VATIS Update Ozone Layer Protection . Mar-Apr 2005

Contents

THE SCIENCE OF OZONE LAYER

Scientists predict Arctic ozone loss

Record cold temperatures in the Arctics upper atmosphere have scientists predicting the loss of ozone over the Arctic as spring approaches. Arctic stratosphere can get very cold and when that happens like in January 2005 when temperatures plummeted to more than 125 below zero chemicals in the layer, such as nitrogen and chlorine, freeze and form polar stratospheric clouds. Since late November, large areas of these clouds have been present over the Arctic region. They are now the largest in the last 20 years. Within these clouds a complex chemical reaction occurs to destroy ozone.

Dr. Paul Newman, an atmospheric physicist with NASAs Goddard Space Flight Centre in Maryland, said that conditions were shaping up for what might be a significant loss of ozone in the weeks ahead. For much of the winter, the high Arctic has been cloaked in darkness. But Dr. Newman said that the high Arctic had begun to receive sunlight, the final ingredient and the catalyst that drives the chemical reactions that ultimately destroy ozone.

Scientists from the European Unions SCOUT-O3 Integrated Project have also been studying since May 2004 the links between atmospheric ozone and climate change in the Arctic. The project is coordinated at the University of Cambridges Department of Chemistry, and has 59 partner institutions with over 200 scientists involved from 19 countries. The scientists are following the situation in the Arctic very closely. The meteorological conditions we are now witnessing resemble and even surpass the conditions of the 1999-2000 winter, when the worst ozone loss to date was observed, said Dr. Neil Harris of the European Ozone Research Coordinating Unit, Cambridge, the United Kingdom.

In 2000, a record amount of ozone was lost over Greenland, England and northern Europe. In 1997, an area of ozone the size of Texas thinned over the Russian high Arctic. Scientists predict that most of this years ozone losses will occur over northern Europe. The ozone layer is not expected to become thinner over other parts of the Arctic, such as Canada and Alaska.

Websites: www.sitnews.us and www.physorg.com

Antarctic ozone situation

The 2004 Antarctic ozone hole season is over, with the circulation over the continent in its summer mode. The ozone layer over much of the Southern Hemisphere south of 50 remains around 10 per cent below the long-

term normal. Column ozone is currently less than 250 DU over southern South America and the Falkland Islands.

The ozone hole (where ozone values are below 220 DU) grew rapidly from mid-August to early September to reach around 19 million square kilometres. It slowly decreased in area from a maximum of 20 million square kilometres in mid-September to 15 million square kilometres in early October. A major spring warming commenced in mid-October, when the area declined rather more rapidly to 6 million square kilometres. However, the warming subsided and the area affected slowly declined from around 10 million square kilometres in late October to around 8 million square kilometres in mid-November. The ozone hole area rapidly dropped to zero after mid-November.

The area of the hole was generally a little below the average size of the last decade. The edge of the ozone hole passed over the southern tip of South America, the Falkland Islands and South Georgia from September 10 to 12. It did so again from September 18 to October 2, and October 11 to 15, with ozone hole levels over southern South America and the Falkland Islands on September 21 and 22. Values were also low over South Georgia on October 7 and 8. Significant parts of the Northern Hemisphere have ozone levels more that 25 per cent below normal, with a small area approaching 40 per cent.

Website: www.antarctica.ac.uk

Ozone layer thinning over North India

An Indo-United States study using satellite and ground data has revealed a dangerously declining trend of ozone layer over northern India. The joint study by scientists from Indian Institute of Technology, Kanpur, and George Mason University, the United States, aims at assessing the trend of total ozone column over the Indian subcontinent, employing satellite data and limited ground observations.

Mr. Ramesh Singh, one of the authors of the study, revealed that the rate of declining ozone was higher in recent years over the northern parts of India covering Indo-Gangetic basin when compared with other parts on India. The authors of the study termed this trend as a serious threat to the 400 million people who live in the basin. They said that the factors responsible for the ozone depletion need further investigation. One source could be the sulphate aerosols and dust particles that get transported from the Sahara desert.

Deccan Herald, 20 February 2005

Global warming enhances ozone depletion

Scientists are veering towards the conclusion that the two major environmental problems once thought to be unrelated climate change and ozone depletion are closely linked in ways that will delay recovery of the ozone layer. Growing evidence suggests that global warming favours destruction of ozone in the stratosphere, jeopardizing the gains of the 1987 Montreal Protocol to protect the ozone layer. According to Mr. Tom McElroy, a scientist with Environment Canada, one signal of the ozone-climate link is the sharp ozone depletion over the Arctic this winter. Ozone over the Arctic was about 10 per cent thinner this January than last, and if current cold temperatures in the stratosphere persist Canada could see record ozone depletion this spring, he added.

Website: newsyahoo.com

Solar storms and Arctic winds thin ozone layer

The sun and stratospheric weather in 2004 have caused the largest decline in the upper ozone layer ever recorded over the far Northern Hemisphere, according to new research by scientists from Canada, Europe and the United States. This decline was totally unexpected, said Ms. Cora Randall, chief author of a paper on the subject and a research associate at the Laboratory for Atmospheric and Space Physics, University of Colorado-Boulder, the United States.

Based on data from seven different satellites, the scientists discovered that nitrogen oxide and nitrogen dioxide (NOx) gases in the upper stratosphere climbed to the highest levels in at least two decades in spring 2004. The team concluded that some of the extra NOx seen in spring was formed after huge quantities of energetic particles from the sun bombarded the earths atmosphere during the solar storms of 2003.

The increases led to ozone reductions of up to 60 per cent roughly 25 miles in altitude above Earths high northern latitudes, said Ms. Randall. Winds in the upper part of a massive winter low pressure system that confines air over the Arctic region, known as the polar stratospheric vortex, sped up in February and March 2004 to become the strongest on record, she said. The spinning vortex allowed NOx gases to descend more easily into the stratosphere. The NOx increases are important because they are major players in the stratospheric ozone destruction process.

