VATIS Update Ozone Layer Protection . Sep-Oct 2003

Contents

THE SCIENCE OF OZONE LAYER

Ozone layer recovery begins

Recent observations by NASAs first and second Stratospheric Aerosol and Gas Experiment as well as the Halogen Occultation Experiment (HALOE) satellite instruments have found less ozone depletion in the upper stratosphere after 1997. This scenario is thought to be an indication of the first stage of ozone layer recovery. The decrease in the rate of ozone depletion is consistent with the decline in the atmospheric abundance of human-made chemicals containing chlorine and bromine, as documented by satellite, balloon, aircraft and ground-based measurements. Prof. Mike Newchurch, lead researcher of the study, opines that total ozone recovery is still decades away.

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Website: www1.nasa.gov

New tool for data collection

A Canadian environmental satellite, SCISAT, has been launched to help researchers assess ozone layer recovery. Two specialized on-board devices will collect data on the chemistry of the ozone layer, which shields earth from the suns harmful ultraviolet rays. The MAESTRO gadget measures precise concentrations of ozone, examining the chemical process at work under ozone holes and near major sources of pollution, while ACE-FTS is an infrared equipment for measuring temperature, trace gases and aerosols through the upper and lower atmosphere at sunset and sunrise. This two-year mission will enable researchers from Canada, the United States, Belgium, Japan, Sweden and France to learn more about the distribution of ozone.

Website: www.globeandmail.workopolis.com

Study explains Northern Hemispheres ozone peak

In the United States, researchers at NASA, the National Centre for Atmospheric Research and various universities have clarified the process by which ozone reaches its peak each spring across North America. The new findings are based on a comprehensive study that links computer models with airborne measurements of gases, particles and ultraviolet radiation. The Tropospheric Ozone Production about the Spring Equinox, or TOPSE, experiment set out to explain the cause of ozone levels peaking about 1.6-8 km above Canada and United States of America as springtime nears. Researchers discovered that ozone peaks as a result of seasonal intrusions of ozone-rich air from the stratosphere above as well as formation of ozone through photochemical

effects of the intensifying spring sun. It was found that photochemical effects dominate in the winter-to-spring ozone raise while stratospheric sources account for a fraction of the observed ozone abundance.

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Antarctic hole heading for record size

Australian researchers sited in Antarctica report that the 2003 ozone hole may exceed the record set three years ago. The reason attributed for this development is colder temperatures in the stratosphere, where the ozone hole forms. The team observed the first signs of cooling of the lower stratosphere, 15-25 km up, about six weeks earlier than usual. Researchers opine that, as a visual sign, the ozone hole would grow rapidly this year. The full extent of this years ozone hole will not be known until the end of September, as August and September are the coldest months for the South Pole.

Website: www.alertnet.org

Hopeful news about ozone

In the United States, researchers from Hampton University and NASA Langley Research Centre have stated that ozone depletion is decreasing in the highest levels of the atmosphere. This development could probably be attributed to the phasing out of chemicals used in refrigerants and aerosol sprays. The team cautions that these effects had been found only in the uppermost stratosphere, about 34-45 km above the ground. About 80 per cent of the ozone layer exists in the lower atmosphere, 19-34 km up.

Website: www.dailypress.com

ODS PHASE-OUT IN INDIA

Ecomark criterion for aerosol propellants

Manufacturers of aerosol propellants can get their products approved for the Ecomark label by conforming to the following requirements:

Propellants used in aerosol products shall meet the relevant standards of the Bureau of Indian Standards (BIS) pertaining to safety, quality and performance;
The manufacturer must produce the consent clearance as per provisions of the Water (Prevention and Control of Pollution) Act 1974 and Air (Prevention and Control of Pollution) Act 1981 along with the authorization, if required under Environment (Protection) Act 1986 and the rules made thereunder, to BIS while applying for Ecomark;
The product package shall be suitably marked that the Ecomark label is applicable only to the propellants used in aerosol sprays, if the product package is not separately covered under the Ecomark scheme;
Product package or leaflet accompanying it shall display instructions of proper use, storage and disposal so as to maximize the product safety and performance, while minimizing wastage;
The material used for product packaging shall be recyclable or biodegradable; and
The propellants shall not contain any ODS as identified under Annexes A and B of the Montreal Protocol.

Website: www.cpcb.delhi.nic.in

Funds to aid CTC phase-out

The Montreal Fund has sanctioned US$52 million to help India completely phase out the production and consumption of carbon tetrachloride (CTC), a toxic chemical used in refrigeration liquids, fire extinguishers, aerosols, solvents, etc. The funding will be provided based on payment schedules linked to annual work programmes, the details of which are being worked out between India, the fund secretariat and the implementing agencies. ExCom will approve an agreement on the annual work programmes and payment schedules at its 41st meeting scheduled for December 2003. According to Mr. Richard Abrokwa Ampadu, Officer-in-Charge of the Multilateral Fund Secretariat, First tranche of US$5 million is being released to enable India proceed with a specific priority, elimination of CTC in the consumption sector. India must reduce its CTC consumption by 85 per cent prior to 1 January 2005.

Website: www.financialexpress.com

Environment friendly technology

Using new technology, Rishiroop Organic Ltd. has eliminated the use of carbon tetrachloride (CTC) at its 550 t/y rubber facility. The US$2 million project received financial assistance from the Multilateral Fund. CTC has been substituted with an aqueous process that is based on technology licensed from one of its shareholders, Rishiroop Rubber International Ltd. The World Bank worked in close cooperation with the Indian governments Ozone Cell to mobilize funding.

Website: www.indianngos.com

Indigenous production of HFCs

SRF Ltd. is to establish a new manufacturing facility for hydrofluorocarbons (HFCs), which are ozone friendly replacement gases for CFCs and HCFCs. The companys Board of Directors has approved US$10.76 million for the facility to manufacture HFC-32, with the option to produce HFC-134a. The HFC-32 technology was developed in-house by SRF while the technology for HFC-134a was developed together with the Hyderabad-based Indian Institute of Chemical Technology. The production methods are designed to be most competitive globally. SRF has already captured over 50 per cent of the Indian HFC market by importing the products and selling them.

Website: www.srf-limited.com

IN THE NEWS

ExCom approves funds to phase out ODS

At its 40th meeting, the Executive Committee to the Multilateral Fund for Implementation of the Montreal Protocol resolved to assist 25 developing nations to advance their ODS elimination programmes. India, Mexico, the Democratic Peoples Republic of Korea and Trinidad and Tobago would be provided with nearly US$100 million. While US$52 million provided to India would be utilized to completely phase out production and consumption of carbon tetrachloride, about US$32 million earmarked for Mexico will help the country gradually phase out its CFC production. The Democratic Peoples Republic of Korea and Trinidad and Tobago will also receive financial aid to phase out all of their consumption of CFCs. Overall, funds committed at the 40th meeting will lead to an additional phase-out of around 12,000 t of consumption and 9,000 t of production of ODS.

