

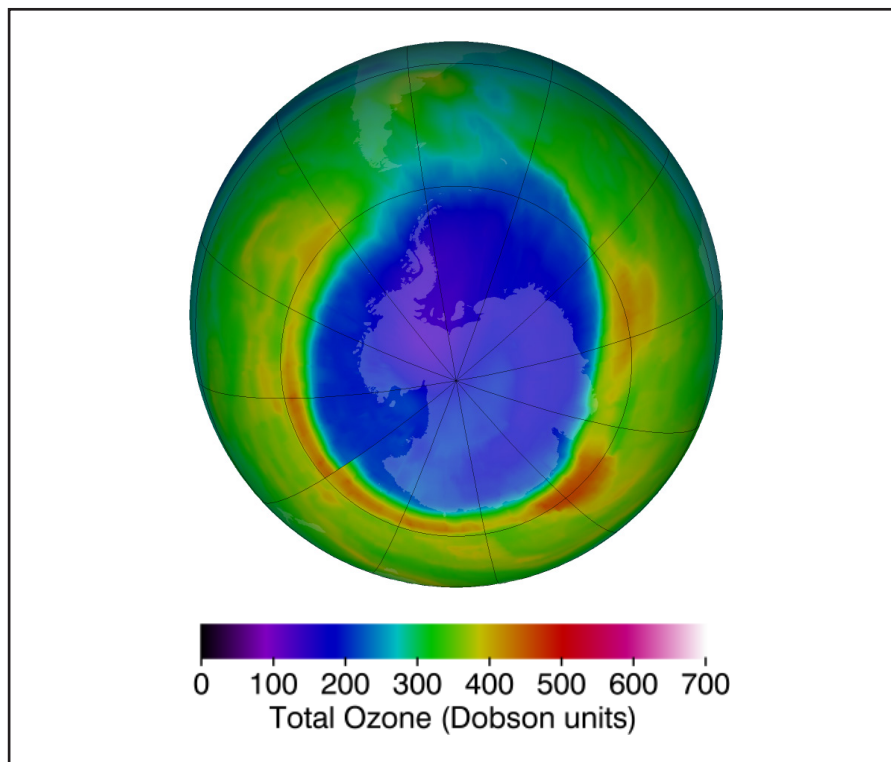


Ozone Layer Protection

Apprise yourself with the latest technological innovations

Highlights

- Compressor with ultra-low GWP refrigerant
- Alternative for cleaning of medical devices
- Fire suppression systems with NOVEC 1230
- Innovative foam solutions
- Environmentally friendly soil sterilization



The **Asian and Pacific Centre for Transfer of Technology (APCTT)**, a subsidiary body of ESCAP, was established on 16 July 1977 with the objectives: to assist the members and associate members of ESCAP through strengthening their capabilities to develop and manage national innovation systems; develop, transfer, adapt and apply technology; improve the terms of transfer of technology; and identify and promote the development and transfer of technologies relevant to the region.

The Centre will achieve the above objectives by undertaking such functions as:

- Research and analysis of trends, conditions and opportunities;
- Advisory services;
- Dissemination of information and good practices;
- Networking and partnership with international organizations and key stakeholders; and
- Training of national personnel, particularly national scientists and policy analysts.



The shaded areas of the map indicate ESCAP members and associate members

Cover Photo

False-color view of total ozone over the Antarctic pole as on 13 September 2016. The purple and blue colors are where there is the least ozone, and the yellows and reds are where there is more ozone

(Credit: NASA, USA)

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'Healing' detected in Antarctic ozone hole

US researcher Prof. Susan Solomon and colleagues, including researchers from the University of Leeds, the United Kingdom, have found the first clear evidence that the thinning in the ozone layer above Antarctica is starting to heal. The scientists said that in September 2015 the hole was around 4 million sq km smaller than it was in the year 2000 – an area roughly the size of India. The gains have been credited to the long term phasing out of ozone-destroying chemicals. The study also sheds new light on the role of volcanoes in making the problem worse.