The scientists believe these nitrogen gases were formed at least 20 miles above the stratosphere, as a result of chemical reactions triggered by energetic particles from the sun. This study demonstrates that scientists searching for signs of ozone recovery need to factor in the atmospheric effects of energy particles, something they do not do now, said Ms. Randall. That we can still be surprised illustrates the difficulties in separating atmospheric effects due to normal human-induced causes, she said. (Website: www.ens-newswire.com)The sun and stratospheric weather in 2004 have caused the largest decline in the upper ozone layer ever recorded over the far Northern Hemisphere, according to new research by scientists from Canada, Europe and the United States. This decline was totally unexpected, said Ms. Cora Randall, chief author of a paper on the subject and a research associate at the Laboratory for Atmospheric and Space Physics, University of Colorado-Boulder, the United States.

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Website: www.ens-newswire.com

ODS PHASE-OUT IN INDIA

ODS phase-out not to burden the industry

Indias Minister of Environment and Forests, Mr. A. Raja, revealed that the country has received funding of about US$240 million for over 350 projects to phase out about 12,000 ozone depleting potential (ODP) tonnes. Mr. Raja, inaugurating the conference on Meeting challenges in phase-out of chlorofluorocarbons from Indias refrigeration and air-conditioning service sector, said that more than 175 projects have already been completed resulting in phasing out about 6,000 ODP tonnes. The projects include both investment and non-investment projects in the refrigeration, aerosol, foam blowing, solvent and fire-fighting equipment sectors.

Observing that India has taken various policy and fiscal measures for smooth implementation of ODS phase-out projects and national ODS Phase-out Plan, the Minister pointed out that completion of such projects demonstrates Indias commitment to phase out ODS without undue burden on the industry, especially small and medium-scale enterprises.

One of the major challenges relating to phasing out of ODS to most countries, including India, has been the refrigeration and air-conditioning (RAC) sector, he said. This has been mainly due to the long life of the equipment used in this sector, extensive spread of equipment to various end users including households and shops and the degree of economic activity for informal sector, especially servicing, generated by this sector, he added.

Therefore action was necessary to reduce and eliminate dependence of the sector on ODS-based technologies in a cost-effective manner, the Minister emphasized. Addressing the gathering, Dr. Prodipto Ghosh, Secretary, Ministry of Environment and Forests, said that the National CFC Phase-out Plan mostly addressed the RAC servicing sectors to ensure the services of new and old refrigerators and to assist industries in choosing new technologies.

Website: www.pib.nic.in

Progress in ODS phase-out

Given the high unit consumption of ODS, the foam sector assumes significance in terms of overall ODS consumption in the country. In this sector, 155 projects covering 426 enterprises have been supported for phase-out at a cost of US$41.4 million. Terminal foam sector phase-out activities are in progress at a cost of US$5 million to phase out nearly 612 MT of CFC-11 involving 105 enterprises. At present, carbon dioxide and HCFC-141b are easily available as alternatives. Large foam manufacturers in the refrigeration and air-conditioning sector have adopted hydrocarbon-based technologies for phasing out ODS. These technologies have been adopted with support from ECOFRIG project and in close cooperation with technical institutions.

In the aerosol sector, 23 projects have been supported covering 42 enterprises to phase out CFC-11 and CFC-12. The alternatives proposed for this sector include deodorized liquid petroleum gas (LPG), particularly for the industrial aerosol sector. Hydrocarbon aerosol propellants (HAPs) are proposed for other applications. While LPG is available locally, the main issue is preparing the transition strategy for metered dose inhalers, with assistance from UNDP. HAPs are imported and this complicates issues related to their consistent availability and costs.

CTC, MCF and CFC-113a are some of the solvents most used in India. Besides the solvent sector phase-out project approved in the 40th Meeting of the Executive Committee, the Multilateral Fund (MLF) has so far supported 29 projects covering nearly 30 enterprises at a cost of US$10.32 million. The first chlorinated rubber plant in India to receive MLF support reopened in May 2003 after complete conversion into a non-CTC product.

Some interesting examples of changeover facilitated by UNIDO have been in the electronics sector, involving the installation of closed ultrasonic cleaning units employing alternative cleaning agents. The opportunity for introducing waste recovery units complements substitution and strengthens cleaner production.

Replacement of spray processes with alternative coating systems has aided substitution in metal cleaning. ODS-based printed circuit cleaning units have been replaced by no-clean soldering and water-based photo-resist. Hydrocarbon cleaning technologies have also helped eliminate ODS-based cleaning processes.

The 40th Executive Committee approved National CTC Production and Consumption Phase-out Project at a cost of US$52 million for implementation by the World Bank, with the governments of Germany, Japan and France as cooperating agencies. (The State-of-the-art report: Implementation of Montreal Protocol in India, September 2004)

Halon production and consumption phased out

The Minister of Environment and Forests, Mr. A. Raja, recently announced the total halon production and consumption phase-out in India. Unveiling the commemorative plaque to mark the closure of the production sites (SRF Limited and Navin Fluorine Industries), as required under the Montreal Protocol, and launching the global programme of UNEP, Remember O3ur Future, he said that halon banking and management system has already been established in the country, which will prevent further emission of halon into the atmosphere.

India, by taking this step, has shown its commitment to the cause of the environment, Mr. Raja said. He added that the closure of halon production facilities not only facilitated India to comply with the provisions of the Protocol but also ensured a healthy and safe environment for future generations. Stating that as per the control schedule of the Montreal Protocol, India has passed the litmus test of achieving the freeze target of CFCs on 01.07.1999 and freeze of halon production and consumption as of 01.01.2002, the Minister pointed out that policy and regulatory measures have been put in place to facilitate compliance with the provisions of the Protocol.

Website: www.pib.nic.in

IN THE NEWS

Bangladesh to phase out CFC refrigerators

The Government of Bangladesh, as part of its National ODS Phase-out Plan (NOPP), with the financial support of Montreal Protocols Multilateral Fund, will procure 9,000 kits to convert the countrys CFC-operated refrigerators into hydrocarbon systems. The Department of Environment (DoE) will launch the drive for retrofitting the CFC-12 gas-operated refrigerators in April 2005, after procuring the kits from the countries having proficiency in this technology. The country currently has 2.8 million refrigerators running on CFC-12 gas, which needs to be phased out completely by 2010 in compliance with the Montreal Protocol, signed by Bangladesh in 1990.

