VATIS Update Ozone Layer Protection . Mar-Apr 2007

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TECH EVENTS

THE SCIENCE OF OZONE LAYER

Diagnosis of Antarctica ozone layer

Scientists are measuring the level of ozone in the atmosphere at the Franco-Italian Concordia Base perched atop the Antarctic Plateau, 3 km above sea level. Mr. Roman Cormic, a researcher in atmospheric physics at Jussieu, Frances top university for science, uses a light detection and ranging machine to measure the ozone, as well as the density of the stratospheric clouds and the presence of chlorine. Dr. Florence Goutail, an engineer in the same field at Frances National Centre for Scientific Research (CNRS), is in charge of setting up and monitoring a specially designed spectrometer that measures ultraviolet (UV) rays from high-floating balloons.

The collective diagnosis is clear: the stratospheric blanket of ozone molecules, some 15-35 km above the Earths surface, is ulcerated. In October 2006 the ozone layers wound spanned a record 29.5 million square kilometres and showed a loss of 40 million tonnes, exceeding the previous record of 39 million tonnes set in 2000, according to the European Space Agency. The chemical reaction that thins ozone peaks with colder high-altitude temperatures in the southern hemisphere winter, making Antarctic skies more vulnerable than anywhere else above the Earth. The polar vortex a persistent, cyclone-like weather pattern located near both poles makes the condition even worse.

Dr. Jean-Pierre Pommereau, research director at the CNRS department of atmospherics physics in Verrieres-le-Buisson, says that like living organisms, the ozone layer will heal itself if given the chance. Barring a string of extremely cold winters, the ozone depletion will stop and fully reverse itself, returning to normal around 2065, say the World Meteorological Organization and the United Nations Environment Programme. The ozone level globally has lowered by 0.3 per cent a year over the past decade. At ground level, ozone is a pollutant created by a chemical reaction between exhaust fumes and sunlight, and can be dangerous for people with bad respiratory or heart problems.

Website: www.physorg.com

Total ozone over Japanese Antarctic station hits a new low

The Japan Meteorological Agency reports that, as per the measurements by Japans 47th Antarctic research expedition team, the total column ozone (the amount of ozone in a vertical column of air) over Syowa Station, the main Japanese research station in Antarctica, hit a record low of 117 milliatmosphere-centimetre on 3 October 2006. The column ozone at the site was at its lowest level since late August 2006.

According to satellite measurements by NASA, the United States, the size of this years ozone hole and the ozone deficit reached the highest levels on 24 September. The size of the hole was 29.3 million square kilometres, the second largest since 2000, while the deficit was 105 million tonnes, the second largest since

2003. The agency cited two factors to explain this serious depletion of the ozone layer: one, concentrations of ozone-depleting substances in the atmosphere; two, the very cold stratospheric air (below minus 78C) over Antarctica which accelerates ozone destruction.

Website: www.japanfs.org

Ozone ban better than Kyoto Protocol to fight global warming

The Montreal Protocol, which restricts the use of ozone-depleting substances (ODS), has helped slow down the rate of global warming, besides protecting the ozone layer, report scientists in a paper published online in the early edition of PNAS. Mr. Guus Velders, of the Netherlands Environmental Assessment Agency, and colleagues report that without the reductions achieved under the Montreal Protocol, the amount of heat trapped by the atmosphere due to ODS would be roughly twice as high as it is today. They say that the savings in trapped heat are equivalent to about 10 years of growth in carbon dioxide concentrations and note that the climate protection already achieved by the Montreal Protocol alone is far larger than the reduction target of the first commitment period of the Kyoto Protocol. Mr. Velders and colleagues argue that amendments to the Montreal Protocol, especially in the absence of a functional Kyoto Protocol, could further help fight global warming.

Website: www.news.mongabay.com

ODS PHASE-OUT IN INDIA

Some UNIDO-implemented projects in the solvents sector

Phase-out of CTC as process solvent

This project, with a total outlay of US$ 249,464, has phased out the use of 49.25 MT of carbon tetrachloride (CTC) at Svic Labs Ltd., Ranipet. CTC was used as process solvent in the manufacture of ibuprofen and IBAP intermediate. The major cost items are US$106,129 for equipment (already installed), training and trial expenses, new equipment including two glass-lined reactors and a distillation system (US$68,189), effluent treatment facilities and civil construction work (US$37,940). Incremental operating costs total US$31,532. Country studies and the country programme prepared during 1992-93 have identified the sector as a high priority area. The project will eliminate 54.17 ODP tonnes of CTC consumption from the solvent sector, which currently constitutes about 40 per cent of the countrys ODS consumption.

Website: www.unido.org

Conversion of cleaning processes from TCA and CTC to non-ODS solvents

The objective of this project worth US$234,602 is to complete the phase-out of the use of 14.4 MT of CFC-113, 50 MY of 1,1,1-trichloroethane (TCA) and 2 MT of carbon tetrachloride (CTC) totalling 7.20 ODP weighted MT, excluding CFC-113 mould-cleaning sprays) at Videocon International, Aurangabad. These solvents are used for: precision cleaning of components such as fly-back transformers and electronic tuner assemblies. Alkoxypropanol formulations will replace TCA solvent in cleaning CTV, tuner units, frames used for surface-mount devices (autochip mounting) and PCB carriers (Tuner unit). Trichloroethylene (TCE) will replace TCA in cleaning of piping of potting units (FBT unit), while the alkoxypropanol Dowclene PX-16S will be the alternative for CTC in cleaning of pallets (CTV unit).

The major investment cost item is US$200,000 for two ultrasonic cleaning units with vacuum distillation for solvent recovery at CTV and Tuner units. Other costs include trials (US$5,000) and modification of potting plants at FBT unit (US$ 40,000). The high cost of Dowclene PX-16S (US$ 8.0/kg) accounts for the incremental operating costs of US$61,400, which the company will have to cover. When implemented as scheduled, 52 MT of ODS (7.2 ODP MT) consumption will have been eliminated from the solvent sector.

