyl bromide phase-out for seven countries including three new agreements and one revised agreement, renewal of IS projects in 25 countries plus one new IS project in Timor Leste; non-investment activities for metered-dose inhaler (MDI) transition strategies in Ghana, India, Indonesia and Pakistan; projects for the phase-out of CFC in the manufacture of MDIs in Argentina, China, Colombia, India and Pakistan. The Executive Committee also approved a bilateral proposal for international methyl bromide compliance workshop for all Article 5 countries. (Source: www.multilateralfund.org)

Regional Network of Ozone Officers for Pacific Island Countries

The Multilateral Fund's Executive Committee established the Regional Network for Pacific Island Countries (PICs) on 12 November 2008, through its Decision 56/33. This is the newest Regional Network established under the Multilateral Fund, and with its approval, all Article 5 countries now receive Regional Networking services provided by the United Nations Environment Programme (UNEP).

Based on UNEP DTIE OzonAction's Networking approach successfully employed for more than a decade in other regions – but modified to take into account the special conditions of these small island developing states – this Regional Network strengthens the capacity of National Ozone Units in the PIC region for compliance with the Montreal Protocol and sustained, permanent reduction in ozone depleting substances.

The Network covers 13 Article 5 countries in the Pacific: Cook Islands, Kiribati, Republic of Marshall Islands, Federated States of Micronesia, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. It uses electronic tools including discussion forums, dedicated web sites, video conferencing (when practical) to share information and experiences throughout the year. *Contact: Mr. Shaofeng Hu, Regional Network Co-ordinator, UNEP Regional Office for Asia and Pacific (ROAP), UN Building, 2B Rajadamnern Nok Avenue, Bangkok 10200, Thailand. Tel: +66 (2) 288 1126; Fax: +66 (2) 280 3829; E-mail: hus@un.org.* (Source: www.unep.fr)

Pakistan working to phase out ODS consumption of by 2010

Pakistan has phased out the consumption of 91 per cent of ozone depleting substances (ODS) – which is above the 85 per cent induction target fixed under the Montreal Protocol – said Mr. Imtiaz Inayat Elahi, Acting Secretary of the Ministry of Environment. "We are successfully heading towards 100 per cent phase-out target of these ozone depleting substances by 1 January 2010," he added, while inaugurating a one-day international awareness and information workshop on transition strategy for phasing out chlorofluorocarbons (CFC)-metered dose inhalers (MDI).

Mr. Elahi said that CFC-MDIs issue is a matter of concern for Pakistan like other developing countries of the region. However, the prices of imported CFC-free MDIs are three time higher than the locally manufactured CFC-MDIs. He called upon the experts from the United Nations Environment Programme, United Nations Development Programme and local pharmaceutical companies to facilitate the process of conversion to CFC-free technology so that asthma patients may avail affordable medication. He also urged the stakeholders and partner organizations to contribute their efforts for phasing out ozone depleting substances for the sake of the present and future generation. (Source: www. thenews.com.pk)

Consultative stakeholder meeting in Nepal

A consultative meeting with stakeholders was held on 11 March 2009 in Kathmandu, Nepal. At this meeting, the United Nations Environment Programme (UNEP) and the United Nations Development Programme made detailed presentation on the content of HCFC Phase-out Management Plan (HPMP) and the related data collection process. The key points relating to HPMP that emerged from the consultations were:

- HCFC users primarily are in domestic, building and industrial air-conditioning applications. Apart from HCFC-22, one large hotel in Kathmandu is operating a HCFC-123 based building air-conditioning system.
- While no HCFC use is reported in commercial applications, transport applications and use in reefer containers, this needs to be confirmed during field survey.
- Equipment using HCFC alternatives are already in use. They are mainly related to R-407c and R-410a, and are imported mainly from India, Malaysia, Thailand, Japan and China. There is no reported use of HCFC blends.
- There is a large number of international brands used in different applications in Nepal. They are sold either through sole dealerships or through retail channel.

- Porous border with India and China is likely to pose a challenge in assessing HCFC demand. There was a general feeling that the demand of HCFC is constrained by the government order. The government released only 20 MT of HCFCs annually in the market in 2006 and 2007 against the limit of 23.04 MT specified in the order.

The summaries of main conclusions have been compiled and given to UNEP for being addressed as a part of HPMP of Nepal. *Contact: Mr. Atul Bagai, Regional Co-ordinator (Networking), South Asia Network Compliance Assistance Programme-OzonAction, UNEP ROAP, UN Building, 2B Rajadamnern Nok Avenue, Bangkok 10200, Thailand. Tel: +66 (2) 288 1126; Fax: +66 (2) 280 3829; E-mail: bagai@un.org.* (Source: www.unep.fr)

National environment literacy effort in Mauritius

A National Environment Literacy Programme (NELP) is at the preparation stage at the Ministry of Environment and National Development Unit, said Minister Mr. Lormus Bundhoo at the launch of an ozone layer campaign at a local school. The aim of NELP is to sensitize and empower individuals from all walks of life, especially students, about their responsibility within their immediate and global environment. It is an operational framework within a systems approach, which aims to capture and add value to existing and future initiatives, the Minister added. (Source: www.gov.mu)