Under the programme, DoE will arrange training programmes at divisional and district levels for providing hands-on training to the technicians in the sector on use of the kits and conversion of the refrigerators. The hydrocarbon technology is a very cost-effective conversion system largely used by the East European countries. Some Asian countries, including China and India, have also developed the technology and, considering the regional aspects, Bangladesh is mulling over using the experience and technology of the Asian nations.

Website: www.nation.ittefaq.com

China leads the campaign against illegal ODS trade

Over the past year, Chinas commitment to curbing illegal ODS trade throughout Asia has taken on the dimensions of a leadership role in strengthening regional cooperation to fight this shared problem. China sent high-level delegations to Nepal and Mongolia in August and September 2003, to compare notes and exchange knowledge between all three neighbours on control as well as enforcement measures. Cooperation initiated during the Mongolia Dialogue led to the creation of a Task Force in which China participates actively through annual meetings. Important outcomes of this ongoing cooperation include the regular exchange of information on a range of concerns between Nepal, China and India, as well as between Mongolia and China, on registered importers and exporters.

At the fringes of the Cooperation Workshop for Customs and Ozone Officers of SEAP and SA countries in April 2004, China held bilateral discussions on the control of trade in ODS with India, Indonesia, the Philippines, Mongolia, Nepal and Sri Lanka. It later invited the Ozone Officer of Sri Lanka to Beijing on August 2004 to explore ways of improving bilateral coordination on ODS trade issues. Both sides agreed on the urgency of improving bilateral cooperation on management of ODS imports and exports by exchanging trade data. A representative of the Asia-Pacific Regional Intelligence Liaison Office also attended the meeting. Another focus of discussions was how to build the capacity of local authorities to tackle illegal ODS trade in China.

Contact: Mr. Atul Bagai, UNEP ROAP.

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OzonAction Newsletter, No. 48, September 2004

Thailand aims at CFC ban in five years

Thailand will ban the import of CFCs within five years, according to Mr. Nikorn Chamnong, Deputy Minister, Transport. He said that the country im-ported 1,358 tonnes of CFCs last year, 80 per cent of which was used in air-conditioners, mainly in the older model buses. Thailand is aiming to end imports by 2010 in accordance with the Montreal Protocol, which Thailand ratified 17 years ago.

The Transport Ministry had recently ordered denial of registration for new private cars and buses that use CFCs in the air-conditioners. Such an ozone-depleting substance is no longer acceptable in the countrys transport sector, Mr. Nikorn said. The action is part of Thailands attempt to show support for the Kyoto Protocol, an international pact to combat global warming. The transport sector ranks second after the energy sector for emitting the most greenhouse gases. Mr. Nikorn said that the Ministry would make further efforts to cut greenhouse gas emissions. The measures planned include promoting gasohol that emits less greenhouse gases than fossil fuels, introducing CFC substitutes, phasing out old vehicles that use CFCs as well as inspection of garages to ensure that artificial CFCs are not used in car air-conditioners. Recently, the Transport Ministry staff had recently confiscated large quantities of artificial CFCs.

Website: www.thailandoutlook.com

Pakistan calls for environment awareness creation

Pakistans Federal Minister for Environment, Maj. (retd.) Tahir Iqbal, has urged the people to join hands with the government in its efforts to control pollution and save the environment. He was addressing the inaugural ceremony of a four-day National Master Trainers Training Course on the theoretical and practical aspects of good practices in refrigerants servicing and reclamation,organized by the Technical Education and Vocational Training Authority (TEVTA). The government plans to train 3,000 technicians in the field of refrigerants in order to control emission of CFCs. It has started a series of programmes to educate the people on environmental issues before holding them responsible for violation of environment laws. The Minister said that a comprehensive environment policy has been drafted and made available on the Internet to seek proposals for its improvement from the public.

Website: www.pakobserver.net

Thailand launches refrigerant identifier machines

Thailands Department of Industrial Works and its Customs Department are cooperating to prevent the smuggling of substances that deplete ozone layer by using 60 refrigerant identifier machines valued at about 4 million baht. Thailand is a signatory to the Montreal Protocol on substances that deplete the ozone layer.

The process of examining ODS imported to the country was difficult in the past. The customs officers could not easily detect the suspicious substances, as they had to be examined and identified in laboratories. Hence, the Department of Industrial Works and the Customs Department jointly decided to procure refrigerant identifier machines, which are able to specify the type and ratio of ODS in the substances examined, thereby making the process faster and more accurate. The move provides better services to importers, while increasing the effectiveness of ODS import controls.

Website: www.customs.go.th

REFRIGRATION/AIR-CONDITIONING

Variable displacement compressor for automobile ACs

Toyota, Japan, has developed an external variable displacement compressor for air-conditioning in automobiles. The lightweight device is reported to help conserve energy and resources as well as reduce carbon dioxide emissions. Conventional compressors installed in compact cars are fixed displacement type that is relatively heavy. In order to reduce the weight of the compressor and to increase its efficiency, Toyota developed 5SEO9, a compact and super lightweight external variable displacement compressor that employs HFC-134a.

According to the company, this compressor is 25 per cent lighter, helps reduce fuel consumption by 60 per cent and allows 30 per cent faster acceleration.

Website: www.iifiir.org

Water source heat pump

Carrier Corporation of the United States a world leader in heating, ventilation, air-conditioning and commercial refrigeration has introduced a new line of Aquazone two-stage water source heat pumps (WSHP) with Puron refrigerant (R-410a).

According to Mr. Bruce Burdon, director of product management and marketing, Carrier North America Commercial, With energy efficiency ratings above 30, the new Carrier Aquazone heat pumps exceed Energy Star and ASHRAE 90.1 standards, providing exceptionally low operating costs. The units come with a two-stage scroll compressor and variable speed blower that adjusts speed to deliver the exact airflow needed. This assures high efficiency while providing tight temperature and humidity control. The new Aquazone heat pump line is available in four sizes in the 2-5 t range, in horizontal, vertical up-flow and vertical down-flow configurations.