Website: www.unido.org

TCE replaces CTC as cleaning solvent

This project, with an outlay of US$660,755, will phase out the use of 49 MT (53.90 ODP-weighted MT) of carbon tetrachloride (CTC) at Navdeep Engineering, Palghar, Maharashtra. CTC is used as cleaning solvent in the manufacture of copper tubes/coils and no-frost evaporators required for refrigeration and air-conditioning and other industrial applications. The major cost items are four top loading vapour degreasers, one front-loading cleaning machine, solvent distillation unit and retrofitting of flushing unit, all with trichloroethylene as solvent and amounting to US$485,000. Incremental operating costs calculated on four-year basis are US$37,812. In view of the technological and environmental upgrade of projects equipment, Navdeep Engineerings direct contribution of is expected to be approximately US$ 200,000, including incremental operating costs.

Website: www.unido.org

Conversion of CTC as process agent with cyclohexane

The project, costing a total of US$ 383,913, will phase out the use of carbon tetrachloride (CTC) at Amoli Organics Limited, Mumbai. CTC is used as process solvent in the manufacture of 2,6-dichlorophenol, which is a precursor of the drug diclofenac. The major cost item is US$258,000 for equipment storage tank, agitating filter with cooling jacket, solvent recovery and rectification unit, nitrogen generator, chilling plant, vacuum system, compressed gas generator, and fixed fire fighting system. Incremental operating costs amount to US$9,225. The project will eliminate 38.5 ODP tonnes of CTC consumption from the solvent sector, which constitutes 0.32 per cent of the CTC consumption in the country.

Website: www.unido.org

IN THE NEWS

UNEP chief hails push for protection of ozone layer

Mr. Achim Steiner, the head of the United Nations Environment Programme (UNEP), has applauded the findings of a new study that calls for a parallel push to fight climate change and also to decrease chemicals harming the ozone layer that shields the Earth from harmful ultraviolet light. I believe the study underscores the simple fact that well-devised action to address one area of environmental concern can have multiple environmental benefits across numerous others, said UNEPs Executive Director.

The new study, by scientists from the Netherlands and the United States, is the first to calculate in detail how the phasing out and reduction of chemicals such as chlorofluorocarbons (CFCs) under the Montreal Protocol assist in protecting the climate. The Montreal Protocol on Substances that Deplete the Ozone Layer, now entering its 20th year, is one of the most successful environmental agreements to date. It has succeeded in phasing out ozone depleting chemicals (ODS) in developed countries, led to the closure of many plants producing ODS and discouraged the creation of industries that use them.

Website: www.un.org

Success for effort to halt illegal trade in ODS

A United Nations-backed initiative to curb illegal trade in chemicals that damage the ozone layer has reported its first promising results ahead of the start of its second phase. Up to 64.8 tonnes of illegal ozone depleting substance (ODS) have been recorded in China, India, Thailand and other countries following the start of Project Skyhole Patching, an initiative launched on 1 September by China Customs, coordinated by the UN Environment Programme (UNEP), and operated by related customs administrations and international organizations in the region.

The project seeks to combat illegal trade in ODS and hazardous waste in the Asia-Pacific region and involves 20 customs and environmental authorities from 18 countries. Since the project began, customs in Hong Kong, India and Thailand have played an active role in sharing information on ODS. Some countries like Viet Nam and Cambodia are holding bilateral discussions on illegal ODS trade. Partner countries in Project Skyhole are: Australia, Bangladesh, Bhutan, Brunei, Cambodia, China, Fiji, India, Japan, Republic of Korea, the Maldives, Mongolia, New Zealand, Samoa, the Philippines, Sri Lanka, Thailand and Viet Nam.

The ODS phase-out becomes more crucial for developing countries as 2010, the year they have pledged for completion, approaches. Illegal trade in CFCs and other ODS is expected to grow when a complete ban is enforced. Studies indicate that trade in illegal ODS represents nearly 10-20 per cent of all trade in ODS. CFCs alone account for 7,000 to 14000 tonnes of this trade, valued at US$25-60 million.

Website: www.un.org

China to phase out CFCs in medicinal aerosols

According to Chinas National Plan for Phasing out Ozone-Depleting Substances approved in January 1993 by the State Council, the country will have phased out the manufacturing and consumption of ozone-depleting substances (ODS) by 1 January 2010. CFCs used as dispersant and propellant in medicinal aerosols are among the substances that shall be phased out by 2010. CFCs in medicinal aerosols are mainly CFC-11, CFC-12 and

CFC-114. To fulfil the commitment of the government and to ensure the smooth implementation of the plan, the State Food and Drug Administration (SFDA) issued a notice on 22 June 2006 that specified details relating to the phase-out of CFCs in aerosols.

As of 1 July 2007, CFCs will be banned as excipients in manufacturing external-use aerosols and the import of external-use aerosols using CFCs as excipients will also be banned. From this date, SFDA will stop approving applications for registration and import for external-use aerosols using CFCs as excipients. Inhalant aerosols manufactured before the set date will be allowed to be circulated and applied until they expire in validity.

Similarly, as of 1 January 2010, CFCs will be banned as excipients in manufacturing inhalant aerosols and their import totally banned. However, if they were imported before this date, they may be circulated and applied until their validity expires. From 1 January 2010, SFDA will stop approving the registration application (including import application), for inhalant aerosols using CFCs as excipients.

Website: www.sfda.gov.cn

Philippines steps up efforts to get rid of CFCs from vehicles

The Philippine government has stepped up its efforts to curb the depletion of the ozone layer through an administrative order that phases out harmful chlorofluorocarbons (CFCs) in car air-conditioning systems. R-12, an ozone depleting substance, is a widely used cooling agent in auto air-conditioning (AC) systems.

The Land Transportation Office and the Philippine Ozone Desk (POD) are spearheading the implementation of Joint Administrative Order No. 3, which calls for total phase-out (zero imports) of R-12 in the country by year 2010, said POD programme manager Ms. Ella Deocadiz. Under the Order, the inspection of car AC systems is a requirement for renewal and registration of vehicles. All vehicles from model 1999 up must have an HFC-134a (R-134a) AC system. While older models with R-12 AC system will still be allowed to register until the phase-out year of 2010, they may opt to retrofit with alternative refrigerants, such as the ozone-friendly R-426A. The use of R-426A is reported to be an important factor in the governments programme to protect the ozone layer. R-426A has zero ozone depletion, is non-inflammable and designed for auto AC systems, and can be used as top-up without system retrofitting.