Website: www.sidsnet.org

Milestone for Article 5 Parties

Article 5 Parties or developing nations, 65 of which have been assisted by UNIDO, have now entered into a more serious phase of commitment to the Montreal Protocol. They have moved past the grace period, distinguished by no control measures, to a compliance period in which they have to achieve specific reductions in national ODS phase-out programmes. By the end of 2000, most Article 5 Parties complied with their commitments to freeze CFC consumption at 1995-97 averages. Now the Parties have to focus their efforts on reducing the consumption and production of CFCs to 50 per cent of their 1995-97 averages by 1 January 2005. The target reduction for carbon tetrachloride (CTC) is 85 per cent and 20 per cent for methyl bromide. The next target date after 2005, reduction in the consumption and production of CFCs by 85 per cent, is due on 1 January 2007 and by 2010 CFCs, CTC and halons will not be produced or used by the Parties. To enable Article 5 Parties fulfil their obligations, the Executive Committee decided to:

Map the compliance need of each country until 2010;
Prioritize funding requests according to the compliance needs; and
Offer increased flexibility to recipient countries in programming and implementing their phase-out programmes.

Two key aspects of the third object are introduction of National and Sectoral Phase-out Programmes (NPPs and SPPs) with multi-year performance-based agreements and a change in the traditional distribution of funds amongst the implementing agencies. NPPs and SPPs mean a departure from stand-alone projects and provide full flexibility to the countries to implement the phase-out programmes in the way they deem appropriate and effective. However, the recipient nations have to bear full responsibility for meeting their performance targets. The implementing agencies will assist in formulation of the programmes and provide technical, policy and institutional strengthening and training support. They will also monitor, verify and evaluate progress and achievements of NPPs and SPPs.

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Website: www.unido.org

World Bank report finds Protocol successful

According to the World Bank Montreal Protocol Status Report released on 16 September, atmospheric ODS would have increased ten-fold by 2050 in the absence of the Protocol. The World Bank and Montreal Protocol: Reducing Health Risks by Restoring the Ozone Layer acknowledges that phasing out ODS in developing nations is crucial to the success of the Protocol. The report further suggests that it is necessary to reduce certain substances by as much as 85 per cent before 2008. Without the Protocols success in reversing the increase of ODS, there would have been nearly 20 million more cases of skin cancer and 130 million eye cataracts, relative to 1980.

About two-thirds of the 180 countries that have ratified the Montreal Protocol are developing nations and countries-in-transition, while the remainder are developed countries. As compliance schedules in developing countries emerge, the status report noted, there is urgent need to reduce CFCs, CTC and halons by 50 per cent by 2005 and to phase them out completely by 2010. Before implementation of the Protocol in 1986, industrialized nations accounted for nearly 82 per cent of the globally consumed 1.1 million tonnes of CFCs. By 1999, developed nations accounted for 84 per cent of the 150,000 ODP tonnes of CFCs consumed globally.

Website: www.ehscenter.bna.com

Green technology for Pakistani refrigerator firm

In Pakistan, a manufacturer of refrigerators has launched CFC-free models in three main cities of the nation Karachi, Lahore and Islamabad. Singer Pakistan Ltd. is the first company in the countrys refrigeration sector to opt for non-ODS technology. The project was implemented with assistance from the Ministry of Environments Ozone Cell and the World Bank. The company has launched an aggressive campaign regarding its green products.

Contact: Mr. Chaudhry Zahoor Sardar, Director, Ozone Cell/NOU, Ministry of Environment, Pakistan. E-mail: ozoncell@comsats.net.pk Or Mr. Atul Bagai, Regional Coordinator (Networking), South Asia Network.

E-mail: bagai@un.org

Website: www.uneptie.org

Ninth International Ozone Day celebration in India

The Ninth International Day for the Preservation of Ozone Layer was celebrated in Mumbai on 16 September 2003. Honble Union Minister of Environment and Forests Thiru T.R. Baalu, presided over the function. Shri Sushil Kumar Shinde, Chief Minister of Maharashtra was the Chief Guest, Honble Union Minister of Petroleum and Natural Gas, Shri Ram Naik and Honble Deputy Chief Minister of Maharashtra, Shri Chhagan Bhujbal were Special Guests of Honour. Other Guests of Honour present were Shri Surup Singh Naik, Minister for Environment and Forests, Government of Maharashtra, Shri Rajesh Tope, Minister of State for Environment and Industry, Government of Maharashtra, Shri Mushtaq Antulay, Chairman, Maharashtra Pollution Control Board. Activities of the Ozone Day were coordinated by the Maharashtra State Pollution Control Board.

The Honble Union Minister for Environment and Forests, Government of India and Honble Chief Minister, Maharashtra inaugurated an exhibition of ozone friendly products and non-ODS technologies. The prize-winning posters, painted by the school children, were also displayed in the exhibition.

To commemorate the Ozone Day, Sky Pirates, a film produced by the United Nations Environment Programme was telecast on the national TV channel Doordarshan, and two TV film spots and special literature aimed at developing awareness among the school children on the need to protect the Ozone Layer were also released. The pledge to make efforts for preservation of the Ozone Layer by way of promoting the use of Ozone friendly substances and restricting and controling of the emission of ODS was administered by the Honble Deputy Chief Minister, Shri Chhagan Bhujal.

Special posters, stickers, calenders, covers and other ozone layer awareness-materials were made available to mark the event. Highlighting the achievements in the implementation of the Montreal Protocol, an advertisement in all regional languages was released in major dailies through out the country.

The Chief Guest and Guests of Honour distributed prizes to the winners of various competitions organized by the Government of Maharashtra to mark this occasion.

Educational products address public health dangers

The World Health Organization (WHO), UNEP and other partners in the Intersun Project launched a set of new educational materials on 16 September 2003, the International Day for the Protection of the Ozone Layer. Every year, there are 2-3 million new instances of non-malignant melanomas and over 130,000 new melanoma skin cancer cases worldwide. The package will help children, their families and educators protect children from the risks of developing malignant as well as non-malignant skin cancers, cataracts and other conditions caused by UV rays. The materials support recommendations made in Sun Protection, an Essential Element of

Health-promoting Schools, a part of the WHO Information Series on School Health. The new package comprises three booklets a guide for schools and teachers on why and how to develop effective sun education programmes, practical teaching materials for primary school students and evaluation materials to assess the effectiveness of primary school sun-education programmes.