Website: www.jarn.co.jp

Water source heat pump

Eco-Clima S. Ltd., a major air-conditioner manufacturer based in Bulgaria, offers a series of high-tech air-conditioners, such as split room, multi-split and window-mount units, new generation split corner-wall ceiling type, and portable units.

Corner wall ceiling air-conditioner is equipped with high-quality components and features a series of technological innovations. These include:

Compact, ultra-tin design of the indoor unit that enables easy installation in tight spaces;

Corner or wall installation of two units, one next to the other, to get air-conditioning at an angle of almost 180; and

Possibility to install four units in a ring in the middle of the premise for multi-directional air supply with

exceptionally wide angles of airflow.

Unlike the traditional wall-mounted split systems that feature frontal air blow directly to the user, the newly designed louver ensures large and wide air flow at almost 90 angle through the multi-stage swing system with intelligent control. The units are available with R-22 and R-407 refrigerants, with 9,000 BTU and 12,000 BTU cooling and heating capacities.

Website: www.videolife.kiev.ua

Algebraic spiral scroll compressors

Hitachi Home and Life Solutions has started marketing a new series of scroll compressors for refrigeration and freezing which have about 15-25 per cent improvement in the freezing temperature region. The new scroll compressors attain about 20 per cent more energy savings than the predecessor series because of the changed shape of the spiral wall from conventional round involute curve to algebraic spiral curve.

Since the algebraic spiral can improve the compressors compression ratio, efficiency in the low freezing temperature range, where suction pressure is low, is improved. The thickened spiral wall at the centre of the spiral reduces gas leakage inside and improves the strength of the spiral. Use of these compressors allows reduction in the height of equipment like refrigerated showcases.

The new series, available in two types that differ in case size, has an extensive line-up from 400 W to 1.8 kW. These units can employ either R-22 or R-404a and work with specific power sources in various countries.

Website: www.jarn.co.jp

High-efficiency e-scroll compressors

Matsushita Electric Industrial Co. Ltd. of Japan has introduced the CS series of scroll compressors for air-conditioners. The e-scroll units have realized very high efficiencies 5 per cent improvement for 2.8 kW unit and 10 per cent for 4 kW unit. They are built as per global warming prevention and ozone protection norms and comply with Home Appliances Recycling Law. The units employ the zero-ODP HFC R-410a refrigerant. The accumulator has been eliminated by optimizing the bypass mechanism characteristic of scroll compressors and improving the bypass valves responsiveness. A rare earth magnet has been employed to improve the motor efficiency and reduce the height of motor almost by half when compared with conventional motor, thus achieving a more compact and lighter body. The series also presents one of the lowest vibration and noise levels one-tenth those of single-piston rotary units.

Website: www.industrial.panasonic.com

Flow boiling of R-141b in small tubes

Researchers from the Department of Mechanical and Chemical Engineering, Heriot-Watt University, the United Kingdom, have conducted an experimental study of two-phase flow and heat transfer of the refrigerant R-121b in small circular and non-circular tubes. Such small tubes are widely used in compact evaporators and condensers.

Dr. S. Lin and colleagues used four circular tubes with diameters of 1.1, 1.8, 2.8 and 3.6 mm and one square tube of 2 mm 2 mm cross-section. The parameter ranges were mass flux 50 ~ 3,500 kg m2 s1, heat flux 1 ~ 300 kW m2, and inlet pressure 1 ~ 3 bar resulting in mean boiling heat transfer coefficients of 0.1 ~ 10 kW m2 C1. It was found that local heat transfer coefficients are not only a strong function of heat flux but also a function of vapour quality and a weaker function of mass flux for all the small tubes tested, showing that both nucleate boiling and convective evaporation occur in small tubes. The mean heat transfer coefficient was found to be primarily a function of the heat flux, rather than the mass flux. Comparison with data in the literature showed that a general flow map developed from adiabatic two-phase flow tests can provide guidance for prediction of flow regimes in heated tubes.

Website: www.extenza-eps.com

Breakthrough in air-conditioning technology

Emerson Climate Technologies, the United States, has introduced the next generation of Copeland scroll compressors designed for light-commercial and residential central air-conditioning systems. The new scroll compressors are designed to help manufacturers meet and exceed the United States governments 13 Seasonal Energy Efficiency Ratio standard for new central air-conditioning systems that goes into effect in January 2006. With 20 major design changes, Emersons new Copeland scroll compressors offer great advancements in efficiency (up to 7 per cent more) and structure (up to 30 per cent lighter and smaller) and significantly reduced operating sound when compared with the prior version. The new Copeland scroll manufacturing platform includes a full product line of 1.5 to 5 hp compressors, available in R-410A and R-22 refrigerants, and motor voltages for both residential and light commercial use.

Website: home.businesswire.com

New natural refrigerant blend

The new natural refrigerant blend from Schick + Co. of Germany, R-723, presents the same advantages as ammonia high specific evaporation heat and insignificant global warming potential besides offering additional benefits such as full mineral oil solubility and ability to be used in copper systems. R-723 is made up of 60 per cent ammonia and 40 per cent dimethyl ether (a hydrocarbon) and is classed as a B2 refrigerant. This composition gives rise to an azeotropic boiling mixture. According to some researchers, the volumetric cooling performance is slightly higher than that of ammonia, and the flatter vapour pressure curve even improves energy efficiency. The compression temperature at the pressure valve is around 20 K lower in comparison with ammonia.

Contact: Schick + Co., Hauptsitz, Wernerstr. 28, 70469 Stuttgart, Germany. Tel: +49 (711) 81491-0; Fax: 49 (711) 81491-13

Website: www.schickemzet.de

Website: www.iifiir.org

SOLVENTS

Ultrasonic cleaning systems

Kitamura Manufacturing Co. Ltd., Niigata, Japan, offers ultrasonic cleaning systems that use a non-CFC and ethane-free cleaning agent to clean electronic parts. Its separated unit cleaning system with automatic conveyor allows the user to choose only the functions needed. The system is equipped with a line cooler that regulates the temperature of the cleaning fluid and a vacuum dryer device that can effectively dry parts with even complex shapes. A distillation recycling device recycles the cleaning agent, thereby lowering running costs.