Website: www.klima.ph

Indian private sector receives Halon-alternative technologies

The Defence Research and Development Organization (DRDO), India, has transferred to the private sector six technologies that it developed on a fire-fighting compound, heptaflouropropane. The new compound is an odourless liquefied compressed gas that replaces Halons in fire-fighting equipment. It was developed by the Delhi-based Centre for Fire, Explosives and Environment Safety, in collaboration with the Hyderabad-based IICT.

The six technologies transferred are MAP-based extinguishant powder for ABC class of fires, advanced oxidation process for hazardous effluents, cement-based solid matrix for disposal of toxic heavy-metal wastes,

laser-based intelligent fire sensor, activated carbon spheroids for NBC applications and heptaflouropropane for replacement of Halons. The technology recipients from the private sector are Southern Electronics of Bangalore, Water Quality Management Systems of Chennai, Mechvac Fabricators and KV Fire Chemicals of Mumbai and Hindustan Electro Graphite Limited in Bhopal.

Website: www.dailyindia.com

Air-conditioning in India and China prompts ozone worries

The growing popularity of air-conditioning in India and southern China has some scientists worried about the impact on the ozone layer. The rising standard of living in the worlds two most populous countries has placed air-conditioners within many peoples means. The problem for atmospheric scientists is that the refrigerant used in the machines HCFC-22 is harmful to the ozone layer. HCFC-22 has been identified as the ozone-depleting gas with the fastest-growing usage.

Website: www.sciencedaily.com

Pakistan bans import of carbon tetrachloride

The Ministry of Commerce, Pakistan, has banned the import of ozone-depleting carbon tetrachloride (CTC) till the announcement of the new import policy, to phase out the ozone-depleting substances (ODS) in the next fiscal year 2007-08. The phase-out of ODSs will be a part of the Import Policy 2007-08, which is to be announced by the Ministry of Commerce by July, according to a top government official. The Ministry has advised all CTC importers to refrain from importing CTC till the announcement of the new trade policy 2007-08. The official said that the Ministry of Environment and the Ministry of Commerce will jointly prepare the new policy for ODS phase-out, as per the requirements of the United Nations Environment Programme (UNEP).

The authorities regulating and implementing the phase-out plan for ozone-depleting substances and gases had allowed the import of 135 metric tonnes of CTC against the authorized quota of 56 metric tonnes in 2005, which put Pakistan at the risk of being declared a non-compliant country by the United Nations Environment Programme, said the official. The Ministry of Environment had cautioned that in case Pakistan did not contain the import of CTC to the allocated limit, UNEP could rank the country as non-compliant, leading to the imposition of a fine at the rate of US$12,000 per metric tonne and cessation of international financial and technical assistance.

The Ministry of Environment, in a communication to the Ministry of Commerce and the Central Board of Revenue has disclosed that the allocated quota system cannot be met due to a vague phase-out schedule for ODS imports in Trade Policy 2006-2007. The policy needs to be amended, notifying year-wise quota allocation for the five authorized CTC importers, who may be issued Category Pass Books by the Ministry of Commerce.

Pakistan has adopted a phase-out plan under the first phase of which the use of CFC gases are frozen at the level of financial year 1995-96 to 1996-97 and targets are set to reduce the volumes of imports up to 50 per cent till 1 January 2005. In the second phase from 2007 to 2010, the import volume is to be further reduced to 85 per cent of the frozen quantity.

Website: www.dailytimes.com.pk

Singapore accedes to protocol amendment on ODS

Singapore has reaffirmed its commitment to the protection of the ozone layer by acceding to the amendment made to an international agreement to stop the use of ozone-depleting substances (ODS). The amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer introduced control measures for the production of hydrochloroflurocarbons (HCFCs), found in appliances such as refrigerators, and the production and consumption of bromochloromethane, found in items like fire extinguishers.

The 1999 Beijing Amendment came into effect five years ago, but Singapore concurred with the amendment only this year. Local industries in Singapore will not be affected by Singapores accession to the amendments until 2016. That is when the phasing out of HCFCs commences for developing countries, according to the agreement. While Singapore does not produce any HCFCs, the chemical is traded and consumed in Singapore.

Website: www.channelnewsasia.com

Green refrigerator campaign in China a success

An award-winning campaign in China to promote energy-efficient CFC-free refrigerators which dramatically increased the number of green refrigerators sold from 1,000 units in 1999 to 40 million in 2005 has come to a successful end after the five-year campaign period. The US$40 million project, entitled Barrier Removal for the Widespread Commercialization of Energy-Efficient CFC-free Refrigerators in China, introduced innovative market incentives designed to encourage refrigerator manufacturers and retailers to promote environmentally friendly refrigerators and to encourage customers to purchase them.

The project established a cash-incentive programme by rewarding those manufacturers and retailers who were the most successful at producing and selling green refrigerators. The national campaign drew wide participation from competing manufacturers and retailers. The success of this project demonstrates that it is possible to find creative solutions that are both environmentally friendly and attractive to Chinese consumers, said Mr. Kishan Khoday, team leader of Energy and Environment for the United Nations Development Programme in China.

China became the worlds second largest refrigerator manufacturer in 1996, and ranks first in the world today. In 1996, in 70 per cent of urban households, refrigerators alone accounted for approximately half of daily residential electricity consumption. Back then, the refrigerators manufactured for the domestic market in China were significantly less energy-efficient than those used in developed countries. The participation in the project of leading Chinese refrigerator manufacturers, such as Kelon and Haier, resulted in an impressive 29 per cent increase in the weighted average efficiency of household refrigerators produced from 1999 to 2005. There was a corresponding drop in CO2 emissions of about 11 million tonnes by 2005, and this is projected to reach 42 million tonnes by 2010.

Website: www.chinacsr.com

REFRIGRATION/AIR-CONDITIONING

Magnetic refrigeration gets rid of gaseous refrigerants

Solid-state refrigeration which has no need for gaseous refrigerants such as HCFCs has come a step closer with the development of materials that change their temperature when magnetized. These binary metal refrigerants, used together with novel nano-particle suspension heat transfer fluids, could work quite efficiently on a large or small scale. The technology has the potential to replace conventional gas compression and cycle refrigeration plants saving energy and avoiding problems associated with leaking refrigerant gases.