Consumption of methyl bromide in Sri Lanka

Sri Lanka has implemented two projects for ceasing the consumption of methyl bromide (MeBr) in tea plantation sector and all other applications, excluding the Quarantine and Pre-shipment Sector (QPS) exempted by the Montreal Protocol. Through the two projects, Sri Lanka is expected to phase out MeBr usage in the country. MeBr consumption in QPS sector – which comes under critical use – has increased significantly for last few years. Therefore, the National Ozone Unit is making arrangements to justify MeBr consumption in QPS sector with relevant stakeholders and to make arrangement for reducing consumption in QPS as well. (Source: www.noulanka.lk)

India to support Islamic Republic of Iran on CFC MDI phase-out

Under South-South co-operation initiatives, the Government of India will provide technical information support to the Government of the Islamic Republic of Iran on chlorofluorocarbons-metered dose inhalers (CFC-MDI) phase-out implementation, with assistance from Cipla, India. Dr. Ebrahim Haji-zadeh, the National Ozone Officer of the Islamic Republic of Iran, had visited Cipla Ltd. and the National Ozone Cell of India.

Taking Cipla's current technical and managerial position into account, especially from the viewpoint of technology transfer, one may conclude that the company has reduced the finished cost of its MDI manufacture by localizing the production technologies, taking the best advantage of the domestic expertise. *Contact: Mr. Atul Bagai, Regional Co-ordinator (Networking), South Asia Network Compliance Assistance Programme - OzonAction, UNEP ROAP, UN Building, 2B Rajadamnern Nok Avenue, Bangkok 10200, Thailand. Tel: +66 (2) 288 1126; Fax: +66 (2) 280 3829; E-mail: bagai@un.org.* (Source: www.unep.fr)

Training on good refrigeration practices in Brunei Darussalam

The second phase of a training programme – the "National Train-the-Trainers Workshop on Good Practices in the Refrigeration Sector" – was held recently at Kuala Belait, Brunei Darussalam. The training programme was conducted under the Memorandum of Agreement between Brunei Darussalam and the United Nations Environment Programme (UNEP) under the Montreal Protocol. The training was designed and targeted for the local technicians in the refrigeration sector to improve their technical knowledge and skills in the servicing procedures for refrigeration and air-conditioning equipment. In the second phase of the training programme, the national trainers (the 16 technicians trained in the first phase) trained other refrigeration technicians from the public and private sector. The training is organized in a series throughout the year in line with the total phase-out of ODS by the end of 2009. (Source: www.brunei-online.com)

REFRIGERATION/ AIR-CONDITIONING

Climate-friendly vending machines

In the United States, the multinational beverage company PepsiCo has announced a pilot project that introduces climate-friendly vending machines. Under the new programme, the Pepsi Bottling Group (PBG) is placing 30 Pepsi-Cola vending machines in high-consumer traffic areas in the Washington, DC area.

The machines, which feature the new Pepsi logo along with a special green refrigerant sticker, use less energy and emit 12 per cent less greenhouse gas than current vending machines, the company stated. In addition to their energy efficiency improvements, the new machines use carbon dioxide, a natural refrigerant, instead of hydrofluorocarbons. PepsiCo says that the project is part of its commitment to reducing the environmental footprint of the vending and cooling equipment used to sell its drinks. (Source: www.tradingmarkets.com)

Condensing unit runs on R-404A

Hawco, an international controls and refrigeration engineering service provider and distributor based in the United Kingdom, offers a refrigeration solution that combines high performance and energy efficiency. Designated the Hawco Extra Cold, the rugged condensing unit is available for R404A refrigerant across high, medium and low temperature ranges. It incorporates energy-efficient hermetic compressors and condenser coils with an energy-efficient Zeil-EBM fan.

Hawco engineers can customize a condensing unit to meet specific needs. While stock in versions are available from 1.5 kW to 18 kW, special models can be ordered for up to 28 kW. All units can be controlled with Hawco's broad line of control panels and controllers. The condensing units are fabricated from galvanized steel to ensure a rugged, weatherproof module that can be flat roof, wall or ground mounted. The heavy-duty housing allows for easy installation and maintenance, as well as providing a low operating noise level of 33dBA to 47dBA. *Contact: Hawco, Abbey Mill Business Park, Lower Eashing, Godalming, Surrey, GU7 2QN, United Kingdom. Tel: +44 (1483) 869 080; E-mail: gary.bennett@hawco.co.uk; Website: www.hawco.co.uk.* (Source: news.thomasnet.com)

Zero-ozone depleting refrigerant

A marine air-conditioning manufacturer, Flagship Marine of the United States, has been analysing various new refrigerants that have been developed to comply with the increasingly stringent environmental regulations. It has finally decided to use ISCEON 59, a patented zero-ozone depleting refrigerant commonly known as R-417A.

This is the first refrigerant that has almost identical performance and operating pressures of the long-time industry standard, R22, while most importantly remaining compatible with the user-friendly refrigerant lubricating oils that have been used for decades. Flagship Marine's biggest problem was avoiding the highly hydroscopic oils that some of the other refrigerants require and the dramatic alterations necessitated by the radically increased refrigerant pressures of some of the other alternative refrigerants.