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Or

Mr. Gregory Hartl, Communications Adviser, WHO, Geneva, Switzerland. Tel: +41 (22) 7914 458
E-mail: hartlg@who.int

Earth-friendly refrigerators

Two major electrical machinery makers in Japan, Toshiba Corp. and Matsushita Electric Industrial Company, are marketing refrigerators that employ hydrocarbons as the cooling medium. These earth-friendly products are the result of nearly 10 years of diligent efforts after the global environment protection group Greenpeace and a German maker jointly developed green freeze hydrocarbon fridges. Germany, the worlds leader in the research into hydrocarbon refrigerators, has reportedly achieved almost 100 per cent success in the drive to rid refrigerators of CFCs. Scandinavia is also said to have nearly caught up with Germany.

Hydrocarbons adopted by Germany had to face a problem inflammable vapours. Germany and other nations then swiftly turned to isobutane to utilize it as a cooling medium for CFC-free fridges. Japanese manufacturers took time to study and determine isobutanes safety, as there was no safety standard. Isobutanes refrigeration power is 1.8 times that of HFC but at that rate of cooling capacity, the pressure is as low as about one-third that of propane gas when a leakage in one case in a million is taken into consideration. To increase the heat extracting efficiency in combating heavy moisture, Japanese makers install automatic defrosters within the refrigerators and adopt an indirect, forced-cooling circulatory system. Rather than using glass tubes, Toshiba engineers opted for a system in which the heater ran as if it was embracing the condenser to rein in temperatures at 60-90C. Matsushita engineers used a double-cylinder glass radiant defrosting heater to keep temperatures low. They have also ensured that there would be no problems even in the event of a gas leakage inside refrigerators by preventing all parts, including fridge door switches and electric lamps, from causing sparks. Extra care is taken so that even if pipes in the fridge are ruptured, the volume of leakage is kept to a minimum. The new system is 10 per cent costlier than the non-hydrocarbon model.

Website: www.japantoday.com

China to award ozone layer protectors

The 9th International Day for the Protection of the Ozone Layer, which falls on 16 September, will be celebrated in China by awarding organizations, projects and individuals who help protect the ozone layer. Six ozonosphere protection awards will be jointly handed out by the State Environmental Protection Administration (SEPA) and the China Environmental Culture Promotion Association on individuals or organizations committed to protecting the ozone layer. While five awards will be given to those who have made special efforts to protect the ozone layer within the past 12 months, the golden award will be dedicated to an organization or individual who has demonstrated a more long-term commitment. These awards will be issued for the following six consecutive years.

Website: www.china.org.cn

New additions to SNAP list of ODS substitutes

In the United States, EPA has issued a Notice of Acceptability that expands the list of acceptable substitutes for ODS under the Significant New Alternatives Policy (SNAP) programme. The substitutes can be employed in refrigeration and air-conditioning, solvents cleaning, foam blowing, fire suppression and explosion protection, as well as aerosols. The new substitutes include:

R-407C For use in new and retrofit equipment and as a replacement for R-502;
ISCEON 89 For use in new and retrofit equipment as an alternative for R-131b in very low-temperature refrigeration;
RS-44 For use in new and retrofit equipment as an HCFC-22 alternative;
Hydrofluoroether (HFE)-7000 Substitute for methyl chloroform and CFC-113 in the precision cleaning and electronics cleaning end uses. It can even be used as a replacement for methyl chloroform, CFC-113 and HCFC-141b in the aerosol solvent end use;
Ecomate Substitute for CFCs and HCFCs for foam blowing;
Hydrofluorocarbon (HFC)-245fa Substitute for all HCFCs in foam blowing; and
HFC-125 with 0.15 per cent d-limonene (NAF S-125) As a substitute for halon-1301 in the total flooding end use in both normally occupied and unoccupied spaces.

Contact: Environment Protection Agency, United States of America.

Website: www.epa.gov

Website: www.uneptie.org

ODS solvent phase-out in China

A contract for consumption phase-out of ODS solvent in the Umbrella Programme for Phase-out of ODS in Chinas Solvent Sector (simplified as SSP) was signed in Beijing. Following the principles of SSP, and using bidding, the enterprises that consume ODS solvent actively and willingly participated in the phase-out activities to ensure effective use of the granted funds. The bidding documents were evaluated strictly and confidentially in two steps, following the principles of openness, fairness and justice. After examining the completeness of the bidding documents submitted by the enterprises, the maturity of the alternative technology proposed and the rationale of the implementation approach were analysed. Following this, the completeness and relevance of the certificates provided by the bidders, and each bidders business situation and prices were examined, to finally select the top 35 enterprises as the bid winners. The project execution period is 18 months from the date of signing the contract, during which the enterprise should, under the guidance of the technical specialists, complete the phase-out of ODS solvent and substitution of equipment by using the granted funds and a part of its own investment for matching the project according to the implementation approach. After finishing the contract project, the enterprises should no longer use any kinds of ODS solvents.

Website: www.ccetca.com

REFRIGRATION/AIR-CONDITIONING

Eco-friendly refrigerators

In the Republic of Korea, LG Electronics Inc. has launched a new range of high-powered refrigerators that are environment-friendly and energy-efficient. The new two-door Linear DIOS refrigerators are based on the so-called linear technology, a set of environmentally friendly solutions that minimizes the emission of pollutants and reduces energy consumption and noise. A linear compressor can lower electricity consumption by more

than 30 per cent. This system uses R-600a, a natural refrigerant, and cyclopentane, a next-generation blowing agent.

Website: www.koreaherald.co.kr

Magnetic materials for refrigeration

In Japan, Tohoku University has developed new magnetic refrigerant materials that exhibit a first-kind magnetic transition, or metamagnetism, in applied magnetic fields. Associated with sharp magnetic changes vs. temperature and magnetic field owing to the first-kind magnetic transition, La(Fe100-xSix)13 compounds exhibit large values of the change in magnetic entropy as well as the change in adiabatic temperature. These large values are closely correlated to the metamagnetic transitions, and large magnetocaloric effects are obtainable in relatively low magnetic fields produced by hard magnets such as Nd-Fe-B. Additionally, elements in the developed materials are cheap and, unlike CFCs, completely inoffensive to the natural environment. The working temperature of the new materials is easily controlled from -85C to 60C by adjusting the hydrogen content, since La atoms have a strong affinity with hydrogen.