The technologies being developed by Camfridge, the United Kingdom, are based on ideas that have been around for some time, such as gadolinium-silicon-germanium alloys, which make a large temperature change when magnetized and show a large hysteresis effect. A magnetic field is applied to a material so that it heats up and after this, the heat is passed to the working fluid, the field is turned off, making the material cool as it takes in energy in order to return to its previous state. It can then absorb heat from whatever it is that needs to be cooled. As it does so, its temperature rises until it reaches the level where the cycle may be repeated.

Two experimental machines have been built. The original uses a bed of gadolinium particles in a tube. Any practical machine is unlikely to be based on gadolinium, as it is too expensive, but it is well understood and easy to work with.

Heat transfer fluid is pumped through the bed that is reciprocated by an actuator through a magnetic field produced by a permanent magnet. This machine, with a cooling power of 10 W, cools fluid from 23/24C to 10/11C on a 4-second cycle time. The permanent magnet is made of neodymium-iron-boron, and is a Halbach magnet that enhances the 1.4 Tesla maximum remnant field associated with this material to 2 Tesla. Although the individual gadolinium particles cycle over a temperature range of 2C, because the working fluid passes through a bed of particles with a hot and a cold end, the overall cooling is 15C.

The other machine has a magnetic disk that rotates its sectors between two pole piece pairs in a larger permanent magnet arrangement with a much shorter cycle time. The machine, about the same size as the first, runs at 10 or more cycles per second and has a cooling power of 100 W.

The team is looking at many materials. Ideally the material should not change its crystalline structure when magnetized or demagnetized, must be low-cost, non-toxic and have high thermal conductivity. Other desired features include low heat capacity and a high electrical resistance.

Website: www.eurekamagazine.co.uk

Recirculating loop chillers

Filtrine Manufacturing Co, the United States, offers chillers that recirculate a clean coolant at constant temperature and pressure to increase the stability and consistency of water-cooled machines and instruments. Air-cooled chillers eliminate the use of tap water and prevent clogging and corrosion of small diameter heat exchangers due to rust and scale build-up.

The PCP closed loop chillers use a storage type cooling tank to provide close temperature control of recirculating coolants. The tank is sealed to prevent coolant evaporation and fouling, and supplied with a liquid level gauge, fill port and clean out. The pump recirculates coolant at constant pressure and flow. The POC open loop chillers pump liquid from an open tank or sump, through the chiller and back to the sump. An adjustable thermostat senses the liquid temperature, cycling the chiller to ensure constant sump temperature.

The recirculating chillers can be used with jacket cooling computers, laser power supplies, induction heaters, vacuum ovens, injection moulding machines, plasma welders, linear accelerators for MRI equipment and electron microscopes.

Their main features are:

Energy-saving design, with the compressor running only when needed

Uses ozone-friendly R-134a refrigerant

Temperature adjustable within a range of 4.4C to 32C (0.8C)

Welded stainless steel cooling tank

Optional stainless steel exteriors

Contact: Filtrine Manufacturing Co., 15 Kit Street, Keene, NH 03431, United States of America. Tel: +1 (603) 352 5500; Fax: +1 (603) 352 0330.

Website: www.globalspec.com

Phase change cooler for PCs

Prometeia Mach II GT from Extreme Cooling Technologies, Denmark, is a phase change cooling system for PCs. At its heart is a Danfoss NF9FX refrigeration compressor, which draws up to 310 W of power during peak operation and is rated to work in ambient temperatures up to 43C. At the front of the Mach II GT is a small condenser, which is actively cooled with a 120 mm fan that pushes 86.5 cfm of air with 35.5 dB of noise. The air from the intake fan passes through the heat exchanger to cool down the refrigerant, and then passes by the compressor before exhausting from the rear of the enclosure, aided by another fan. The Prometeia Mach II GT employs R404a refrigerant, which is a near-azeotropic, zero ozone depletion HFC refrigerant blend specifically used for low-temperature refrigeration applications.

Website: www.pcstats.com

Reverse cycle air-conditioning

GenIII from Advantage Air, Australia, is a reverse-cycle, ducted air-conditioning that allows individual room temperature control throughout a home. Another benefit of this precise air delivery from GenIII is that it eliminates hot and cold spots using sensors in every room. The CSIRO of Australia estimates Gen III as 26 per cent more efficient than Advantage Airs regular reverse cycle system.

A high-tech colour touch screen gives the user fingertip control and delivers data instantly. The scheduling ability allows the user to set the temperature for the system, in every room, for every hour, for the next 30 days. Available options include Fresh Air, which brings in air from outside to ventilate the home even when all the windows and doors are closed and boosts the energy efficiency of GenIII by a very environmentally friendly 38 per cent. GenIII system is one of the first air-conditioners to use R407C, a new non-ozone depleting refrigerant.

Website: www.infolink.com.au

New refrigeration technology that runs at half the power

Sanyo Electric, Japan, has developed a refrigeration unit that uses the worlds first W-Multi System, a system that connects multiple showcases with multiple refrigeration units. The enegreen supermarket showcase refrigeration system combines central control of the showcases with in-store lighting and air conditioning equipment to save around 38 per cent (compared with Sanyos conventional units) of electrical energy.

With the enegreen system, a structure best-suited to the premises can be built, by combining five models of refrigeration units fitted with DC inverter compressors, which allows operation to be optimized for the refrigerating capacity of the showcase with improved compressor efficiency. The enegreen system, can not only reduce annual energy consumption by up to 38 per cent, but can also save as much as 46 per cent of energy by combining in-store equipment such as air-conditioning and lighting.

The system uses R410A refrigerant, which has superior environmental features and a lower global warming potential (GWP) than R404A, which is now being used. R410A has a higher heat transmission capacity and smooth circulation, and the amount of refrigerant used can be reduced by 21 per cent, thereby permitting thinner pipe diameter.

Website: www.sanyo.co.jp

Hydrofluorocarbon refrigerant compositions

Researchers from Honeywell International Inc., the United States, have applied for a patent on refrigerant compositions comprising 80-99.9 weight per cent of at least one C1-C5 hydrofluorocarbon (HFC) and 0.1-20 weight per cent of at least one C3-C7 alcohol, for recharging or retrofitting existing refrigeration systems through a relatively simple drop-in operation.