Researchers carried out detailed measurements of the amount of ozone in the stratosphere between 2000 and 2015. Using data from weather balloons, satellites and model simulations, they were able to show that the thinning of the layer had declined by 4 million sq km over the period. They found that more than half the shrinkage was due solely to the reduction in atmospheric chlorine. Normally measurements are taken in October when the ozone hole is at its largest. The study has been published in the journal *Science*.

However this team believed they would get a better picture by looking at readings taken in September, when temperatures are still low but other factors that can influence the amount of ozone, such as the weather, are less prevalent. "Even though we phased out the production of CFCs in all countries including India and China around the year 2000, there's still a lot of chlorine left in the atmosphere," said Prof Solomon. One finding that puzzled researchers was the October

2015 reading that showed the biggest ozone hole on record over Antarctica. The scientists believe that a key contributor to the record hole was volcanic activity.

Source: <http://www.bbc.com>

Impact of the Antarctic ozone hole

A team of scientists from GEOMAR and Christian-Albrechts Universität zu Kiel, Germany, Geophysical Institute, University of Bergen and Bjerknes Centre for Climate Research, Norway, have found evidence that the strengthened stratospheric westerlies arising from the Antarctic ozone hole-induced cooling cause a polar mesospheric warming and a subsequent cooling in the lower thermosphere. While previous studies focused on the role of nonresolved (gravity) wave drag filtering, here the role of resolved (planetary) wave drag and radiative forcing on the Antarctic mesosphere and lower thermosphere (MLT) was explored in detail.

Using simulations with NCAR's Community Earth System Model, version 1 (Whole Atmosphere Community Climate Model) [CESM1(WACCM)], scientists found that in late spring and early summer the anomalous polar mesospheric warming induced by easterly nonresolved wave drag is dampened by anomalous dynamical cooling induced by westerly resolved wave drag. This resolved wave drag is attributed to planetary-scale wave ($k = 1-3$) activity, which is generated in situ as a result of increased instability of the summer mesospheric easterly jet induced by the ozone hole.

On the other hand, the anomalous cooling in the polar lower thermosphere induced by westerly non-

resolved wave drag is enhanced by anomalous dynamical cooling due to westerly resolved wave drag. The polar MLT temperature response to the Antarctic ozone hole is, through thermal wind balance, accompanied by the downward migration of anomalous zonal-mean wind from the lower thermosphere to the stratopause. The results highlight that a proper accounting of both dynamical and radiative effects is required in order to correctly attribute the causes of the polar MLT response to the Antarctic ozone hole.

Source: <http://www.journals.ametsoc.org>

Reaction mechanisms of ozone depletion events

In a study conducted by a team of researchers from Nanjing University of Information Science and Technology, China, and Université catholique de Louvain, Belgium, a reaction scheme representing the chemistry of ozone depletion and halogen release is processed with two different mechanism reduction approaches, namely the concentration sensitivity analysis and the principal component analysis. In the concentration sensitivity analysis, the interdependence of the mixing ratios of ozone and principal bromine species on the rate of each reaction in the mechanism of ODEs is identified.

Furthermore, the most influential reactions in different time periods of ODEs are also revealed. By removing 11 reactions with the maximum absolute values of sensitivities lower than 10%, a reduced reaction mechanism of ODEs is derived. The onsets of each time period of ODEs in simulations using the original reaction mechanism

and the reduced reaction mechanism are identical while the maximum deviation of the mixing ratio of principal bromine species between different mechanisms is found less than 1%. The research has been published in *Atmos. Chem. Phys.*

By performing the principal component analysis on an array of the sensitivity matrices, the dependence of a particular species concentration on a combination of the reaction rates in the mechanism is revealed. Redundant reactions are indicated by principal components corresponding to small eigenvalues and insignificant elements in principal components with large eigenvalues. Through this investigation, aside from the 11 reactions which have been identified as unimportant in the concentration sensitivity analysis, additionally nine reactions were identified to contribute only little to the total response of the system.