Website: www.jsme.or.jp

New heat pumps

Ronnie Lim Consultants, Singapore, offers Colmac-Sol-Air air-to-water heat pumps, which operate on the same principle as domestic air-conditioners but with reversed function. The heat pump takes in heatfrom the surrounding air. R-134a, in proprietary double-walled tubes (to separate refrigerant from potable water), is compressed and heated, which in turn heats the potable water that it surrounds in the coaxial copper tube assembly. A 0.5 m3 Colmac-Sol-Air heat pump can deliver 18,000 l of 60C hot water per day, while consuming 5.1 kW of electricity.

Contact: Ronnie Lim Consultants, 66, Bayshore Road, #25-05, Singapore 469985. Tel: +65 6241 2148; Fax: +65 6242 7148

E-mail: ronnie@singnet.com.sg

Website: www.c-sol-air.com

Website: www.neec.gov.sg

Centrifugal chiller

Haier Group of China has developed a 2,000 RT centrifugal chiller adopting HFC-134a. The system ensures optimum operation by means of a remote monitoring system that continuously monitors the units operational conditions. Centrifugal chillers are large systems that are presently being manufactured by only a few companies based in the United States, Japan, the Republic of Korea, etc.

Website: www.videolife.kiev.ua

Cooling system based on helium

Twinbird Corp., Japan, has successfully developed a compact Free Piston Stirling Cooler (FPSC) with assistance from Global Cooling BV. FPSC-TB40 has significant differences to the conventional Rankine compressor or Peltier (thermoelectric) module type of refrigeration systems. The cooling method is based on the Stirling cycle for maximum efficiency. It is compact, lightweight and can be operated on different power

sources, such as AC or DC electricity and photovoltaics (solar battery). Key features of the system include:

Rapid cooling to deep temperature;
Precise temperature control (1C);
Energy saving; and
Environmentally friendly (CFC-free).

Up to -20C can be achieved in a small-sized freezer with one FPSC whereas it may be difficult to reach such temperatures with conventional Rankine compressors. Under no-load conditions, -50C can be obtained in about two minutes at an ambient temperature of 25C. While the casing is fabricated using stainless steel, naturally occurring helium gas is used as the working gas. TB40 has a maximum lift of 40 W and a COP of about 1.2 at -23.3C on cold side and 35C on warm side. The FPSC is most suitable for small counter-top freezers/refrigerators, cooler boxes for outdoor use and car use.

Contact: Mr. H. Fujino/Mr. K. Sone, SC Business Development Operations, Twinbird Corp., 2084-2, Nishi Ohta, Yoshida Machi, Nishi Kanbara Gun, Niigata 959 0292, Japan. Tel/Fax: +81 (256) 926 160/927 521.

Website: www.twinbird.jp

Ultra-low temperature cascade system

In Japan, Mayekawa Mfg. Co. and Kansai Electric Power Co. have jointly developed the worlds first ultra-low temperature cascade system employing the natural refrigerants carbon dioxide (CO_2) and ammonia (NH_3). This eco-friendly system utilizes CO_2 in the low-temperature side and NH_3 in the high-temperature side. It offers efficiencies above COP 1.2 under -55C of evaporating temperature, up 20 per cent than existing refrigeration systems for ultra-low temperature region. Power condenses CO_2 in the low-side system by the latent heat of evaporation of NH_3 refrigerant in the high-side system, and adopts oil injection type middle/large screw compressors in the heart of both low- and high-side systems. Excelling in durability and load follow-up performance, these compressors have been widely adopted for industrial applications. Concentration of oil in CO_2 vapour has been limited to less than 0.01 ppm by incorporating a multi-stage oil separator on the discharge side of low-side CO_2 compressor, thus making it possible not to have lubricating oil stay in the evaporator even around -56C, allowing the evaporator to fully exhibit heat transfer performance.

Furthermore, the low-side temperature CO_2 is conveyed to the product line side (to be refrigerated) in a refrigerated warehouse or food processing factory.

Contact: Mayekawa Mfg. Co. Ltd., 2-13-1, Botan, Koto-ku, Tokyo 135 8482, Japan. Tel: +81 (3) 3642 8181; Fax: +81 (3) 3643 7094

Website: www.mycomj.co.jp

New hermetic scroll chiller

In Japan, Mayekawa Mfg. Co. Ltd. and Hitachi Air-conditioning System Co. Ltd. have jointly developed a refrigerating and air-conditioning hermetic scroll chiller packaged unit. MYCOROLL is suitable for small-scale cold storage facilities, supermarket and convenience store showcases, low-temperature air-conditioning for food handling chambers in cold storages, and general medium-scale air-conditioning applications ranging between 5 and 15 kW and up to 5.49 USRt (below 5 JRt) or rated refrigerating capacity. Suitable for use with the natural refrigerant ammonia, MYCOROLL is based on individual technologies of Hitachi and Mayekawa and results from their collaboration.

Scroll compressors are most suitable for high revolution speed, 2-pole direct coupling operation (3,600 rpm at 60 Hz). Taking into account the scroll compressors winding coil corrosion resistance in the presence of ammonia and its high reliability into consideration, Mayekawa opted for a high-efficiency semi-hermetic can-less motor as the key component in MYCOROLL. Some features of the semi-hermetic can-less motor include:

Advanced design provides a motor efficiency on par with a conventional open-type motor;
The stator, insulation material and terminals are all ammonia-proof materials to assure durability;
By mounting the terminals on the motor casing, savings in manufacturing cost as well as compactness have been achieved; and
Temperature inside the motor is very low even under operating conditions of the rated output.

Contact: Mayekawa Mfg. Co. Ltd., Cooling System Group, Japan. Tel: +81 (297) 459 346; Fax: +81 (297) 459 348.

Website: www.mycomj.co.jp

New cooling systems

Mayekawa Mfg. Co. Ltd. of Japan has developed a -100C cooling system for milling rubber and plastics. This low-cost and eco-friendly alternative to cooling with liquefied nitrogen combines ethane and ammonia, both natural refrigerants, with brine in a cascade cooling system. In the pilot-scale unit, ethane and brine are used in the low stage and ammonia in the high stage. Plate heat exchangers are employed and a limited, optimized refrigerant charge is used to realize evaporation temperatures as low as -100C. Brine is used as a secondary refrigerant to cool rubber. A jet-flow type freezer (cooling room at -87C) cools the used tyres and plastics below the glass temperature. Brine also cools the milling machine in order to prevent the materials from melting during the milling process.