Kitamuras compact direct bath cleaning system comes as units that cover the full range of processes from intermediate cleaning to the ultra-precise cleaning of semiconductor parts. The micropart cleaning system is a direct cleaning equipment that allows high-precision cleaning and drying. It is fitted with a revolving conveyor to automate the cleaning process.

Contact: Kitamura Manufacturing Co. Limited, Industrial Machine Division, 1-3604-12 Ryokawa, Niigata 950-0322, Japan. Tel: +81 (25) 280 7112; Fax: +81 (25) 280 7142

E-mail: sanki@kitamurass.co.jp

Website: www.kitamurass.co.jp

Dry ice cleaning system

The SNO GUN dry ice cleaning system, manufactured by Va-Tran System Inc. of the United States, is intended to provide an environmentally and economically sound substitute for the use of CFC-based cleaners. It cleans parts by means of a blast of dry ice snowflakes generated using pressurized (about 850 psi) liquid carbon dioxide (CO2). The CO2 used must be 99.99 per cent pure. The company can also supply Va-Tran Purifier CO2 purification equipment that ensures high purity (99.999999 per cent) CO2 from contaminated gas source.

All wetted parts of SNO GUN cleaner are made of stainless steel or Teflon. A lengthy stainless steel-braided hose is provided to transport CO2 to the gun. The specially designed cleaning nozzle is fitted with an acrylic extension tube, which can be used if very large, soft flakes are required. Without this extension, the device will generate small, hard pellets of dry ice. Changing the rate of flow and slipping some insulation on the outside of the acrylic tube will change the flake size.

Contact: Va-Tran System Inc., 677 Anita Street, Suite A, Chula Vista, California 91911, United States of America. Tel: +1 (619) 423 4555; Fax: +1 (619) 423 4604.

Website: www.vtran.com

Fluorinated solvent cleaner

Kaneko Chemical Co. Ltd. of Japan offers e-Clean 21F series fluorinated solvent-based cleaner, which

replaces CFC-113, 141b and AK225. The product is less toxic than the solvents it replaces, and has zero ODP and very low GWP. It can be used for cleaning electronic parts, printed circuit boards, precision parts, plastic parts, rubber parts, ceramic, glass, etc. Its low surface tension enables cleaning of tight spots. Equipment that uses Freon or hydrocarbon could be used without any major modification.

The physical properties of e-Clean 21F cleaner are comparable to that of CFC-113, while the detergent effect is better. It is fast drying, non-inflammable and insoluble in water. The cleaner has low odour and allows vapour cleaning. It is recyclable many times, and thus brings down running costs.

Contact: Kaneko Chemical Co. Ltd., 5-26-33, Sengendai-nishi, Koshigayashi, Saitama 343-0041, Japan. Tel: +81 (48) 979 5691; Fax: +81 (48) 979 4520

E-mail: info@keneko-kagaku.com

Website: www.kaneko-kagaku.com

HFE cleaner-degreasers

MG Chemicals of Canada offers two HFE blend cleaner-degreasers, reformulated with a newly developed solvent that bestows cleaning power, non-inflammability, non-conductivity, cost reduction and environment friendliness. The Super Cleaner Degreaser 4120 can be used for removing flux, greases, oils, oxides, silicones, carbon, dirt, smoke film and grime. It is suitable for use on live circuits but might damage some plastics. The fast drying product leaves no residue and is a perfect replacement for CFC-141b. It comes in 450 g (16 oz) aerosol container.

The Super Cleaner Degreaser 412 is suitable when an azeotropic, non-inflammable and non-conductive cleaner is required. It cleans and degreases energized circuits, contacts, motors and other electronic equipment, and is a replacement for 1,1,1 trichloroethane and HCFC solvents. It is available in 300 g (10.5 oz) and 450 g (16 oz) aerosol cans.

Contact: MG Chemicals, 9347, 193rd Street, Surrey, British Columbia, Canada V4N 4E7. Tel: +1 (604) 888 3084; Fax: +1 (604) 888 7754.

Website: www.mgchemicals.com

Dry cleaning machine

Mitsubishi Heavy Industries Co. Ltd., Japan, has introduced MGIII series dry cleaning machines compatible with Bexcel Clean 25, a brominated solvent substitute for 1,1,1 trichloroethane. The machines have a compact design and microcomputerized controls that make operation easy. A two-step recovery system features a refrigerating unit and activated charcoal absorption, with a closed system that recovers 99 per cent of the solvent. An easily maintained rotary filter reduces running costs.

Mitsubishis MA Series dry cleaning machines are compatible with Solkane-365, a non-hazardous solvent substitute for Freon. Their cleaning performance is equal to machines using Freon (R-113). The machines are

easy to operate and meet all exhaust, drainage and waste product regulations.

Contact: Mitsubishi Heavy Industries Co. Ltd., 1-Takamichi, Iwatsuka-cho, Nakamura-ku, Nagoya, Japan. Tel: +81 (52) 412 1630; Fax: +81 (52) 412 5536.

Website: www.sanikhanbai.co.jp

Ultrasonic cleaning machines

Kerry Ultrasonics of the United Kingdom offers a series of ultrasonic cleaning machines. Its Microsolve mono-solvent machines provide two-stage cleaning ultrasonic cleaning followed by vapour rinsing followed by optional super-heat drying, and freeboard drying. Microsolve machines unique solvent retention feature ensures economic as well as effective use of HFE or HFC solvents.

Microsolve co-solvent ultrasonic cleaning machines provide two ultrasonic cleaning stages, followed by vapour rinsing, optional super-heat drying, and freeboard drying. In the first cleaning stage, a mixture of HFE and a hydrocarbon solvating agent removes gross contamination from the components. Large quantities of dirt and oils can be taken up by the solvent, making the process suitable for heavy-duty cleaning. Both systems have the following typical precision cleaning applications include:

Bearings;

Gyro components (aerospace applications);

Precision medical components;

Maintenance cleaning of pneumatic, hydraulic and power generation system components; and

Flux removal from partially populated, reworked and assembled PCBs.

Mono-solvent systems can also be used for bare board cleaning and flux removal from soldering jigs and fixtures, while co-solvent systems find specific use for paste removal from misprinted PCBs and no-clean flux removal.