Source: <http://www.atmos-chem-phys-discuss.net>

Researchers study atmospheric carbon tetrachloride

A team of researchers from Australia, UK, USA, Canada and Belgium have used a three-dimensional (3-D) chemical transport model to investigate the impact on its predicted decay of uncertainties in the rates at which CCl_4 is removed from the atmosphere by photolysis, by ocean uptake and by degradation in soils. The largest sink is atmospheric photolysis (76% of total) but a reported 10% uncertainty in its combined photolysis cross-section and quantum yield has only a modest impact on the modelled rate of CCl_4 decay.

This is partly due to the limiting effect of the rate of transport of CCl_4 from the main tropospheric reservoir to the stratosphere. The model suggests large interannual variability in the magnitude of this stratospheric photolysis sink caused by variations in transport. The impact of uncertainty in the minor soil sink (9% of total) is also relatively small. In contrast, the model shows that uncertainty in ocean loss (15% of total) has the largest impact on modelled CCl_4 decay due to its sizeable contribution to CCl_4 loss and large uncertainty range (157 to 313 years).

With an assumed CCl_4 emission rate of 39 Gg/yr, the reference simulation with best estimate of loss processes still underestimates the observed CCl_4 (overestimates the decay) over the past two decades but to a smaller extent than previous studies. Changes to the rate of CCl_4 loss processes, in line with known uncertainties, could bring the model into agreement with in situ surface and remote-sensing measurements, as could an increase in emissions to around 45 Gg/yr. Further progress in constraining the CCl_4 budget is partly limited by systematic biases between observational datasets.

Source: <http://www.atmos-chem-phys-discuss.net>

Satellite data of stratospheric hydrogen fluoride

A team of researchers from University of Leicester and University of Leeds, the United Kingdom, University of Waterloo, Canada, and Old Dominion University, Jet Propulsion

Laboratory, and Hampton University, the United States, have reported the comparison of global distributions and trends of HF measured in the Earth's atmosphere by the satellite remote-sensing instruments ACE-FTS (Atmospheric Chemistry Experiment Fourier transform spectrometer), which has been recording atmospheric spectra since 2004, and HALOE (HALogen Occultation Experiment), which recorded atmospheric spectra between 1991 and 2005, with the output of SLIMCAT, a state-of-the-art three-dimensional chemical transport model.

In general the agreement between observation and model is good, although the ACE-FTS measurements are biased high by ~ 10% relative to HALOE. The observed global HF trends reveal a substantial slowing down in the rate of increase of HF since the 1990s: $4.97 \pm 0.12 \text{ \% year}^{-1}$ (1991–1997; HALOE), $1.12 \pm 0.08 \text{ \% year}^{-1}$ (1998–2005; HALOE), and $0.52 \pm 0.03 \text{ \% year}^{-1}$ (2004–2012; ACE-FTS). In comparison, SLIMCAT calculates trends of 4.01, 1.10, and 0.48 \% year^{-1} , respectively, for the same periods.

Furthermore, the observations reveal variations in the HF trends with latitude and altitude; for example, between 2004 and 2012 HF actually decreased in the Southern Hemisphere below ~ 35 km. An additional SLIMCAT simulation with repeating meteorology for the year 2000 produces much cleaner trends in HF with minimal variations with latitude and altitude. Therefore, the variations with latitude and altitude in the observed HF trends are due to variability in stratospheric dynamics on the time-scale of a few years.

Source: <http://www.atmos-chem-phys.net>

HFO in foam sector

The Ministry of Environment, Forest and Climate Change (MoEF&CC), government of India, has suggested that it will propose for the funding of foam industries to ease shift from using ozone-depleting Hydrochlorofluorocarbons (HCFC) to chemical Cyclopentane. The transition will be funded by the Executive Committee of the Multilateral fund as per the Montreal Protocol Agreement in the second stage of HCFC phase-out. Cyclopentane is a hydroflorocarbon with zero ozone depletion potential (ODP) and low global warming potential (GWP).