R-417A and HCFC-22 refrigerants are so similar in their characteristics that they are actually interchangeable, though they cannot be mixed. *Contact: Mr. Tom Martland, Flagship Marine Inc., 2427 SE Dixie Hwy, Stuart, FL 34996, Florida, United States of America. Tel: +1 (561) 283 1609; Fax: +1 (561) 283 4611.* (Source: www.marinetalk.com)

R-744 compact brazed heat exchangers

The Swedish company SWEP, one of the world's leading suppliers of compact brazed heat exchangers (CBEs), has developed a double-wall unit for high-pressure carbon dioxide (CO_2) refrigeration and heat pump applications. The highly performing B16DW-U is fully reliable to protect the cooled food chain in supermarkets, saving capital, running costs and valuable retail space.

SWEP has developed a range of CBEs to work reliably in CO_2 cascade refrigeration systems,

booster systems and pumped R-744 systems. The new CBE features a reinforced steel frame held together by bolts, combining double-wall safety with both thermal and cost efficiencies. It could be employed as an evaporator and gas cooler for industrial chillers of up to 50 kW cooling capacity, and in heat pump applications.

SWEP offers technology to meet the needs of smaller stores requiring up to 80 kW MT and 10 kW LT cooling, as well as for supermarkets where the cooling capacity required is up to 250 kW MT and 50 kW LT. Its ColdPlate range specifically caters for CO_2 systems with working pressures of up to 45 bar, as well as transcritical applications at 140 bar. It provides mechanical strength for CO_2 installations and aims at a high COP value in supermarket refrigeration. *Contact: Mr. Henrik Ewetz, SWEP International, Hjalmar Brantings väg 5, P.O. Box 105, 261 22 Landskrona, Sweden. Tel: +46 (418) 400400; Fax: +46 (418) 29 295; E-mail: info@swep.net.* (Source: www.r744.com)

R-744 scroll compressors, motor valve & driver module

Emerson Climate Technologies, Germany, has added Copeland Scroll™ CO_2 compressor range, a motor-driven valve providing a precise control of the refrigerant, and a universal driver module. The scroll compressors integrates models optimized for carbon dioxide (CO_2) low-temperature sub-critical applications, such as in cascade and booster systems operating in supermarkets and industrial sites.

With nominal refrigeration capacities from 8 kW to 24 kW, the four models ZO34, ZO45, ZO58 and ZO104 offer very high efficiency and lead to a reduction of the overall system energy consumption. The compactness and reduced weight of the Copeland Scroll CO_2 range – 30 per cent to 60 per cent less compared with reciprocating piston compressors of similar capacity – allow for not only an easier transport and maintenance, but also the design of more compact compressor packs. The nominal power varies from 2 hp to 6 hp. *Contact: Emerson Climate Technologies GmbH, European Headquarters, Pascalstrasse 65, D-52076 Aachen, Germany. Tel: +49 (2408) 929-0; Fax: +49 (2408) 929-570; E-mail: info@Emerson.com; Website: www.emersonclimate.eu.* (Source: www.r744.com)

SOLVENTS

All-natural and sustainable cleaning products

Perf Go Green Holdings Inc., the United States-based leader in biodegradable plastic products and everyday green solutions, has launched Perf Go Clean™ all-natural and sustainable household cleaning products. The Perf Go Clean retail line includes Total Bathroom, Glass and Multi-Purpose Cleaner, Fresh & Clean Air, and Stain & Odour Remover – all hypoallergenic, non-toxic, readily biodegradable and non-inflammable.

Perf Go Clean bio-based products provide total ingredient disclosure and do not contain ozone depleting substances, synthetics, petroleum distillates, glycol ethers, or phosphates. Perf Go Clean packaging (including the bottle, trigger, and label) is recyclable and made with recycled materials. (Source: www.msnbc.msn.com)

Contact cleaner for sensitive equipment

Electro Wizard™ contact cleaner from Krylon Products Group, the United States, features a new patent-pending formula that quickly removes, dissolves and rinses away foreign contaminants. The product provides an effective and compliant solution for cleaning sensitive equipment and precision instruments. The cleaner removes surface contaminants with minimal effort, evaporates instantly, and leaves behind no residue to harm or ruin the item.

Designed to be non-inflammable even when exposed to a direct flame, the solvent may be directly applied to equipment while in operation. With very low VOC content, it is an alternative to HCFC-141b, a Class II ozone-depleting substance that is being phased out. Other applications of Electro Wizard contact cleaner include meters, relays and switches, radar and X-ray equipment, hydraulic and missile fuel systems, timing devices, office machines, electronic games, computer systems and memory devices, TV-video equipment and satellite communication equipment. *Contact: Krylon Products Group, 101 W. Prospect Avenue,*

Cleveland, OH 44115, United States of America. Tel: +1 (800) 777 2966; Fax: +1 (800) 243 3075. (Source: pr-usa.net)