The company has also developed a building air-conditioning unit with CO2 as the refrigerant. This system makes use of late-night electricity (partially combined with daytime electricity) as the driving source. The simple configuration combines a CO2 brine chiller package and ice thermal storage tank. Compared with the brine chiller package using ammonia, another natural refrigerant, this chiller package is compact with regard to both installation area and volume. Adoption of the oil injection rotary screw type high-performance CO2 compressor featuring high-speed (2,950 rpm) and high-pressure (design pressure 9.8 MPa), single-stage compression at normal temperatures has been feasible with the cooling technology and engineering in the supercritical pressure area, thus allowing the system to function as a brine chiller with simple CO2 cycle configuration. This unit has a refrigerating capacity of 40 USRt.

Contact: Mayekawa Mfg. Co. Ltd., MYCOM Tokyo Overseas Planning Department, Japan. Tel: +81 (3) 3642 8088; Fax: +81 (3) 3643 7094

E-mail: kaisouki@mycomj.co.jp

Website: www.mycomj.co.jp

New range of driers

Boge Compressors offers a range of compact and economical refrigerant compressed air driers to prevent condensation and subsequent corrosion in compressed air pipework and consistently deliver high-quality dry

air with a typical pressure dew point of 3C. Low-pressure differential across the drier cuts running costs by making excessive air compression unnecessary. The Boge DB refrigerant drier range uses nearly 70 per cent less coolant than traditional types of refrigerant drier. Filled with R-134a, these driers have flow capacities in the range of 0.167-27.5 m3/min, within a range of 25 different models. Power consumption is as low as 0.13 kW for the DB1 and only 0.88 kW for the DB50. From the DB15 model onwards, a multifunctional electronic display provides data on the pressure dew point, relative humidity at the drier outlet and details of any malfunction.

Contact: Boge Compressors, Rastrick Common, Brighouse,West Yorkshire HD6 3DR, United Kingdom. Tel: +44 (1484) 719 921; Fax: +44 (1484) 712 516.

Website: www.engineeringtalk.com

SOLVENTS

Ozone-friendly fluoro-surfactant

Daikin, Japan, has initiated commercial production of an ozone-friendly fluoro-surfactant. The new-generation product does not contain chlorine. Endowed with excellent flow, levelling, wetting and penetration traits, the fluorochemical surfactant finds wide use as a cleaning agent in the production of semiconductors and electronic components. Originally developed at RITE, Hydrofluoroether-S7 (HFE-S7) has the potential to replace its HCFC-based predecessors by virtue of:

Zero ODP;
Incombustibility;
Superior rinsing characteristics;
Reduced surface tension;
Lower levels of latent heat of vaporization, at less than tenth that of water; and
Compatibility with most metals, plastics and rubber.
HFE-S7 is ideal for use in the rinsing, steam cleaning and steam drying processes in LCD or optical lens production.

Contact: Daikin, Japan.

E-mail: takao.watanabe@daikin.co.jp

Website: www.ibpcosaka.or.jp

Non-chlorinated industrial cleaning solvents

SIS Chemicals, the United Kingdom, has introduced a range of non-chlorinated and non-VOC industrial cleaning solvents. The New Era line of solvents combine outstanding industrial cleaning performance with unique environmental benefits to comply with current legislations. These substitutes for trichloroethylene contain highly efficient PURASOLV lactate esters and a powerful combination of the non-VOC PURASOLV Ethyl Hexyl Lactate (EHL) and FORANE 365 HX. Most New Era solvents are also biodegradable, provide optimum toxicological properties and include a non-VOC option. Developed for a variety of solvent cleaning applications, including for use in enclosed and modular systems, and cold cleaning, the New Era range is suitable for a wide variety of market applications including aerospace, aeronautic, electronics, medical, motor and pharmaceutical. The New Era range includes:

PURASOLV EHL is the only non-VOC for solvent cleaning and residue-free drying.

Enhanced Solvent combines the superior solvency of PURASOLV EHL with the rinsing and solvent vapour drying properties of FORANE 365 HX to provide superb cleaning results.
PURASOLV ethyl lactate (EL) provides outstanding solvency power and is suitable for cold cleaning applications and formulations. Approved as a food additive.
PURASOLV butyl lactate (BL) and PURASOLV normal propyl lactate (NPL) for use in cold cleaning formulations. Approved as food additives.

Contact: SIS Chemicals, Linden House, No. 1 The Square, Pennington, Lymington, Hampshire S041 5GN, United Kingdom. Tel: +44 (1590) 674 202; Fax: +44 (1590) 679 505.

Website: www.manufacturingtalk.com

New cleaning solvents

Miller-Stephenson Products, Canada, offers new precision-cleaning solvents and contact cleaners. Intended for cleaning light contaminants and oils, the non-inflammable safezone precision cleaning solvents MS-941/CO2 (16 oz aerosol) and MS-943 (Qt, G, 5G, 55G) are suitable for use in critical cleaning applications in electronics, aerospace, military and communications for electronic parts, circuits, precision instruments, electrical contacts, relays and switching devices. They are non-conductive, evaporate quickly and do not leave behind any residues.

Safezone cleaning solvents MS-944/CO2 (16 oz aerosol) and MS-946 (Qt, G, 5G, 55G) are strong non-inflammable solvents ideal for oils, flux, ionic salts and particulates. They are similar in application to MS-941 with the enhanced solvency power of a stronger solvent, and safe for use on reactive metals such as aluminium and zinc. Vertrel XF cleaning agents MS-780 (16 oz aerosol), MS-780M (8 oz aerosol) and MS-782 (4 oz, 8 oz, Qt, G, 5G, 55G) are very mild, non-inflammable solvents with excellent compatibility with most plastics. Typical applications include cleaning and rinsing, drying, particulate removal, fluorocarbon lubricant carrier, heat transfer and replacement for many PF, HCFC and CFC-113 uses. Vertrel MCA cleaning agents MS-750 (16 oz aerosol) and MS-752 (4 oz, 8 oz, Qt, G, 5G, 55G) are non-inflammable azeotropes of Vertrel XF with trans-1,2-dichloroethylene. Their enhanced solvency power, compared with Vertrel XF, make them particularly effective for difficult soil conditions. They can replace 1,1,1-trichloroethylene and HCFCs in many applications.