India is in the process of phasing out HCFC by 2030 as per the existing agreement signed by India in the Montreal protocol. HCFC is a commonly used refrigerant gas. It is also used in foam blowing agents, solvents, aerosols and fire extinguishers. India has completed its first step of phase-out, achieving the target of 10% reduction by 2015 and is now working towards phasing down 35% by 2020 in the second stage. The executive committee of multilateral fund has allowed for a 25% increase above the cost-effectiveness threshold for introduction of low-GWP alternatives.

It has also decided that SMEs in the foam sector with consumption of less than 20 metric tonnes can apply for up to 40% additional funds as per the ExCom decision 74/50 to incentivise the SMEs to shift. UNDP surveyed the foam manufacturing sector and suggested the industry to choose from the three alternatives in the survey. A study by non-profit Centre for Science and Environment said that the HFC phase down benefits few companies and brings uncertainty over the pollution these chemicals may cause. This decision will also support India's stand in the

ongoing Montreal protocol negotiations of not moving to another transition gas like HFO.

Source: <http://www.downtoearth.org.in>

Safety standards on use of hydrocarbons

The refrigeration and air conditioning committee of the Bureau of Indian Standards (BIS) has formed a panel to consider amendments to refrigerant standards, proposed by Delhi-based non-profit Centre for Science and Environment (CSE). If accepted by the committee, the amendments will enable wider use of hydrocarbons, a refrigerant gas which has significantly lower global warming potential (GWP) than other common gases. According to CSE, currently, India does not have any safety standards for refrigerating systems.

To bridge this gap, the BIS committee had proposed the adoption of "ISO 5149: Refrigerating systems and heat pumps – Safety and environmental requirements" as the India standard in 2015. But these standards restrict the use of natural refrigerants like hydrocarbons. ISO 5149, adopted by European countries and followed by Indian refrigerator and air conditioner manufacturers, states that the maximum charge size must not exceed 350-360 g of hydrocarbons, which corresponds to a maximum cooling capacity of around 1.5 tonnes.

A change in the standard would allow Indian manufacturers to expand their production line to hydrocarbon air conditioning systems with higher cooling capacity. CSE argued that ISO 5149 is restrictive for the use of natural refrigerants. Existing refrigerant gases are either ozone-depleting substances (ODS), have high GWP or are synthetic chemi-

cals which may have unforeseen effects on the environment.

Source: <http://www.downtoearth.org.in>

SRF to invest in chemical plants

SRF Ltd., India, will invest Rs. 345 crore in two projects for specialty chemicals and chloromethane. The Board has approved two separate capex proposals aggregating Rs 345 crore. One of the proposals pertains to setting up a chloromethane (CMS) plant at an estimated cost of Rs 165 crore in its chemical complex at Dahej in Gujarat. The project aims to double SRF's capacity for chloromethanes to 80,000 tonnes per annum. The existing chloromethane plant is situated at Bhiwadi in Rajasthan.

The new chloromethane plant will enable SRF to meet the growing needs of its pharma customers for methylene dichloride (MDC) and will strengthen its foothold in the Indian market, which remains a net importer of methylene dichloride (MDC). Besides, MDC is a key raw material for HFC 32, the refrigerant that SRF recently started manufacturing at its Bhiwadi plant with its own technology.

The expansion of chloromethanes plant is, however, strongly linked to captive consumption of chloroform, which has limited usage. SRF is, therefore, uniquely positioned to leverage the opportunity as it has the capability for captive consumption of the other two ingredients, chloroform and carbon tetra chloride (CTC). Apart from its usage as a solvent in the growing pharmaceutical drugs, MDC is also used for various applications such as foam blowing segments, aerosols, polycarbonate resins and adhesive formulations.