One key aspect of the invention is that the miscibility of HFCs in conventional lubricants, such as non-synthetic lubricants, can be greatly enhanced by combining the HFC having 1-5 carbon atoms and at least one each of hydrogen and fluorine atoms with one or more alcohols having 3-7 carbon atoms, wherein at least one

carbon atom is part of a COH moiety. In addition, it has been found that certain combinations of alcohols and HFCs possess thermodynamic properties approximately about the same as the heat transfer fluid that is being replaced. The invention also covers methods of recharging or retrofitting an existing heat transfer system that contains a non-HFC heat transfer fluid and a compatible lubricant.

Website: www.freepatentsonline.com

New CO2 circulation system

Birton A/S of Denmark has developed a carbon dioxide (CO2) circulation system as alternative or replacement for centralized refrigeration and air-condition systems that use direct expansion of synthetic HFC refrigerants, or chillers with water and brine systems. The system comprises a CO2 condenser cooled by the primary refrigeration system. The liquid CO2 is gravity-fed to one of the two pumping vessels, where the pressure is equalized with the condenser through a solenoid valve.

Liquid from the primary system is led through the solenoid valve, heating the trapped CO2 in the vessel, generating pressure and supplying liquid CO2 through a non-return valve to the evaporators. When the pumping vessel is empty, the system alternates, aided by a liquid level sensor in each vessel and a small PLC. The advantages include:

No energy consumption for pumps, compressors or other mechanical devices;

Direct expansion assures circulation of a minimum amount of refrigerant;

Small pipe dimensions compared with flooded CO2 systems.

Oil-free operation for optimal heat transfer;

No need for capacity control of pump or overflow device.

Installation costs can be similar to traditional systems.

Environmental savings due to reduced primary refrigerant.

Any primary refrigerant HFC, Ammonia or Propane is suitable.

Contact: Birton A/S, Hovedkontor/Administration, Industrivej 19, DK-8260 Denmark. Tel: +45 (86) 146 211; Fax: +45 (86) 142 921

E-mail: info@birton.dk

Website: www.birton.dk

SOLVENTS

New ODS-free adhesive technology

Ultra Light-Weld 3-20741, the new adhesive from Dymax Corporation in the United States, cures upon exposure to ultraviolet light (UV) light in seconds to create intrinsically strong clear bonds, while eliminating the marking or discolouration that can occur with heat sealing RF or sonic welding. The adhesive is formulated to provide structural bonds to PET-type resins, and is ideally suited for bonding applications across a wide range of industries.

Ultra Light-Weld 3-20741 is 100 per cent free of solvent and ozone depleting compounds. While eliminating costly tooling, set-up, capital equipment and high energy requirements resulting in lower assembly costs and enhanced worker safety it also offers excellent depth and speed of cure. Crazing of plastics is also eliminated.

Contact: Dymax Corporation, 318 Industrial Lane, Torrington, CT 06790, Connecticut, United States of America. Tel: +1 (860) 482 1010; Fax: +1 (860) 496 0608

E-mail: info@dymax.com

Website: www.manufacturingtalk.com

HFE solvent with low environmental load

Sumitomo 3M Ltd., Japan, is launching Novec- 7600HFE, a hydrofluoroether (HFE) suited for use as a solvent. The product can be used in a wide range of temperatures due to its of high boiling point (130C) and low freezing point (-98C). It is a clear and colourless liquid with zero ozone-depleting potential and a global warming potential of 700. The values correspond to approximately one-tenth those of CFC-replacing perfluorocarbon (PFC) with a comparable boiling point. The product also features excellent heat stability and insulation properties. It is non-combustible and practically harmless.

The key applications of Novec7600HFE are as a heating medium to control temperature in manufacturing apparatus for semiconductor devices and LCD panels, a cleansing agent for precision electric and electronic components, a diluent for fluorinated oils, a coating agent, etc. The product comes in 15 kg cans.

Website: www.techon.nikkeibp.co.jp

Non-ODP degreasing and defluxing composition

Purac Biochem B.V., the Netherlands, has secured a United States patent on non-ozone depleting cleaning compositions for degreasing elements in manufacturing and engineering processes and for defluxing printed circuit boards. The compositions contain 70-99 per cent by weight of at least one C6-C12 alkyl lactate ester, preferably 2-ethyl hexyl lactate, and 1-30 per cent by weight of at least one emulsifier, preferably n-octanol.

A main advantage of the composition is that an emulsion is formed in the water-rinsing step for removing the composition from the treated surface. This emulsion is stable enough to allow proper rinsing and will separate rather quickly into oil and water phases after rinsing. This feature enables the reuse of the active cleaning agent C6-C12 alkyl lactate ester and fully or partly reusing the wastewater. The cleaning composition is applied through immersion or spraying, and may be supported by either heat or ultrasound.

Website: www.freepatentsonline.com

Cleaner for polyurethane processing equipment

CRYSTAL CLEAN from TSE Industries Inc., the United States, was developed for use in flushing and cleaning urethane residues and crystallized isocyanates from various types of polyurethane processing equipment. It is a non-gelling, high flash point cleaner and is recommended for both flushing and cleaning, especially in applications in which liquid isocyanates are present prior to cleaning, or will be introduced after cleaning. It may be used for flushing uncured urethane residues and isocyanates as well as uncured epoxies.

The product is a non-chlorinated, non-inflammable, non-ozone depleting solvent designed to replace solvents such as methylene chloride, acetone, MEK, and 1,1,1-trichloroethane. While it is more aggressive than methylene chloride, it is safer in the workplace and friendlier to the environment.

Contact: TSE Industries Inc., 4370, 112th Terrace N., Clearwater, FL 33762, Florida, United States of America. Tel: +1 (727) 573 7676; Fax: +1 (727) 572 0487

E-mail: inquiry@tse-industries.com

Website: www.tse-industries.com

Use of azeotropic compositions in vapour degreasing

Vulcan Materials Company, the United States, has patented a vapour degreasing process for cleaning soil from solid articles using an azeotropic vapour mixture, comprising perchloroethylene and water, which condenses on the articles and thus cleans them. The mixture is placed in the lower portion of a degreasing chamber and the articles to be cleaned in the upper portion. The cleaning agent is heated and evaporated to form a minimum-boiling azeotropic vapour mixture, which is then condensed onto the articles. The condensation removes the soil from them and the cleaned articles are then removed from the chamber. The apparatus used is a conventional vapour degreaser/defluxer.