Non-chlorinated degreaser

CRC Industries, the United States, has introduced Insta-Solv™ degreaser, an extremely low-VOC, non-chlorinated degreaser for industrial and electrical applications. Insta-Solv cleans and degreases oils, dirt and grease from motors, chains, cables, gears, generators, power tools and heavy equipment. Its fast evaporating formula aggressively dissolves grease, dirt and oils from most non-plastic surfaces and it is non-corrosive. Insta-Solv degreaser contains no Class I or Class II ozone depleting chemicals, and is registered with NSF K1 for use in meat and poultry plants. It is available in 20 oz aerosol can. *Contact: CRC Industries Inc., 885 Louis Drive, Warminster, PA 18974, United States of America. Tel: +1 (800) 272 4620; Fax: +1 (215) 674 2196; E-mail: cbrown @crcindustries.com.* (Source: news.thomasnet.com)

Low-ODP brominated compound for use in solvents

Kyzen Corporation, the United States, has patented a solvent mixture, which can be used in solvating, vapour degreasing, photoresist stripping, adhesive removal, cold cleaning, and solvent cleaning applications including defluxing, dry-cleaning, degreasing, particle removal, metal and textile cleaning. The mixture is a suitable replacement for ozone-depleting and/or toxic solvents. The soils and contaminants that are removed in the mixture include oil, grease, coatings, flux, resins, waxes, rosin, adhesives, dirt, fingerprints, epoxies and polymers.

The mixtures comprise monobrominated compounds with highly fluorinated compounds and/or other enhancement agents that improve and enhance the properties of the original mixture. The enhancement agents are one or more of the following materials: alcohols, esters, ethers, cyclic ethers, ketones, alkanes, terpenes, dibasic esters, glycol ethers, pyrollidones, or low or non-ozone depleting chlorinated and chlorinated/fluorinated hydrocarbons. Monobrominated compounds can have the formula $C_x H_{2x+1}Br$ (where x = 2-12) or $C_y H_{2y-1}Br$ (where y = 2-12). Fluorinated compounds can the formula $C_a F_b H_c X_d$ (where a = 1-16, b>c, c = 1-16, d = 0 or greater, and X = O, N, halogen, or Si,). Other compounds may be added to the mixture to vary the properties of the cleaner or solvent to fit various applications. (Source: www.freepatentsonline.com)

Compositions for cleaning contaminated articles

In the United States, Honeywell International Inc. has patented certain compositions and methods for cleaning contaminated articles based on the provision of a zeotropic composition comprising at least one (a) inflammable solvent; (b) non-inflammable solvent having a boiling point which is less than the inflammable solvent at same pressure; and (c) second non-inflammable solvent having a a boiling point which is more than the inflammable solvent at same pressure.

Honeywell has discovered that certain combinations of solvents comprising at least one inflammable solvent and a plurality of non-inflammable solvents segregate in certain cleaning processes, including certain vapour degreasing processes, but in such a way so as to produce inflammable solvent mixtures. The preferred cleaning methods involve the use of a solvating agent of the present invention to effectively remove adherent contaminants from the surface of articles by means of a solvation process. Cleaning is also achieved by contacting the article with the solvating agent whereby the kinetic force of the solvating agent removes the contaminants, such as inorganic and organic materials like greases, waxes, adhesives and rosin fluxes. (Source: www.freepatentsonline.com)

The Montreal Protocol Who's Who

"The Montreal Protocol Who's Who" a new web portal aiming to honor the visionaries, innovators and implementers who are making the Montreal Protocol a global environmental success story. The portal hails all those who were essential in realizing this global effort. For more information, contact:

Who Administrator
E-mail: mpwhoswho@unep.fr
Web: http://www.unep.fr/ozonaction/montrealprotocolwhoswho/index.htm

HALONS

New clean agent fire extinguishers

Fire and Safety Centre, the United Kingdom, has introduced a new range of compact and economical automatic "clean agent" fire extinguisher. The 1 kg and 2 kg capacity Fireblitz extinguishers contain FE-36 clean agent, a gas-based suppressant for Class B & C fires (inflammable liquids and gases) that is also safe to use on electrical fires. FE-36 provides a direct replacement for Halon, the use of which is now being phased out. FE-36 leaves no harmful residue, is non-corrosive, non-conductive and environmentally safe. It is ideal for protecting boat engine compartments, plant and machinery bays, sensitive electronic equipment, and stored valuables and documents.

Both models are fitted with a 79°C glass bulb sprinkler head that operates the fire extinguisher automatically in the event of fire providing 24 hour protection. The 1 kg capacity has a rated use for a maximum enclosed volume of up to 1.7 m^3 and the 2 kg 3.4 m^3. *Contact: Fire and Safety Centre, Atkinson Way, Foxhills Ind. Estate, Scunthorpe, North Lincolnshire DN15 8QJ, United Kingdom. Tel: +44 (1724) 854 199; Fax: +44 (1724) 854 213; E-mail: sales@fireandsafetycentre.co.uk.*
(Source: www.fireandsafetycentre.co.uk)

Fluoroiodocarbon blends as halon replacements

In the United States, Ikon Corporation has patented a new set of effective, environmentally safe, non-inflammable, low-toxicity refrigerants, solvents, foam blowing agents, propellants, and fire-fighting agents. The agents are clean, electrically non-conductive, and have short atmospheric lifetimes, zero ozone-depletion potential and low global warming potential. The agents comprise at least one fluoroiodocarbon agent satisfying the general formula $C_aH_bBr_cCl_dF_eI_fN_gO_h$, wherein a is 1-8; b is 0-2; c, d, g, and h are each 0 or 1; e is 1-18; and f is 1 or 2, either neat or mixed with additives selected from the group consisting of alcohols, esters, ethers, fluoroethers, hydrocarbons, hydrofluorocarbons and perfluorocarbons.