Contact: Kerry Ultrasonics, Guyson International Ltd., Snaygill Industrial Estate, Keighley Road, Skipton, North Yorkshire, BD23 2QR, United Kingdom. Tel: +44 (1756) 799 911; Fax: +44 (1756) 790 213

E-mail: sales@kerry.co.uk

Website: www.kerry.co.uk

Cleaner HFE

ITW Chemische Produckte GmbH, Germany, has introduced a Cleaner HFE, specially developed out of a new

class of non-inflammable fluorinated compounds for the safe and powerful cleaning of electrical components in energized equipment. This new generation of cleaning solvents has better toxicological values and low odour. Cleaner HFE is perfect for removing grease, oil, dirt and flux residues. This fast-drying precision cleaner based on the new HFE technology evaporates without leaving any residues and without forming any explosive air-vapour mixtures.

Cleaner HFE is non-conductive and has a good breakdown voltage (17 kV). The zero-ODP product features excellent material compatibility. This clear, colourless liquid has a specific gravity of 1.36 (at 25C) and a surface tension of 11.6 mN/m. It is particularly suitable for cleaning energized equipment and sensitive areas where explosive air-vapour mixtures are dangerous.

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AEROSOLS

New drug formulation employs HFA propellant

Boehringer Ingelheim Pharmaceuticals Inc., headquartered in the United States, has introduced Atrovent HFA inhalation aerosol indicated as a bronchodilator. The new ipratropium bromide formulation that uses hydrofluoroalkane propellant is comparable in therapeutic benefit to its CFC-propelled counterpart, and has been approved by the United States Food and Drug Administration. A 12-week, double-blind, active-controlled and placebo trial established the comparable safety and efficacy of Atrovent HFA to Atrovent CFC, with no statistically significant differences between them. Boehringer will replace its CFC inhalers with HFA alternative once the replacement products are available.

Website: www.formkit.com

Vortex flow aerosol inhaler

Three researchers from Chiesi Farmaceutici, Italy, have applied for patent on a vortex flow aerosol inhaler that delivers metered dose using hydrofluoroalkane (HFA) propellant. The HFA selected is 1,1,1,2-tetrafluoroethane (HFA-134a), 1,1,1,2,3,3,3-heptafluoropropane (HFA-227) or their mixtures. The propellant also has a co-solvent such as ethanol and an optional low-volatility component such as glycerol, propylene glycol, polyethylene glycol, oleic acid and isopropyl myristate. The inhaler has a flat body with a seat for housing the aerosol can, a mouthpiece for inhalation and an expansion chamber shaped to create a vortex flow of the aerosol particles expelled by the actuator through an orifice 0.3-0.5 mm in diameter.

Conventional pressurized cans for dispensing metered aerosol doses are difficult to use correctly, either because the user is unable to synchronize pressing the can with inhaling, or maintain an adequate inhalant flow rate or inhale deep enough. This problem is more acute with children and elderly patients. Further, the

availability of an inhaled medicament to the airways largely depends on the size of the aerosol droplets, which in turn depends on the formulation and on the propellant evaporation time. It is well documented that even under the most favourable conditions only 10 per cent of the aerosol dose delivered by a pressurized can reaches the respiratory tract.

The newly developed inhaler has an expansion chamber shaped to create, because of the speed at which the aerosolized material is expelled by the dispenser, a vortex flow in which the particles remain suspended for sufficient time, with a consequent reduction in particle size, leading to more efficient drug delivery. The jet actuator used by this inhaler allows, unlike conventional actuators, to achieve reproducible delivered dose and fine particle dose. HFA-134a and HFA-227 used in the device are acknowledged as the best non-CFC propellants.

Website: www.freshpatents.com

Nanoparticle dispersion in HFA propellant

Currently, nebulization is the most practical system for the aerosolization of synthetic non-viral gene vectors required to apply genetic therapy locally to the appropriate region of the lower respiratory tract. However, the delivery efficiency is greatly reduced due to the restrictions of the device and the physico-chemical characteristics of the particles at elevated concentrations in the nebulizer reservoir. Pressurized metered-dose inhalers (pMDIs) may provide more viable alternatives for delivering therapeutically active macromolecules, particularly genes, to the lung. The Welsh School of Pharmacy of Cardiff University, the United Kingdom, is developing a novel technology for producing drug nanoparticles for dispersion in hydrofluoroalkane (HFA) propellant for pulmonary gene therapy.

Initially, pDNA is loaded into the aqueous pool of the reverse micelles that form when a water-in-oil microemulsion is formed between water, an organic solvent and a surfactant. After removal of the water and organic solvent, the dimensions of the surfactant-coated particles and their ability to disperse in HFA propellants allow for the production of stable aerosolized medicines for deep pulmonary delivery by pMDI.

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FOAMS

UNIDO case study: Conversion to zero ODP blowing agent

Among projects recently implemented by UNIDO in Indonesia with Multilateral Fund backing is one that involves the company P.T. Trias Rantai, which produces polyurethane (PU) integral skin shoe soles. This

conversion has a zero ODP and is thus considered to be an end solution.

The choice of the proper blowing agent was crucial in the production of PU shoe soles, as the visual aspects of the end-product are very important. The skin has to be completely smooth, and free of bubbles and other blemishes. Other physical properties such as abrasion resistance, tear strength and elongation at break-point are also crucial. The water-blown technology demands a higher skill of operators, exact metering of the components and constant temperature of the moulds.

With the installation of the new equipment, the company acquired certain capacity to operate in more economical mode such as consistent product quality and negligible scraps volume while maintaining enough production capacity to cope with the market demand. European industrial and occupational safety standards were applied to the installation of the equipment, though there was no safety-related cost allocation.

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Economical appliance foam

A great deal of effort and a variety of approaches are being directed towards improving the cost and performance of HFC-245fa appliance foams. Bayer MaterialsScience in the United States has reported on ways to make foams more economical by using less HFC-245fa and increasing water levels to generate more carbon dioxide. Bayer showed that HFC-245fa can be reduced by 68 per cent from 12.5 per cent to 4 per cent while the average K-factor increases by only 11 per cent. Another strategy to reduce foam cost is supplementing reduced levels of HFC-245fa with HFC-134a.