Source: <http://www.business-standard.com>

China phases out over 250,000 tonnes of ODS

The Chinese Ministry of Environmental Protection (MEP) has phased out 250,000 tonnes of ozone depleting substances (ODS) in the past five years, accounting for over a half of the total amount phased out by all developing countries. A meeting commemorating this year's International Day for the Preservation of the Ozone Layer was held in Beijing by the ministry, the United Nations environment and development programs. "More than one million tonnes of ODS had been phased out globally. China will encourage and support research into alternative technological substitutes for ODS, said MEP vice minister Zhao Yingmin.

Source: <http://www.english.cri.cn>

Iraqi experts receive hydrocarbon training

A group of HVAC&R experts from Iraq, gathered in Casale Monferrato, Italy, to receive specialised training on alternative refrigerants for commercial refrigeration and the safe use of hydrocarbons in domestic and commercial refrigeration. The purpose of the training was to ensure that Iraq has an established group of experts and trainers to promote and support the introduction of hydrocarbon and low-GWP refrigerants in the domestic and commercial refrigeration sector.

The participants, who received certification after completing the training course, will be responsible for running a local training programme in order to elevate the skills and capacity of local engineers and technicians in Iraq. The training, funded by the Multilateral Fund of the Montreal

Protocol and managed by the UN Environment Programme (UNEP) OzonAction, is part of Iraq's national strategy for phasing out ozone depleting substances (ODS). The training was held in cooperation with the Association of Italian Refrigeration Technicians (ATF) and was hosted by the Centro Studi Galileo.

Through practical and theoretical training and field visits, the Iraqi experts acquired the necessary knowledge to train local engineers and technicians. This will hopefully allow Iraq to make significant progress in phasing out HCFCs and reduce its dependency on high-GWP and ODS refrigerants with available alternatives. UNEP will continue to support Iraq through the next stages of its phase-out plan by ensuring that relevant stakeholders from the refrigeration and air conditioning industry receive the necessary training and capacity building.

Source: <http://www.hydrocarbons21.com>

Training workshop on ODS phase-out

Recently, Mr. Paula Ma'u, the CEO for Ministry of Climate Change (MEIDECC) opened a 2-day training workshop on combating the illegal trade of the Ozone Depleting Substances (ODS) in Tonga. The illegal trade of "environmentally-sensitive" commodities such as ozone depleting chemicals is an international problem that threatens our environment which results in revenue loss for governments and increase in number of criminal organizations. The criminals who engage in smuggling of controlled ozone depleting chemicals operate in every region, trying to circumvent a country's border controls.

This illicit trafficking undermines the substantial hard work, financial

resources and time invested by government, companies and individuals to implement the Montreal Protocol. Thus the main objective of this training workshop was to provide the customs officers, brokers and law enforcement officials in Vava'u with the knowledge and skills to effectively monitor and control the imports ODSs and products to Vava'u and Tonga. Representatives from the the Vava'u Customs Officers, Brokers, Law Enforcement Officials and Businesses attended this workshop.

Source: <http://www.mic.gov.to>

Workshop on ODS alternatives in Maldives

A stakeholder meeting on Ozone Depleting substances (ODS) Alternative Survey and HFC Inventory in Maldives was held at the Ministry Environment and Energy. The workshop was inaugurated by Minister of State for Environment and Energy, Mr. Abdullahi Majeed. The main objective of this workshop is to discuss about the ODS imported to Maldives and how to control and manage the ODS in Maldives by the year 2030. In this workshop a total of 20 stakeholders from different institutions participated. This is the first workshop being held regarding HFC inventory. The inventory is expected to be completed in the month of September 2016.