An advantage of the invention is the duplication of existing refrigerants, solvents, foam blowing agents, aerosol propellants, and fire-fighting agents at lower cost. Other advantages of the invention are optimization of properties by blending of fluoroiodocarbons with selected additives, and in some cases providing superior compositions of fluoroiodocarbons as replacements for existing chemical compounds. (Source: www.freepatentsonline.com)

Environment-safe fire extinguishant

ROC Group, United Arab Emirates, offers NAF S-125®, an extinguishing agent recognized by Underwriters Laboratories (UL) and listed by the United States Environmental Protection Agency's SNAP for occupied spaces. NAF S-125 offers:

- Minimum quantity of agent required;
- Minimum number of cylinders required;
- High speed of extinguishment;
- High design flexibility (25 bar-42 bar);
- Maximum environmental and human safety; and
- Optimum Halon replacement option.

ROC Group is the only UL-accredited Original Equipment Manufacturer (OEM) in the Middle East. It is also recognized as an Alternative Manufacturing Location (AML) licensed by Safety Hi-Tech of Italy to design, assemble, fill, supply, serve and maintain UL-listed NAF fire suppression systems. *Contact: ROC Group, United Arab Emirates. Tel: +971 (4) 268 0402; E-mail: info@rocint.com.*
(Source: www.firemiddleeastmagazine.com)

Catalyst promoters for producing trifluoroiodomethane

Honeywell International, the United States, has been assigned a patent on a process for the preparation of trifluoromethane, a fluoroiodoalkane compound employed as fire extinguishing agent. Represented by the formula $CF_3(CF_2)_n$-I, wherein n is 0 or 1. The process includes the step of contacting: (i) a compound represented by the formula $CF_3(CF_2)_n$-Y, wherein Y is selected from H, Cl, Br and COOH, and n is 0 or 1; (ii) a source of iodine; (iii) an alkali or alkaline earth metal salt

catalyst supported on a carrier; and (iv) a catalyst promoter for the alkali or alkaline earth metal salt catalyst. The catalyst promoter includes at least one element selected from a transition metal element, a rare earth metal element, a different main group element, and any salts or combinations thereof. The contacting is carried out at a temperature and pressure and for a length of time sufficient to produce the fluoroiodoalkane compound. The contacting may be carried out in the presence of a solvent and in the presence of oxygen.

Trifluoroiodomethane (CF_3I) is a potential fire extinguishing agent that can substitute for Halon 1301 ($CBrF_3$) and Halon 1211 ($CBrClF_2$), which are ozone-depleting substances. CF_3I is also a potential refrigerant with a low global warming effect. It has heretofore been produced by reacting trifluoromethane (CF_3H) with iodine in the presence or absence of oxygen using conventional iodination catalysts. In the new method, catalyst performance and reaction rates are significantly improved by employing catalyst promoters. When lanthanum is used as a promoter, the catalyst was found to be about 2 to 3 times as active as a corresponding lanthanum-free catalyst.
(Source: www.freepatentsonline.com)

Car fire extinguisher

Yueqing Jiuxin Electric Instrument Co. Ltd., China, has introduced Model MSJ460 car fire extinguisher as a substitute for Halon-based extinguishers. This aerosol-type fire extinguisher can control starting fires very efficiently and completely within several seconds from 4-5 m away. Its operation is simple.

The unit employs a patented dissolvable tiny-foamed fire extinguisher (DTE) wetting agent, which fully breaks down in the soil, without causing any environment pollution. The agent is packed in a sealed aluminium container, which can withstand pressures up to 18 bar and temperatures up to 80°C. The water-soluble extinguisher also has temperature reduction and flame retardant properties, and is claimed to be a "natural" product. *Contact: Ms. Echo Xue, Yueqing Jiuxin Electric Instrument Co. Ltd., No. 90 Yishou Road, Hongqiao Town, Yueqing Zone, 325608 China. Tel: +86 (577) 6131 5338; Fax: +86 (577) 6131 5329.*
(Source: www.madeinchina.com)

FOAMS

Styrofoam plant converted to zero-ODP foaming agent technology

In the United States, Dow Chemical Company has succeeded in converting its first facility that manufactures Styrofaom™ brand insulation in Dalton to its new zero ozone-depleting, no-VOC foaming agent technology. The building industry has been watching closely to see when manufacturers will convert and how quickly they will be able to get new product into the supply chain.

Dow developed its next-generation foaming agent technology well in advance of the Montreal Protocol and United States Environmental Protection Agency guidelines, and is on track to convert its facilities before 1 January 2010, in accordance with the Montreal Protocol. Dow's new proprietary technology delivers the same Styrofoam Extruded Polystyrene (XPS) foam insulation (R-5/inch insulation value), with an even "greener" choice to builders designing energy-efficient homes and buildings with rigid foam insulation.