Bayer researchers indicated that for very low K-factors of 0.123 to about 0.129, using HFC-245a and water was the best choice. For K-factors between 0.130 and 0.136, a foam co-blown with HFC-134a and 245fa might prove cost-effective, though the systems would require special equipment to handle HFC-134a gas. For applications that use K-factors above 0.137, HFC-134a or cyclopentane could be the sole blowing agent.

Contact: Bayer MaterialsScience LLC, 100 Bayer Road, Pittsburgh, PA 15205-9741, United States of America. Tel: +1 (412) 777 2000.

Website: www.ptonline.com

FR building insulation

Albemarle Corporation in the United States has developed a new series of Saytex low-viscosity brominated flame retardants that provide greater formulation flexibility in HFC-245fa foams, and in some pentane-blown PUR and PIR systems for lamination boardstock, pour-in-place and sprayed foams. Albemarle researchers say

that a Class I fire rating can be achieved in pour-in-place PUR blown with either HFC-245fa or cyclopentane. In 245fa foams, Saytex XP-7272 provided the best flame rating (27.8) and smoke results (248). Best results in pentane-blown foams were obtained with Saytex RB-7001, which gave a flame spread of 29.4 and smoke density of 415.

PIR open-pour foam blown with HFC-245fa can also achieve Class I, although smoke levels are relatively high. Saytex retardant XP-7353 was the best performer for PIR, with a flame spread of 24.5 and 411 smoke density. Saytex XP-7353 makes a Class I, 245fa PUR spray foam with a flame spread of 27.4 and smoke density of 276.

Contact: Albemarle Corporation, 451 Florida Street, Baton Rouge, Louisiana LA 70801, United States of America. Tel: +1 (225) 388 7402; Fax: +1 (225) 388 7848

Website: www.albemarle.com

Website: www.ptonline.com

Zero-ODP foam additive

Arkema Inc., Philadelphia, the United States, had previously demonstrated that its zero-ODP and very low-GWP additive trans-1,2-dichloroethylene (TCDE) can significantly improve the fire performance of HFC-245fa foams. Arkema researchers have since found that TCDE also allows lower HFC-134a levels, which significantly reduces the blowing agents vapour pressure, making the blowing agent more user-friendly in PUR insulation. TCDE also dramatically reduces the viscosity of polyols and improves foam processing.

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Website: www.arkemagroup.com

Website: www.ptonline.com

Silicone surfactants in HFC systems

Degussa, which acquired the surfactant supplier Goldschmidt Chemicals Co., the United States, has reported that new silicone surfactants can improve foam quality and provide more efficient utilization of HFC-245fa in appliance foams. Using an optimized surfactant greatly reduces freeze-stable density and minimum fill density while improving K-factor in next generation HFC-245fa systems, including ones with low and high water contents or co-blown with HFC-134a.

In a system using a low level of HFC-245fa with HFC-134a, developmental surfactant EP13 improves flow by 3.4 per cent and K-factor by 2.7 per cent, compared with workhorse Tegostab B8465. Smaller but still significant improvements can be achieved in a high-245fa/low-water system with new Tegostab B8481, which improves flow by 0.5 per cent and K-factor by 2.2 per cent.

In another 245fa/water system, developmental EP3 surfactant reportedly improves K-factor and freeze-stable density (FSD) 1.5 per cent and 2 per cent, respectively. In the same system, developmental EP8 and EP9 surfactants both reduce FSD by 3.2 per cent without loss of thermal performance.

Contact: Goldschmidt Chemicals Co., P.O. Box 1299, Hopewell, VA 23860, United States of America. Tel: +1 (804) 541 8658; Fax: +1 (804) 541 2783

Website: www.goldschmidt.com

Website: www.ptonline.com

PU soundproofing blocks

American Insulock Inc. of Canada is producing polyurethane (PU) blocks for use in building sound-walls and soundproofed buildings using a prototype process that the company claims has no adverse effect on the ozone layer. Brand-named Insulock Blocks, the interlocking forms are produced using a resin that contains a zero-ODP blowing agent to make the PU foam up. Most manufactured forms of this kind are created from polystyrene (PS). The company claims that the new PU blocks are stronger than PS and offer higher heat and sound insulating values, efficient to R-30 or R-38 standards.

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Expandable polystyrene foams

Ming Dih Industry Co. Ltd. of Taiwan offers polystyrene foams manufactured using pentane as the blowing agent. The products have a bulk density of 600 g/l and a pentane content of 5.7 per cent. Its general-purpose expandable polystyrene has easy mould-release and excellent fusion properties. It comes in four grades (for densities 13-30 g/cm3) and can be used for precision and low-density articles made using continuous machine or block process. Self-extinguishing expandable polystyrene is available in two grades, for densities of 15-30 g/cm3.

It can be used for precision and low-density articles as well as for insulation boards made using continuous machine or block process. Both products come as spherical beads (varying in size from 0.5 mm to 1.8 mm, depending on the grade) in paper bag, PP woven bag or bins.

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Website: www.mingdih.com.tw

HALOONS

Conversion of halons

Two ozone-depleting substances used in firefighting equipment, Halon 1211 and Halon 1301, can now be economically converted to difluoroethylene, an industrial chemical feedstock. Under a research programme managed by the AFRL Air Force Office of Scientific Research, Prof. Eric Kennedy and fellow researchers at the University of Newcastle in Australia discovered a way to convert the halons into difluoroethylene. Halon 1211 is used in small, portable fire extinguishers, while Halon 1301 serves as a gaseous agent in total room fixed-flooding systems. To create the chemical reaction that produces difluoroethylene, Prof. Kennedy's team used a laboratory-scale reactor capable of processing 3,000 kg of halon per day to react the halon with methane. The research team determined that a plant capable of processing 900 tonnes of halon per year would realize an annual profit of more than A$1.3 million.

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Website: www.afrl.af.mil

CO2 as fire suppression agent

In the United States, Mr. Viswanath Katta of Innovative Scientific Solutions, Mr. Fumiaki Takahashi of NASA Glenn Research Centre and Mr. Gregory Linteris of the National Institute of Standards and Technology have conducted numerical investigations on the fire suppression characteristics of carbon dioxide (CO2).