The process operates at a low temperature, and the cleaning composition be capable of removing in a single step both hydrophobic soils (such as oils and greases) and hydrophilic soils (such as metal salts) from soiled articles. The azeotrope composition consists of approximately 17 weight per cent water and approximately 83 weight per cent perchloroethylene, and has a boiling point of about 88C at 760 mm Hg. The mixture can serve as a direct, drop-in replacement in conventional vapour degreasers or vapour defluxers that use CFC-113 and 1,1,1,-trichloroethane.

Web-site: www.freepatentsonline.com

Developing alternatives to ozone depleting solvents

A research team at Stanford Linear Accelerator Centre (SLAC) has developed and implemented alternatives to ozone-depleting chlorofluorocarbon (CFC) cleaners for use in high-energy physics. This team selected solvents and innovative cleaning methods that ultimately decreased emissions to the atmosphere by up to

3,600 kg/year, while maintaining the required cleanliness standards. Unclean surfaces tend to release contaminants that deteriorate vacuum conditions and can interfere with the subatomic particle experiments, and SLAC has stringent cleaning requirements for metal parts that are used in the ultra high vacuum environments.

At the Mechanical Fabrications Department, one group selected a near-zero emission (NZE) vapour degreaser, which recycles a non-ozone depleting solvent and substantially reduces solvent emissions to the atmosphere. The NZE system replaced in regular operating service a vapour degreaser that used the ozone-depleting solvent, 1,1,1-trichloroethane. Another group from the Physical Electronics Laboratory was involved with defining the criteria and analytical methods for determining cleanliness and performed surface analyses using X-ray photoelectron spectroscopy techniques to compare the cleaning performance of existing and new solvents. A researcher from the Klystron Department eliminated the use of two vapour degreasers, and developed a low-water aqueous cleaning system for cleaning of Klystron tubes. Another from Stanford Synchrotron Radiation Laboratory developed and implemented an alternative organic-based solvent in the cleaning of vacuum equipment.

Website: www.hss.energy.gov

Aerosols for PCB assemblies

3M Novec Engineered Fluids, from 3M Electronic Materials in the United Kingdom, for contact cleaning, degreasing and flux removal are available in convenient aerosol canisters. These cleaners are non-inflammable, non-conductive and have a short atmospheric lifetime. The aerosols are non-ozone depleting, as they do not contain HFCs, HCFCs or HAPs, providing an environmentally responsible alternative to trichloroethylene and n-propyl-bromide.

There are three aerosols in the range 3M Novec aerosol electronic degreaser, 3M Novec aerosol contact cleaner and 3M Novec flux remover aimed primarily at users in the fields of electronic product design and manufacture. They feature excellent cleaning performance, including low emissive and drag-out losses.

Contact: 3M Electronic Materials, Hudson Road, Elms Industrial Estate, Bedford, MK41 0HR, United Kingdom. Tel: +44 (1234) 229430; Fax: +44 (1234) 229499.

Website: www.electronicstalk.com

HALONS

A drop-in replacement for Halon

Megola Inc., a leading Canadian environmental solution provider, has introduced AF11E, a 1:1 drop-in replacement for Halon 1301 and an effective alternative to Halon 1211. AF11E, as tested by the Loss Prevention Council (LPC) in the United Kingdom, uses the same working pressures and volumes as Halon 1301, making it effective as a total flooding agent at 5 per cent design concentration with a 10 second discharge time. No other alternative agent meets these criteria, says Megola. AF11E is also an effective streaming agent to replace Halon 1211 in portable fire extinguishers for the suppression of class A, B and C fires. Like Halon 1211, AF11E is a clean agent, but because of its higher boiling point and lower vapour

pressure, it can be propelled farther than Halon 1211, an advantage in a portable fire extinguisher.

AF11E uses HCFC-123, a commonly used refrigerant with a very low ozone depletion potential (ODP) of 0.016 (the lowest among commonly used HCFCs), as a carrier for its proprietary blend of fire-fighting ingredients. Because of its relatively minor environmental impact, HCFC-123 is not scheduled for phase-out under the Montreal Protocol until the year 2030. Also, when compared with the other halocarbon alternatives that are based on the zero-ODP HFCs such as FM-200, FE-36 and FE-13 AF11E has a much lower global warming potential and atmospheric lifetime. Therefore, AF11E could have the lowest overall environmental impact of all the halocarbon alternatives to Halon 1301 and 1211. Application for inclusion of AF11E under SNAP list of approved Halon substitutes is currently pending with the Environmental Protection Agency.

Contact: Megola Inc., 446 Lyndock Street, Suite 102, Corunna, Ontario, N0N 1G0, Canada. Tel: +1 (519) 481 0628; Fax: +1 (519) 481 0629

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Website: www.macreport.net

Heptafluoropropane-based fire extinguishing system

Heptafluoropropane extinguishant with its high extinguishing efficiency, quick extinguishing, zero residue after discharging and low toxicity is regarded as an ideal substitute product for Halons. Shanghai Jindun Fire-fighting Security Equipment Co., China, offers its ZQ series heptafluoropropane-based automatic fire extinguishing systems.

The systems are composed of storage cylinder, liquid check valve, high-pressure hose, nozzle, box and fire alarm controller. The storage pressure of ZQ system at 20C is 4.2 MPa, and the highest working pressure at 50C is 5.3MPa. The storage pressure of ZQW system at 20C is 2.5 MPa, and the highest working pressure at 50C is 3.4 MPa.

Contact: Shanghai Jindun Fire-fighting Security Equipment Co. Ltd., No. 365, Hengqiao Road, Fanrong Indl. Area, Zhoupu, Pudong, Shanghai, 201318 China. Tel: +86 (21) 5109 5888; Fax: +86 (21) 6806 6788.

Website: www.shjd.en.alibaba.com

Environment-friendly fire suppression systems

White Systems Inc., the United States, offers various types of fire suppression systems with environment-friendly extinguishants. The White Systems vertical carousels can be fitted with wet-pipe sprinkler systems, single-interlock pre-action sprinkler systems, or clean agent gaseous suppression systems.