The contact cleaners include:

Contact Re-Nu MS-730 (16 oz aerosol), MS-730M (8 oz aerosol), MS-730SP (4 oz aerosol) and MS-732 (4 oz, 8 oz, Qt, G, 5G, 55G) Odourless cleaning agents that restore mechanical and electrical continuity with all types of contacts including connectors, relays, distribution panels, rheostats, servomechanisms and switching devices. The safe, non-inflammable blend contains a hydrofluoroether and does not leave any residue.
Safezone contact Re-Nu MS-930/CO2 (16 oz aerosol) and MS-932 (Qt, G, 5G, 55G) Non-inflammable and evaporate quickly without leaving behind any residues.
Contact Re-Nu and Lube MS-738 (16 oz
aerosol), MS-738M (8 oz aerosol), MS-738SP (4 oz aerosol) and MS-739 (4 oz, 8 oz, Qt, G, 5G, 55G) Non-inflammable, plastic-safe, cleaning and lubricating agents that restore electrical and mechanical continuity with all types of contacts and switches. They contain a high-performance fluorinated synthetic oil in a HFE solvent.
Safezone Contact Re-Nu and Lube MS-938/CO2 (16 oz aerosol) and MS-939 (Qt, G, 5G, 55G) Contain a fine hydrocarbon oil for restoring
electrical continuity and lubricating moving parts. Non-inflammable and excellent for cleaning and lubricating switches, relays, distribution panels and servomechanisms.

Contact: Miller-Stephenson Products, 514, Carlingview Drive, Rexdale, Ontario M9W 5R3, Canada. Tel: +1

(416) 6753 204; Fax: +1 (416) 6742 987

E-mail: support@miller-stephenson.com

Website: www.miller-stephenson.com

New technology to clean motion picture films

Eastman Kodak Co., the United States, has been awarded the 2003 Stratospheric Ozone Protection Award by EPA for developing Particle Transfer Roller (PTR) technology, employed for cleaning motion picture films. PTR is a specially moulded soft polyurethane roller that captures dirt and dust through contact adhesion without the use of solvents. This new method eliminates the use of 1,1,1-trichloroethane for particulate removal. PTR film cleaners remove dirt and dust from film on-line during conventional film printing and projecting operations. As the film gently glides over the PTR, dirt and dust stick on to the roller, thus protecting picture film quality.

Website: www.kodak.com

New cleaner for power cable jointing work

Furukawa Electric, Japan, is offering a non-CFC cleaner for power cable jointing works. The FC-WIPER is used for cleansing oily stains during power cable jointing works. It is supplied as non-woven cloth sheets soaked with appropriate quality of non-CFC solvent. The cleaner sheets are packaged, like wet paper tissues, in an envelope, which incorporates a sealing fastener serving as the dispenser. Excellent qualities of this cleaner have been demonstrated by the high cleansing ability in cable jointing works in addition to a positive proof that the cleaner causes no degradation in the electrical performance of the cleansed cables. Moreover, the cleaners flashpoint is as high as 60C, assuring the safety of cable jointing works in confined working space such as manholes.

Cleaner sheets are sold by the carton containing 50 packs made of aluminium-laminated material. Each pack contains 15 cleaner sheets.

Contact: The Furukawa Electric Co. Ltd., 6-1, Marunouchi 2-chome, Chiyoda-ku, Tokyo 100, Japan. Tel: +81 (3) 3286 3001; Fax: +81 (3) 3286 3747/3748

Website: www.furukawa.co.jp

FOAMS

Co-extruded PP foam

Sentinel Products Corp., the United States, is offering a co-extruded PP foam sheet with a low-density core and solid skins. The combination of an annular die with physical blowing agents used to manufacture the co-extruded PP foam enables a low-density core with the foam sheet being as stiff as steel. A 5 mm sheet with 5 pcf foam constituting 30 per cent of its thickness has a flexural modulus exceeding 8,000 psi. The company has produced three-layer ABA and ABC structures as well as five-layer ABCDE structures.

The PP foam layer is obtained with the help of a modified twin-screw extruder and co-extruded with unfoamed layers from up to four single-screw satellite extruders. Sentinels foams are blown using a cocktail of physical

blowing agents, mostly carbon dioxide plus a blend of butane, nitrogen and a proprietary gas. The new PP foam technology is being offered for non-automotive applications like packaging. Possible applications include thermoformed microwavable food trays that would stay rigid even in contact with boiling water. Another application is trays for modified atmosphere packaging, in which a barrier film could be laminated to the foam. For thermoforming, co-extruded foam provides several benefits over unfoamed PP. These include 50 per cent faster cycle time, no sagging in the oven and more easily trimmed trays.

Website: www.plasticstechnology.com

New foam product

Dow Chemical Co., the United States, offers its latest development in the SYNERGY line of Soft Touch foam products from Dow Performance Foams. SYNERGY RCA combines the exceptional benefits of SYNERGY technology with the high-value feature of recyclability. SYNERGY RCA is a 60 kg/m3 material designed for surface protection of Class A finishes, making it perfect for shipping the most delicate accessories. It is strong enough to endure the rigours of shipping and handling, while keeping the contents safe and in working order. SYNERGY RCA meets all industry strength and longevity requirements, and is available in 2 24 108 inches and 50 600 2,750 mm sized planks in white, grey or black.

The products strength, resilience and softness make it ideal for protecting valuable parts. Cutting, skiving and routing can be performed without elastic build-up, which promotes a markedly longer tool life than competitive material. The 100 per cent non-cross linked polyolefin foam allows any post-fabrication off-cuts to be sent to the recycler, eliminating disposal costs. It is produced using RapidRelease technology, a proprietary process that incorporates a patented CFC- and HCFC-free blowing agent system.

Contact: Ms. Stacey Siler, The Dow Chemical Co., United States of America. Tel: +1 (989) 6360 351

E-mail: sisiler@dow.com

Website: www.dow.com

HC-blown foam

In the United States, researchers have developed a technique to manufacture hydrocarbon-blown foam. This invention relates to the addition of alpha-methyl styrene, isobutanol and/or isopropanol to reduce vapour pressure, improve thermal conductivity (K-factor) and enhance the solubility of the blowing agent in the premix and/or improve the processing traits of PU and polyisocyanurate closed-cell foams prepared with a blowing agent comprising a hydrofluorocarbon (HFC) selected from the group consisting of 1,1,1,3,3-pentafluoropropane, 1,1,1,2-tetrafluoroethane, 1,1,2,2-tetrafluoroethane and mixtures thereof. The addition of alpha-methyl styrene to the foam formulation improves K-factor and thermal ageing traits.