The manufacture of extruded polystyrene foam insulation at the Dalton facility relies on methane gas from a nearby landfill to reduce the amount of fossil fuels typically consumed during production. When properly installed in buildings, production capacity at Dalton of Styrofaom brand insulation could save carbon dioxide emissions equivalent to: planting 700,000,000 trees; taking 83,000 cars off the road for a year; reducing vehicle travel by 1.4 trillion miles; or saving petrol worth approximately US$140 billion. *Contact: Mr. Jan McKinnon, Dow Chemical Company, Dow Chemical Company, 1425 Vidal Street South, P.O. Box 3030, Sarnia, Ontario N7T 8C6, Canada. Tel: +1 (519) 339 3131; E-mail: jmckinnon@dow.com.*
(Source: news.dow.com)

Low-GWP liquid blowing agent for foam insulation

Honeywell Specialty Materials, based in the United States, has announced that it is developing a new blowing agent with low global warming potential

for energy-efficient polyurethane foam (PU) insulation. The new blowing agent being developed is a non-inflammable liquid that will help customers reduce the overall environmental impact of foam. Honeywell expects the blowing agent will offer performance benefits comparable to those of other fluorocarbons, but with a low GWP that is less than 15. In addition, the blowing agent will have an atmospheric lifetime of just a few days. These properties are expected to result in lower greenhouse gas emissions impact on the environment while also providing the foam's high insulation performance, dimensional stability and compressive strength.

The new blowing agent will provide customers with an efficient alternative to hydrocarbons and traditional hydrofluorocarbons in PU foam production. PU foam is primarily used as a cost-effective and highly energy-efficient insulation for appliances and homes, and for commercial roofing systems. *Contact: Ms. Nina Krauss, Honeywell Specialty Materials, 101 Columbia Road, Morristown, NJ 07960-4640, United States of America. Tel: +1 (973) 455 4253; E-mail: nina.krauss@honeywell.com.* (Source: www.foxbusiness.com)

Thermoplastic foam production process

Cryovac Inc., the United States, has patented a thermoplastic foam production process that consists of: (1) melting a thermoplastic polymer to produce a polymer melt; (2) introducing a carbon dioxide blowing agent into the polymer melt; (3) adding to the polymer melt one or more additives selected from the group consisting of polysiloxane and mineral oil; and (4) extruding and foaming the melted polymer melt, blowing agent, and one or more additives to produce thermoplastic foam. The resultant thermoplastic foam can be thermoformed into various foamed articles, such as foam packaging trays.

The quality of foams made from a carbon dioxide (CO_2) blowing agent has been found significantly improved by adding one or more of polysiloxane, mineral oil and, optionally, polyolefin additives to the polymer melt during the extrusion and foaming process. Such foams have far less ruptured cells, surface cracks and corrugation than comparable foams made with a CO_2 blowing agent but which lack the additives of the present invention. The improvements of the present invention are particularly significant when 100 per cent CO_2, as opposed to a blend of CO_2 and a conventional aliphatic or halogenated blowing agent, is used. *Contact: Cryovac Inc., P.O. Box 464, Duncan, South Carolina, 29334-0464, United States of America*. (Source: www.freepatentsonline.com)

Fourth-generation blowing agents to replace HFCs

French chemicals company Arkema is in the process of developing hydrofluorolefins (HFO), fourth generation blowing agents to replace hydrofluorocarbons (HFCs), which are becoming increasingly regulated for some applications because of their global warming potential (GWP) values (1300 for HFC-134a and 950 for HFC-245fa). The company says the next generation HFOs will enjoy a better environmental performance, while maintaining excellent general properties including insulation properties for rigid polyurethane foams. Arkema is expected to launch newly developed series of zero ozone depletion potential (ODP) and low GWP blowing solutions shortly. These blowing agents are said to feature a blowing efficiency similar to HFCs and hydrocarbons, and provide improved dimensional stability and a major advantage on k-factor. (Source: www.plastemart.com)

Second-generation PET foam

AIREX T92 is a reformulated and "significantly improved" core material based on PET foams AIREX T90 and T91 – from Alcan Composites in the United States – used in a range of products such as wind turbine blades, trains, boats and industrial applications. It will replace AIREX T91 and be used for a wide range of structural sandwich applications. The second generation core material is aid to be lighter while being stronger and stiffer than the T91. According to Alcan, the real break-through is the increased shear elongation and hence damage tolerance. With a shear elongation at break of 15 per cent, AIREX T92 offers an increased damage tolerance in the range of well proven polyvinyl chloride foams. It is compatible with all common resins and production processes up to 150°C showing neither shrinking nor out-gassing. (Source: www.reinforcedplastics.com)

FUMIGANTS

Study seeks to control potato cyst nematode

In Shropshire, the United Kingdom, five potato growers are taking part in trials to find out whether mustard grown as a biofumigant crop could help to control potato cyst nematode. The research by Harper Adams University College is funded by the Potato Council. Simultaneous laboratory studies at the University of Leeds will test the potency of different mustard varieties. Crop protection and agronomy company Agrovista is also helping with the project.