The study examined the efficacy of CO2 in: (1) a periodically oscillating, methane-air jet diffusion flame formed over a cup burner; and (2) a steady-state planar flame formed between opposing jets of fuel and air. It used a detailed chemical-kinetics model having 31 species and 346 elementary reaction steps.

In the cup-burner flame, CO2 reduced the flame temperature to ~1,620 K at suppression and destablized the flame base, which moved out of the computational area at CO2 volume fractions above 14.5 per cent.

However, even for very high CO2 concentrations, the calculations did not yield simultaneous quenching of the entire cup-burner flame. On the other hand, the opposed-jet flame was extinguished through global extinction

of flame chemistry. The low-strain (30 s-1) opposed-jet flame extinguished at CO2 volume fractions >16.4 per cent, while moderate-strain (90 s-1) flame extinguished at volume fractions >10.4 per cent. Both the opposed-jet flames extinguished nearly at the flame temperature of ~1,580 K, indicating that the extinction limits are primarily controlled by chemical kinetics.

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Website: fire.nist.gov

Advanced fire-fighting streaming agents

In the United States, under a joint initiative of the Strategic Environmental Research and Development Programme and the Department of Defence, the Air Force Research Laboratory studied environmentally and occupationally safe streaming agents for drop-in replacement of Halon 1211 in wheeled 150 lb flight-line fire extinguishers and in portable aircraft and facility extinguishers.

Several new tropo-degradable halocarbon compounds have been identified by developing and using a Quantitative Structural Property Relationship (QSPR) computer model to predict the compounds that have the powerful fire suppression benefits of Halon 1211 but without its high ODP. Candidate replacements have been synthesized and screened for a variety of attributes including effectiveness, compatibility, stability, toxicity and environmental behaviour to ensure suitability as a streaming agent. The QSPR model was successful in identifying blends of octafluoro-2-butene and 1-bromopropane as efficient replacements with low ODP, low tropospheric lifetime and good toxicity values. Streaming tests of the blends showed performance similar to Halon 1211. The model also successfully identified a family of compounds known as brominated unsaturated ethers that are predicted to have excellent fire suppression ability, very low ODP, moderate-to-low toxicity and many other desirable physical characteristics.

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FUMIGANTS

Propylene oxide as potential quarantine fumigant

A joint Turkey-Israel research study led by Mr. A.A. Isikber of the Faculty of Agriculture, University of Kahramanmaras Sutcu Imam, Turkey, examined the feasibility of propylene oxide (PPO) as a methyl bromide (MB) replacement in post-harvest fumigation of nuts. PPO is a zero-ODP liquid sterilant used (under low pressure in CO2-rich environment owing to its inflammability) on processed spices, cocoa and nuts.

Toxicity tests were carried out on all life stages of the Indian meal moth Plodia interpunctella, a major insect species of stored nuts, in 2.6 litres desiccators at 30C temperature and 70 percent relative humidity at 4 hours exposure time. Tests at different concentrations were carried out on walnuts, peanuts and almonds and each test was repeated once. The complete mortality of all life stages of the insect was achieved at 61.2 mg/l/h. Sorption of PPO by nuts after 4 hours exposure was very high, ranging from 87 to 91 per cent of the initial concentration. However, PPO residues were all below the maximum tolerance of 300 ppm after 1 day and negligible after 3 days. The study concluded that the combination of PPO with low pressure could be a potential fumigant for MB replacement.

Website: www.mbao.org

New fumigants to control insect pests in log

A research team in Japan, led by Mr. Y. Abe of Yashima Sangyo Co. Ltd. has studied Ecofume and Ecotwin, two methyl bromide (MB) alternatives. Ecofume is 30 per cent methyl isothiocyanate (MITC)+70 per cent liquefied carbon dioxide (CO2), while Ecotwin is 30 per cent MITC+30 per cent sulphuryl fluoride (SF)+40 per cent liquefied CO2.

MITC has low boiling point (119C) and high vapour pressure (20.7 mm Hg). Its oil formulation has been used for soil fumigation through injection. SF is an accepted pesticide for insect-infested logs. In Ecotwin, SF was combined with MITC for higher efficacy against all growth stages (except egg) of insects, low boiling point (55.2C), low rate of adsorption to fumigated items, high solubility in liquefied CO2 and high compatibility with MITC. The formulations were sprayed using high-pressure liquefied CO2 onto samples kept in tarpaulin bags.

In the case of Ecofume, gas concentration reached maximum within 1 hour and reduced rapidly in a few hours because of its high adsorption rate. A dose of 180 g/m3 was needed to ensure total mortality of all insects tested (Monochamous alternatus, Xyleborus validus, X. pfeili and Xylosandrus germanus). In the case of Ecotwin, high SF concentration was maintained during fumigation and final gas concentration was 21.9 g/m3 at 24 hours after treatment. The concentration of MITC fell rapidly and was 0.5 g/m3 at the end of 24 hours. All life stages of pests (Cryphalus fulvus, Callidiellum rufipenne, Xyleborus perforans and X. pfeili) were destroyed at doses of 50 g/m3 and 70 g/m3. Therefore, Ecotwin is considered a possible alternative to MB for fumigating logs infested with forests insect pests.

Website: www.mbao.org

Agrocelhone scores over MB fumigants

Initiatives by the Spanish agrochemicals company Agroqumicos de Levante (AQL) to develop substitutes for methyl bromide (MB) for fumigation have shown promising results with formulations of 1,3-D and chloropicrin, which can be applied to the soil by mechanical injection or (in emulsion form) by drip irrigation. The efficacy of these Agrocelhone formulations in terms of controlling soil pathogens and improving crop yield and quality has led to their wide adoption in the EU and elsewhere, where tomatoes and strawberries are key export crops that rely on MB use.
The choice of Agrocelhone formulations (injectable or emulsifiable) allows treatments to be tailored to different crops and conditions in a versatile way.

Growers in Spain and Morocco have switched to Agrocelhone for more than 20 per cent of cash crop

production formerly needing MB for soil fumigation.

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