As used here, the blowing agent composition refers to HFC-245fa or HFC-134a singly or in combination with other non-ozone depleting blowing agents, e.g. other HFCs such as difluoromethane (HFC-32), difluoroethane (HFC-152), trifluoroethane (HFC-143), tetrafluoroethane (HFC-134), pentafluoropropane (HFC-245), hexafluoropropane (HFC-236), heptafluoropropane (HFC-227); C.sub.4-C.sub.7 hydrocarbons, including but not limited to isobutane, n-pentane, isopentane, cyclopentane, butane, hexane and isohexane; inert gases (e.g. air, nitrogen, carbon dioxide); and water in an amount from about 0.5 to 2 parts per 100 parts of polyol. Where isomerism is feasible for HFCs listed above, the respective isomers may be used either singly or in the form of a mix.

Website: www.patft.uspto.gov

HALONS

New extinguishing agent

Gielle, Italy, offers a new extinguishant for use in total flooding applications. The gaseous GL-125 can be used as a replacement for carbon dioxide (CO_2) and halon-1301 in total flooding systems to protect normally occupied areas. GL-125 is a blend of HFC-125 and 1-bromopropane, the latter enhances the extinguishing performance of HFC-125. The physical properties of GL-125 allow fast and homogeneous distribution in the protected volume, ensuring rapid and efficient extinguishment of the fire. The choice of GL-125 in a fire protection system is suitable when:

An inert and electrically passive extinguishing agent is required;
The clean-up of another media would represent a problem;
Rapid extinction of the fire is desired; and
Risks to life posed by CO_2 are to be eliminated.

Website: www.gielle.it

Nitrogen-based fire extinguishing system

In Japan, Nohmi Bosai Ltd. is offering NN100 fire extinguishing system based on nitrogen gas. The eco-friendly system poses less danger to human life than CO_2 extinguishers and complies with ISO 14520-13 and NFPA standards. In this device, nitrogen gas is contained in a cylinder under a pressure of 24 MPa. Fires are extinguished by diluting or lowering the concentration of oxygen in the air. Key features include:

No frosting, dewing or contamination;
Nitrogen gas does not generate any fog by vapourization of the agent while discharging;
Less leakage from protected rooms; and
Remote cylinder station feasible.

C pipes used for CO_2 extinguishing systems can also be used for this system as the cylinder valve for the NN100 unit suppresses nitrogen gas at the outlet of the cylinder valve to 11 MPa. The NN100 system is suitable for computer rooms, telecommunication facilities, museums, libraries, indoor parking spaces, power generating rooms, etc.

Contact: Nohmi Bosai Ltd., Japan. Tel: +81 (3) 3265 0231; Fax: +81 (3) 3265 5348

E-mail: kouhou@nohmi.co.jp

Website: www.nohmi.co.jp

Portable extinguisher

In Saudi Arabia, Saudi Factory for Fire Equipment Co. offers portable Halotron I fire extinguishers as an alternative to halon-1211. Halotron I gas is a clean extinguishing agent discharged as a precisely dispersed rapidly evaporating liquid. Key traits and technical features of Halotron I (HCFC-123) are:

Ready for instant use;
Simple to operate and residue-free;

A gauge helps monitor the internal pressure of the cylinder;
Trouble- and rust-free brass body; and
Minimal servicing requirements.

The portable Halotron I systems are suitable for protecting delicate electrical equipment, computer rooms, data storage and transfer areas, aircraft, automobiles, motor boats, homes, etc.

Contact: Saudi Factory for Fire Equipment Co., P.O. Box 58469, New Industrial Area, Riyadh 15515, Saudi Arabia. Tel: +966 (1) 2650 070; Fax: +966 (1) 2652 190

E-mail: riyadh@sffeco.com.sa

Website: www.sffeco.com

Water mist suppression system

Scotch Mist Ltd., the United Kingdom, offers a new breed of suppression agents designed to protect spaces or equipment utilizing environmentally acceptable substances. Scotch Mist is a single fluid, variable pressure suppression unit. Scotch Mist water vapour/mist replacement for halons is a new concept for producing fire-fighting mist using the technology behind boundary layer and surface tension energy release (BLASTER). The BLASTER nozzles are unique and produce mist using the single fluid principle. These patented fire-fighting nozzles make large quantities of inert water vapour and transports much of this into the heart of the fire by means of a carefully designed series of small- and medium-sized droplet jets whose huge surface area and heat chill factor create a massive chill.

Website: www.djsengineering.fsnet.co.uk

FUMIGANTS

New soil treatment methods

In Australia, researchers at the Department of Primary Industries Institute for Horticultural Development (IHD) have successfully developed new soil treatment techniques that can be used as alternatives to methyl bromide (MB). Apart from maintaining crop productivity, these treatments set new directions for production, which are more sustainable and reduce the threat of diseases and weeds. For their work, the MB project team was awarded the 2003 Daniel McAlpine Outstanding Achievement Award.

Contact: Mr. Alan Shanks, DPI Knoxfield, Australia. Tel: +61 (3) 9210 9222.

Website: www.nre.vic.gov.au

Bio-generated atmospheres to control Narcissus fly

Researchers at the Department of Food Science, Agricultural Research Organization, Israel, are investigating into quarantine applications of bio-generated atmospheres to control Merodon eques or the large Narcissus fly, which attacks bulbs of narcissus and other geophytes. The team studied three treatments of modified atmospheres high CO2 concentration (95 per cent), vacuum (low pressure of about 50 mm Hg) and storage under hermetic conditions alone. Results have shown that the time needed to achieve a 99 per cent morality of fly maggots was about 24 h for the first two treatments and 34 h under hermetic conditions alone.

In pilot commercial trials, researchers employed vacuum-hermetic fumigation (V-HF) process used in a newly developed transportable, patent-applied, pesticide-free integrated transportation and storage (PITS) tunnel. The PITS tunnel was specially designed for rapid machine loading and unloading, and featured two main components a 18.75 m3 sleeve-shaped sealed chamber and a supporting light metal frame. Sorted bulbs were placed in the PITS tunnel on their original shipping pallets. In each trial, three pallets were arranged inside the PITS tunnel to evaluate the effectiveness of each treatment. In addition to these, three crates of bulbs infested with fly maggots at sorting were placed at the bottom centre and top rows of the crates. In each of these locations, a data logger recorded the temperature and humidity. The system was then sealed for 48 h and a slight vacuum of 10 Pa (0.007 mm Hg below ambient) was applied using a hand-held household vacuum cleaner to adhere the PITS tunnel liner to the crates.

Results of examining each bulb in the three crates of treated infested bulbs revealed 100 per cent mortality in all three treatments. The treated non-infested bulbs were evaluated at the end of each treatment and bulbs from all pallets passed the requirements needed for export approval. Samples of non-infested treated bulbs and control bulbs planted in a greenhouse did not exhibit phytotoxic effects. The quality of treated bulbs was as good as the control.