The growers planted 2 ha trial plots of Caliente 99 mustard seed last August and September. It will be flailed, worked into the soil and sealed by rollers, and left for a period of at least 14 days before potato planting this spring. Potato cyst nematode egg numbers will be recorded at each stage. When chopped, mustard produces isothiocyanates, similar to the active ingredients in some chemical soil sterilants. When over-wintered, the crop has further potential benefits such as reduction in nitrogen leaching and soil erosion, and improving the soil organic matter content. (Source: www.hortweek.com)

A methyl bromide substitute

In the United States, University of California (UC) scientists have identified a compound suitable for use as a methyl bromide (MeBr) substitute. The UC compound is comparable or superior to MeBr in efficacy on a molar basis, and has been proved effective in controlling a number of organisms including plant pathogenic fungi, nematodes, and weeds. It is expected to be also effective in the control of soil bacteria and insects. It is effective in the broad variety of application methods used for MeBr including tractor tines or manually in canisters. The UC compound has a higher solubility and lower vapour pressure than MeBr, making it less hazardous to workers. The UC compound is reported to be significantly more photolabile than MeBr, making it very unlikely to be involved in stratospheric ozone destruction. (Source: www.ideaconnection.com)

Insect heat treatment equipment

Unlike methyl bromide (MeBr) treatment, spot insect heat treatment with steam heaters from Armstrong International, the United States, is a cost-effective method of controlling insect outbreaks without having to shut down the entire plant. Portable and permanent heaters use steam to provide quick, on-demand heat treatment that typically costs less per application than chemical treatment.

Armstrong claims heat treatment to be a safe and effective alternative to MeBr fumigation. The insect heat treatment equipment from Armstrong offers:

- Spot infestation treatment without the need for building evacuation;
- Maintenance and/or production continuity during treatment;
- Controlled temperatures safe for electronics and structures;
- Compatibility with needs of organic growers/processors; and
- Exemption from required technicians and government regulations.

Armstrong heavy-duty heating coils are at the heart of both Hot Breath Heaters and Hot Bin Heaters. Both units are available in a wide variety of sizes, output capacities, voltages and material options. Hot Bin Heaters provide an effective way to heat bins, silos and other hard-to-access areas within a food facility. Because the heat is ducted, Hot Bin Heaters can distribute heat to multiple areas from a single heater. Hot Breath Heaters are mounted on a sturdy cart, providing portable on-demand spot heating in any area within a food-processing facility.

All portable heaters are pre-piped and have a temperature regulator, inlet strainer, outlet steam trap, dial thermometer, manual motor starter, as well as easy-rolling locking wheels. Hot Breath Heater is also available as a permanent mount unit. *Contact: Armstrong International, 816 Maple Street, Three Rivers, Michigan, MI 49093, United States of America. Tel: +1 (269) 273 1415; Fax: +1 (269) 278 6555; E-mail: marketing@armstronginternational.com.* (Source: www.armstrong international.com)

Drip-applied herbicides and metam potassium

Field trials were conducted to determine the efficacy of pre-emergence herbicides and metam potassium (metam-K) on density of a mixed stand of *Cyperus esculentus* and *Cyperus rotundus* in tomato (*Solanum lycopersicum* L.). Treatments consisted of a combination of doses and application methods of the herbicides napropamide + S-metolachlor (2.3 + 1.5 kg a.i./ha) and S-ethyl dipropyl(thiocarbamate) or EPTC (4.0 kg a.i./ha), as well as the presence or not of drip-applied metam-K (400 kg a.i./ha). A non-treated control and a grower standard (methyl bromide + chloropicrin) were added.

Results indicated that drip-applied EPTC was injurious to tomato, while the drip-applied combination of napropamide + S-metolachlor was ineffective against the weed. The best combinations were obtained with bed top applications of napropamide + S-metolachlor or EPTC followed by metam-K, which provided similar levels of *Cyperus* control and tomato yields to plots treated with methyl bromide + chloropicrin. *Contact: Dr. Bielinski M. Santos, Gulf Coast Research & Education Centre, University of Florida, Balm, Florida, United States of America. E-mail: bmsantos@ufl.edu.* (Source: www.sciencedirect.com)

Soil solarization as an alternative to methyl bromide

Mr. Giovanni Iapichino and co-researchers from the University of Palermo, Italy, have compared the effects of soil solarization and methyl bromide (MeBr) fumigation on the growth and yield of strawberry plants (*Fragaria xananassa* Duch.) cultivated under plastic tunnel conditions. The study was conducted in a Mediterranean coastal area, in four consecutive annual production cycles in a field with no history of MeBr fumigation and 2-year history of strawberry production. In all four years, solarization was conducted for 7 to 9-week intervals from late June to early September. Cultivar Tudla frigo plants were planted through mulch in the first week of September of each year. The average daily soil temperatures in solarized plots measured at 15 cm depth were 6.0, 8.1, 7.8, and 8.4 °C higher than the control, during the summer of 2001, 2002, 2003 and 2004, respectively. Solarization produced 781, 610, 630 and 525 hours above 37°C at 15 cm depth during the first, second, third, and fourth year, respectively.