Wet-pipe sprinkler systems rely on temperature-sensitive elements set in the sprinkler heads for activation. Sprinkler heads and piping inside the vertical carousel connect to the facilitys fire water supply. Water is discharged when a fire generates enough heat to activate one or more heads. The sprinkler heads are upright or pendent style, quick response type.

Intermediate levels are normally shielded from the water spray of higher-level heads. Pre-action sprinkler systems feature air-pressurized sprinkler pipes isolated from the supply water by a pre-action valve. A smoke or heat detection system opens the valve and allows water into the system. Sprinkler heads discharge when the fire generates enough heat to activate one or more heads. Pre-action systems are typically used in carousels holding high value product that is sensitive to accidental water discharge.

Clean agent systems protect the enclosed area by extinguishing a fire before major smoke or heat damage can occur. A clean agent system consists of one or more smoke detectors connected through a controller to a pressurized gas source and specially designed nozzles inside the carousel. When a fire is detected, the controller sounds an alarm, shuts the carousel door, disconnects power from the carousel and releases the agent. Clean agent systems such as FM-200, FE-13 and Inergen use non-toxic, environment-friendly gases to suppress fires without risk of ozone depletion. They leave behind no water, foam or dry chemical.

Contact: White Systems Inc., 30 Boright Avenue, Kenilworth, NJ 07033, United States of America. Tel: +1 (800) 275 1442; Fax: +1 (908) 272 5920

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Website: www.whitesystems.com

Testing of gas generator fire extinguisher

Thousands of commercial and military aircrafts currently have Halon-based Halon 1301 (bromotrifluoromethane) is the most commonly used fire extinguishers for their engine nacelles. However, Halon 1301 is a Class-1 ozone depleting compound (ODC) and is being phasedout under the Montreal Protocol. A gas generator fire extinguishing system designed as an alternative to Halon 1301 systems was evaluated during dry bay and engine nacelle tests at the Naval Air Warfare Centre Weapons Division, the United States. Based on existing airbag-inflation technology, the gas generator system was developed by Olin Rocket Research Division of Olin Aerospace Co., Washington. The gas generator system, which rates as a zero ozone depletion potential (ODP) fire extinguisher, is approved by the Environmental Protection Agency.

The gas generator system functions like a rocket motor: combustion inside the cylinder produces inert gases that are released into the dry bays or aircraft engine. Once released, the heated gas rapidly expands through the bay, displacing the available oxygen and effectively smothering the fire. The gas, along with combustion products from the extinguished fire, is then flushed out of the bay by the ventilation airflow.

A simulated F/A-18 dry bay and fuel tank were used to investigate the gas generators ability to suppress dry-bay fires and explosions resulting from ballistic penetration of the fuel tank. Similar testing of a simulated wing section of the V-22 vertical take-off and landing aircraft was also done. Results showed that the gas generator system is highly effective in suppressing and extinguishing fires or explosions in the dry bays. Based on these results, the system has been approved for incorporation into F/A-18 and V-22 designs.

Another test series at the Weapons Survivability Laboratory (WSL) involved two months of rigorous comparative testing of the gas generator and Halon systems using a full scale F/A-18 E/F engine nacelle and a

gas generator system designed with a manifold. The purpose of the manifold was to allow variable concentrations and dwell times of the fire extinguishing gases to determine their effectiveness. Preliminary results from the tests are reported to indicate that the gas generator system matches the performance of Halon 1301 in extinguishing engine bay fires. Full-scale tests are now on and the results will prove the effectiveness of the system.

The non-polluting, dual-use gas generator technology has a wide range of application, according to the researchers. Potential uses include fire protection for buildings, commercial aircraft, commercial and military surface ships and armoured vehicles. A Fire Science and Technology working group is currently preparing proposals for the study of advanced compounds for use in such improved gas generator fire extinguishers. The proposals contain plans to perform scale-up of promising candidates which will be tested in an intermediate scale comparison tests of their effectiveness followed by the most successful candidate designs being prepared as prototype extinguishers for full scale testing.

Website: www.nawcwd.navy.mil

AEROSOLS

Foam premixes with improved processability

Atofina Chemicals Inc., the United States, has been granted a patent for a method for improving the processability of foam premixes containing HFC and/or pentane-based blowing agents in polyols. The method comprises adding trans-1,2-dichloroethylene to the premix in an amount effective, which is dependent on the specific blowing agent and the type of polyols, to enhance the processability. The premixes can be converted into polyurethane foams by using conventional techniques, such as hand-mixing, high-pressure impingement, low-pressure mechanical mixing, etc. Auxiliary blowing agents such as water, HCFCs or and hydrochlorocarbons may also be present with the HFC and/or pentane blowing agents. The other components of the premix and foam formulations may be the conventionally used ones such as fire retardants and surfactants.

The compatibility of HFC blowing agents (245fa and 365mfc) with and without trans-1,2 was tested in polyester polyol. When 39 parts of 245fa was added to 100 parts of the polyester polyol without trans-1,2, phase separation occurred. When trans-1,2 was added to 245fa in a 50/50 weight ratio, a homogeneous, one-phase polyol mixture was obtained at a level equivalent to about 50 parts of 245fa to 100 parts polyol. Similar results were found also with 365mfc.

Website: www.freepatentsonline.com

Moulded polyurethane foam system with HFC blowing agents

Renosol Corporation, the United States, has obtained a patent on a moulded polyurethane foam system that uses hydrofluorocarbons and alkane hydrocarbons as the blowing agents. The moulded polyurethane foam products made using this system have a high-density integral skin and a low density core. The patented process involves reacting an isocyanate and a polyol in the presence of a blowing agent, which includes HFC-134a alone or a mixture of tetrafluoroethane (HFC-134a) with one or more of the following: alkanes (such as methylbutane, pentane and heptane) and other inert volatile organic compounds with boiling points in the 15-

100C range (such as pentene and acetone). The preferred HFC used in the present invention, tetrafluoroethane, has zero ozone depletion potential (ODP), and offers reduced toxicity, improved in-use stability and zero risk of inflammability or smog production.