Contact: Mr. Simcha Finkelman, Department of Food Science, Agricultural Research Organization, The Volcani Centre, P.O. Box 6, Bet-Dagan 50250, Israel.

E-mail: simchaf@volcani.agri.gov.il

Website: www.ars.usda.gov

Compost: an alternative to methyl bromide

In the United States, Burch Farms has replaced methyl bromide (MB) with compost from McGills Leprechaun Organic Products to produce leafy greens, cabbage, squash, eggplant, cantaloupe and a variety of speciality crops. This development is based on a three-year study by researchers at North Carolina State University that used compost in strawberry production instead of MB.

During the spring of 2001, Leprechaun Soil Builder Compost was broadcast on six acres at a rate of 35 cubic yards to the acre. Pre-plant fertilizer was applied to another 20 acres without compost at the full recommended rate of around 454 kg (1,000 lb) 6-6-18 per acre. Three-feet, plastic-covered beds were formed on 72 inch centres. Beds in the 20 acre control block were fumigated with about 23 kg of MB. The six acre composted block was not fumigated; however, a single application of Treflan/Command was made with good results to control weeds emerging in the open ground centres of the compost block. On 15 April, King Arthur variety bell pepper plants were set in double rows at a population rate of 14,000 plants/acre. Over the next 60 days, the compost and MB blocks were similarly drip irrigated and fertigated with CN 9 and 408. Kocide and Manzate fungicides, along with Spintor insecticide, were applied by spraying at similar rates to both blocks.

Observations of both the compost and MB blocks noted no significant difference in plant health or growth. Soil and tissue samples indicated similar plant nutrient levels, consistent with the approved ranges for the crop. The harvest grade and quality of peppers harvested from both blocks were high. It has been concluded that

compost application can be a low-cost alternative to MB and can significantly increase yield and per acre income.

Contact: Mr. Lewis Flynn, McGill-Leprechaun Compost Sales, United States of America. Tel: +1 (910) 5322 539, ext. 28.

Website: www.mcgillcompost.com

Integrated approach to eliminate the use of MB

Researchers at the United States Department of Agriculture report that a combination of pesticides, crop rotation or leaving fields fallow for at least a year appears to be a viable alternative to using methyl bromide. The Agricultural Research Service team uncovered that by not planting in a field for 12 months, microscopic root-eating nematodes can be eliminated. Another approach involves a regimen of pesticides. Many growers now combine the pesticide chloropicrin with Telone. Metam sodium can also be added to control weeds for some crops.

Website: www.newstribune.com

New sterilization system

Cosmed Group Inc., the United States, is offering PureOx process as a substitute to the use of MB in eliminating insects and other pests in fruits, vegetables and several other food products. The patented sterilization system uses newly developed technology to sustain the anti-microbial activity of gaseous ozone.

Generators sited at the treatment facility use a controlled electrical discharge to create ozone. Newly generated ozone is pumped into a closed stainless steel chamber containing the target product. Exposure is continued for a time sufficient to sterilize the materials within the vessel. Excess ozone is removed from the treatment vessel and converted back to oxygen prior to release. Ozone within the product reverts to atmospheric oxygen within minutes. The only detectable difference between treated and untreated materials is the absence of microbial contamination and insect infestation.

Contact: Mr. William Lanning, General Manager, Industrial Sterilization of NV, Cosmed Group Inc., 1225 E. Greg Street, Sparks, NV 89431, United States of America. Tel: +1 (702) 3560 609; Fax: +1 (702) 3560 867;

E-mail: billl@cosmedgroup.com

Website: www.cosmedgroup.com

Software program for MB alternative

Dow AgroSciences, the United States, offers a software program to accompany ProFume, the companys sulphuryl fluoride fumigant replacement for MB. The ProFume Fumiguide software has been developed to help users conduct fumigations with the new product that maximize efficiency and minimize risk. The software enables fumigators to calculate the correct dosage utilizing all the variables involved with the job, including the type of pest, its life stage, temperature and exposure time. As such, fumigators can now precisely match the dosage to the job. The software, which runs on Windows platform, monitors data during the job, predicts dosage outcome and recommends alterations based on the parameters of the job. It also enables users to record information, reports and graphs associated with fumigation jobs.

Website: www.pestcontrolmag.com

New agricultural pesticide

In the United States, a researcher at the Alabama Agricultural Experiment Station has reformulated a chemical used as the inflation-triggering agent in automobile air bags into a highly effective, environmentally friendly agricultural pesticide and a viable alternative to MB. According to Auburn University plant pathologist Prof. Rodrigo Rodriguez-Kabana, the liquid formulation of sodium azide, presently known as SEP-100, significantly outperforms MB in controlling weeds, diseases and harmful root-eating nematodes. Additionally, liquid sodium azide, which is applied to soil before planting through drip irrigation systems under plastic tarps, actually enhances the environment. As sodium azide decomposes in the soil, it breaks down into fertilizer and leaves the soil healthier than before. Furthermore, sodium azide does not harm beneficial nematodes and insects.

Website: www.southeastfarmpress.com

PUBLICATIONS

Sourcebook of Alternative Technologies for Protecting the Ozone Layer: Alternatives to MB

The phase-out of methyl bromide (MB) presents a special challenge. This UNEP publication allows readers to carefully and thoroughly assess the available alternatives and decide on the best option for their situation. It also provides addresses of suppliers and specialists in alternatives; references; and contacts for implementing agencies.

Environmental Effects of Ozone Depletion and its Interactions with Climate Change: 2002

The Montreal Protocol requires periodic assessments of available scientific, environmental, technical and economic information. The latest 2002 assessment focuses on the following areas changes in biologically active ultraviolet (UV) rays reaching the Earths surface and the effects of increased solar UV radiation on health, terrestrial ecosystems, aquatic ecosystems, air quality and bio-geochemical cycles.

For the above publications, contact: United Nations Publications, Room DC2-0853, Dept. 1004, New York, NY 10017, United States of America. Tel: +1 (212) 9638 302; Fax: +1 (212) 9633 489;

E-mail: publications@un.org

Alternative Refrigerant Blends and Oils

This publication covers alternative refrigerants to CFCs and HCFCs, the Montreal Protocol, legislation and regulation, regulatory requirements, equipment certification, refrigerant leaks, mandatory technician certification, refrigerant sales restriction, reclaimer certification, safe disposal needs and lots more.

Contact: ESCO Press, P.O. Box 521, 1350 W Northwest Highway, Mount Prospect, IL 60056 0521, the United States. Tel: +1 (847) 2532 220.