In the first year, solarization significantly increased both early and total marketable yields by 15 per cent compared with the fumigated plots, whereas in the successive years, solarization and fumigation were equally effective in increasing yields when compared with untreated plots. Significant differences in average fruit weight were not observed between solarized and fumigated plots in individual years. The study demonstrated that the Mediterranean coastal areas have appropriate environmental conditions to apply soil solarization in strawberry planting as a viable substitute to methyl bromide fumigation. *Contact: Mr. Giovanni Iapichino, Dipartimento di Agronomia Ambientale e Territoriale, Sezione di Orticoltura e Floricoltura, Universita di Palermo, Palermo, Italy.* (Source: www.informaworld.com)

Alternative technology platforms

ammonia21.com

ammonia21.com is a commercial website that aims to foster the worldwide use of ammonia (also known as R-717) in industrial and commercial refrigeration, chilling and other applications. It provides details about commercially available ammonia-based technology.

hydrocarbons21.com

hydrocarbons21.com is a commercial website that aims to support the worldwide use of hydrocarbon (HC) refrigerants in cooling, refrigeration, and heating. It includes details about commercially available HC technology and provides an interactive tool to connect with the global HC community. It also carries information about the latest developments regarding the use of HC – including propane, isobutane and propylene – as natural refrigerants. Some of the HC technologies featured on this site are replacements for HCFCs.

R744.com

R744.com is a commercial website that covers "Everything R744" – in mobile air-conditioning, refrigeration, heat pumps and many other applications.

RECENT PUBLICATIONS

Air-Conditioning and Refrigeration

This publication helps one understand today's cooling and climate control systems so expertly that one can use it as the foundation for a career in the sector. Lucid instruction – with over 800 photographs and illustrations – offer step-by-step guidance to learning the trade for students, professionals and homeowners who want to do their own installations or repairs. *Air-Conditioning and Refrigeration* has all the task-simplifying details one would need for any project. This complete guide would be a valuable tool for anyone who needs clear, illustrated, step-by-step instructions for efficient, cost-effective and current methods in choosing, installing, maintaining, troubleshooting, servicing and repairing today's air-conditioning and refrigeration equipment.

Contact: The McGraw-Hill Companies, Returns Department, 7500 Chavenelle Road, Dubuque, IA 52002, United States of America. Tel: +1 (877) 833 5524; Fax: +1 (614) 759 3749; E-mail: pbg.ecommerce_custserv@mcgraw-hill.com.

Air-Conditioning Design Manual

This updated manual bridges the gap between engineering theory and practical application in air-conditioning. It was first published in 1993 to assist entry-level engineers designing air-conditioning systems. The update includes new materials that deal with design process, indoor air quality and green design. Changes to the guide include the addition of information on: (1) the various stages of the design process and the role of HVAC&R systems design in each stage; (2) the commissioning process; (3) indoor air quality; and (4) green design for HVAC systems in high-performance buildings.

Contact: ASHRAE Customer Service,1791 Tullie Circle NE, Atlanta, Georgia, GA 30329, United States of America. Tel: +1 (404) 636 8400; Website: www.ashrae.org/bookstore.

TECH EVENTS

27-29 Aug
HCM City
Viet Nam

RAHV Vietnam
Contact: Top Repute Co. Ltd.
Rm. 2403, Fu Fai Commercial Centre,
No. 27, Hillier Street,
Sheung Wan,
Hong Kong.
Tel: +852 28518603;
Fax: +852 28518637;
E-mail: topreput@top-repute.com.

7-11 Sep
Bangkok
Thailand

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

10-13 Nov
San Diego
United States

2009 Annual International Research Conference on Methyl Bromide Alternatives & Emissions Reductions
Contact: Methyl Bromide Alternatives Outreach,
6556 N. Dolores Avenue, Fresno,
California CA 93711,
United States of America.
Tel: +1 (559) 449 9035;
Fax: +1 (559) 449 9037;
E-mail: gobenauf@agresearch.nu;
Website: www.mbao.org

14-17 Sep
New Jersey
United States

2009 FOAMS Conference & Tutorial
SPE Event Management,
Society of Plastics Engineers,
14 Fairfield Drive,
Brookfield, CT 06804-3911,
United States of America.
Tel: +1 (203) 740 5452;
Fax: +1 (203) 740 5403;
E-mail: conferences@4spe.org.

14-19 Oct
Jakarta
Indonesia

AIRCON INDONESIA 2009
Contact: PT. Pamerindo Buana Abadi,
Deutsche Bank Building, 13th Floor,
Jalan Imam Bonjol No. 80,
Jakarta 10310,
Indonesia.
Tel: +62 (21) 316 2001;
Fax: +62 (21) 316 1981;
E-mail: info@pamerindo.com.

10-13 Nov
San Diego
United States

2009 Annual International Research Conference on Methyl Bromide Alternatives & Emissions Reductions
Contact: Methyl Bromide Alternatives Outreach,
6556 N. Dolores Avenue, Fresno,
California CA 93711,
United States of America.
Tel: +1 (559) 449 9035;
Fax: +1 (559) 449 9037;
E-mail: gobenauf@agresearch.nu.

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BOOKS

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❑ 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.*