Website: www.freepatentsonline.com

Environmentally safe surfboard foam blanks

Glory Foam, Mexico, has announced a significant breakthrough in environmentally safer foam surfboard blanks with the unveiling of its new PUR Foam product. PUR Foam is an environmentally safer surfboard foam that also maintains a bright white appearance. The foam production using the comparatively safer PMDI technology does not involve bleaches, pigments, additives or enhancers. The tiny bubbles in the cell structure refract light and make the foam appear bright white.

The process uses the renewable plant material, namely sugar, as a base. The blowing agent employed has zero ozone depletion potential and global warming potential. The production process also eliminates the need for release papers, which contribute to landfill trash, commonly used in other production methods. PUR Foam maintains a uniform tight cell structure, and will not yellow, chunk or tear. The light and flexible blank does not contain pour lines and hence, the foam accepts tints well.

Website: www.globalsurfnews.com

CO2-blown polyurethane packaging foam

E.R. Carpenter Company Inc., the United States, has patented a method of preparing polyurethane foam for dispensing into a container as packaging for shipping. A notable feature of the invention is that the temperature of the polyurethane foam being dispensed into the container is lower than other comparable systems, as is the maximum reaction exotherm temperature. The method involves reacting polymeric isocyanate and polyoxyalkylated polyol precursors in the presence of water as the foam blowing agent. A nucleating agent is present in at least one of the precursors in an amount sufficient to reduce the dispensing temperature of the foam reaction product. Incorporation of a nucleating agent into the isocyanate and polyol resin components results in a carbon dioxide (CO2) blown polyurethane packaging foam preferably having a density of 0.2-2.0 lb/ft3.

Website: www.freepatentsonline.com

Microcellular foam using polymer surfactants and CO2

Researchers at the University of North Carolina (UNC) at Chapel Hill, the United States, have developed a method of making microcellular foam, using carbon dioxide (CO2) as a blowing agent and either a thermoplastic resin or resin blend in conjunction with non-ionic polymeric surfactant. The method could be used in the production of microcellular foamed polymers/polymer blends for industrial thermoplastic applications.

Production of structural and other conventional foams typically employ physical blowing agents and semi-crystalline polymers. However, semi-crystalline polymers present various processing challenges, particularly when producing microcellular foams using a continuous processing, because of the small size of the cell walls. A small defect in the cell wall could form a weak point in the structure. Producing various foamed semi-

crystalline thermoplastics such as (poly) vinylidene fluoride in a continuous process has also been a problem. As the material exits the nozzle, the extrudate becomes brittle and breaks up into fine powder. This is most significant in the formation of microcellular foams, where the large number of small distributed cells causes the cell walls of the foamed materials to be significantly thinner than those of conventional foams.

The UNC method involves essentially three components: a thermoplastic polymeric resin or blend of thermoplastic polymeric resins; compressed high-pressure CO2 as a blowing agent; and a polymeric non-ionic surfactant used to reduce the surface tension between the thermoplastic resins and CO2. The combination of blended material and surfactant modifies the final foam microstructure and enhances blend miscibility. The polymeric surfactant also reduces viscosity.

Website: www.ibridgenetwork.org

FUMIGANTS

Mustard, a good alternative to fumigant pesticides

Farmers in Idaho, the United States, are using a crop rotation of mustard as a less toxic and less expensive alternative to chemical fumigants in potato production. Mustard is planted after a wheat harvest in August or September, and it sprouts in two to three weeks. It is incorporated back into the soil after six weeks of growth. According to the chemist Dr. Susan Kegley of Pesticide Action Network North America (PANNA), Mustard plants produce small amounts of methyl isothiocyanate (MITC), the same active fumigant that is produced when metam sodium reacts with water. Unlike synthetic MITC, the mustard plant produces very small amounts of this chemical in the soil over the entire growing season, rather than in one high-dose treatment, so the levels emitted are very small, and therefore pose less toxic risk than with chemical-based farming methods. Mustard is proving especially effective on curbing nematodes and early die in potatoes. The crop also helps hold soil in place, and ploughing in this green manure enhances soil percolation.

Website: www.panna.org

Revolutionary device for soil treatment

The Dutch firm VDL has launched the Cultivit soil treatment device, which it claims can achieve the same yield enhancement as traditional chemical treatments. The machine, developed by Israeli inventor Mr. Eli Paltin, has a spader (a rotary tiller with rotating spades) of 35 cm diameter. The spader churns soil at 180 rpm before exposing it to a fierce blast of super-heated air from its diesel burner. Tests at the Netherlands Wageningen University have shown that Cultivit can, in heavily nematode-infested Mediterranean soils, achieve yield increases of up to 150 per cent.

Cultivit is remote-controlled and a GPS-controlled model is in development. It is suitable for organic farming systems as an effective alternative to chemical treatment, and soils can be planted immediately. The machine cannot achieve the 100 per cent kill of its chemical competitors. Nevertheless, Mr. Paltin says that this is more than offset by improved soil structure and the need to treat less frequently.

Website: www.fwi.co.uk

Research on alternative to methyl bromide

The Subtropical Plant Pathology Research Unit of United states Agricultural Research Service is conducting research on alternatives to methyl bromide soil fumigation for vegetable and floriculture production. The research objectives are:

Identify impact of pest management tactics on functional diversity of soil microflora and weed populations, their competitive interactions, and effects on crop health.

Conceive, develop and test tactics for the control of plant diseases, parasitic nematodes and weed pests of vegetable and floriculture crops. These would include novel chemical, biological, biorational, cultural and organic pest control tactics.

Identify combinations of pest control tactics that interact synergistically to improve pest control, are practical to implement, and will minimize environmental disruption.

Define the impacts of pest management and crop production practices on soil health including the suppression of soil-borne pests.

A rational and sustainable approach to finding viable alternatives to methyl bromide is to utilize integrated pest management (IPM) programmes where combinations of tactics are used to maintain economic damage from key pests below a tolerable threshold.

Redesigning the production systems, minimizing the potential for outbreaks of soil-borne pests is another approach. Availability of biological pest management tactics needs to be increased. Growers must be able to choose the tactics that fit the needs and constraints of their individual programmes. Deployment of multiple or companion tactics is essential to alleviate selection pressure and manage increases in resistant pest populations. Synergistic effects from combinations of pest management tactics need to be determined.

Specific research methodology will include combinations of cultural practices, biotechnology, biological and conventional control methods.

Website: www.ars.usa.gov