Source: <http://www.environment.gov.mv>

Women technicians help protect ozone layer

Women in Pacific Island are confidently entering the traditionally male-dominated refrigeration and air-conditioning (RAC) servicing

profession, supporting national and global efforts to protect planetary and human health. "If we want to do anything, we should follow our dreams and aim high. We should follow our heart and our passion no matter what the challenges are so that we can reach our goal, recalling how she herself 'climbed the way up' from a technician to becoming a lecturer," said Ms. Akanisi Varani, at the Fiji National University.

Varani was one of women participants who attended the train-the-trainer workshop on "Good Servicing Practices for Longer-term, Low-Global Warming Potential Alternatives in Refrigeration and Air-conditioning Sector", which took place in Fiji. The workshop co-organized by the United Nations Environment Programme (UNEP) OzonAction, in collaboration with the Ministry of Fiji, European Commission, Fiji National University and Bundesfachschule Kälte-Klima-Technik (BFS) brought together 49 RAC technicians from 14 Pacific Islands.

Considering that ozone-depleting substances (ODS) are being phased out under the universally ratified Montreal Protocol on substances that deplete the Ozone Layer, the workshop focused on strengthening the capacity of the technicians to adopt and safely manage ozone-climate-friendly and energy-efficient alternatives. Although Varani has only a few female students in her air-conditioning and refrigeration course in Fiji National University, more young women are taking up engineering courses in the Pacific.

Source: <http://www.unep.org>

Oman to cut down use of ODS

The Oman Ministry of Environment and Climate Affairs (MECA) has

rolled out the second phase of the national strategy for phasing out HCFCs, under which various policy measures will be implemented. Under this phase Oman will drastically cut down the consumption of Hydrochlorofluorocarbons (HCFCs), the ozone depleting substances (ODS) by 2020.

The regulatory measures include ban on the import of bulk HCFC-141b by 2016, import of HCFC-141b-based pre-blended polyols by December 2017, use and import of refrigerants in disposable containers, venting of refrigerants into the atmosphere during servicing and establishment of mandatory refrigerants recovery and recycling, by January 1, 2020.

Oman will also establish quarterly reporting on the recovered, recycled and reused refrigerants and stock of unusable refrigerants by January 1, 2020. The implementation of the stage two of the strategy will phase-out 5.32 ozone depleting potential (ODP) tonnes of HCFCs resulting in a 35% reduction by 2020.

Oman's HCFC consumption of 20.38 ODP tonnes in 2014 was lower than the maximum allowable consumption proposed by Oman of 28.32 ODP tonnes for 2015-18 and 20.46 ODP tonnes for 2019-20. UNIDO clarified that the lower consumption in 2014 was due to large amounts of HCFCs imported in 2011 and 2012 as stocks for use in subsequent years.

Source: <http://www.muscatdaily.com>

Phasing out HCFCs in the fishing sector

At a five-day meeting for the joint South East Asia Pacific, South Asia and Pacific Island countries network of Ozone officers at Grand Pacific Hotel, Fiji Minister

for Local Government, Housing, Environment, Infrastructure and Transport Parveen Kumar highlighted that the phasing out of the Hydro-Chloro Fluoro Carbons (HCFCs) in the fishing sector, destruction of ozone depleting substances (ODS), counterfeit products, use of flammable alternative refrigerations and other areas of common interest, is a challenge for Fiji and a number of other countries.

HCFCs are gases or liquids which evaporate and it easily occurs as leakage from cooling appliances which contain them, both during their manufacture, use and disposal. Although the gaseous emissions from these appliances are relatively small, they have a powerful warming effect on global warming. The meeting aims to address all aspects of the Ozone protection in terms of its operation, reporting, monitoring, identification and methods of tracking down illegal ODS.

Source: <http://www.fijitimes.com>

New HFO blend for chillers

Chemours Company, the United States, has announced that its Opteon XP30 refrigerant has received SNAP listing from the US Environmental Protection Agency (EPA) for new and retrofit chiller applications. The SNAP approval paves the way for chiller OEMs to introduce new products using the HFO-1336mzz-based blend to replace R123, which is subject to phase-out under the Montreal Protocol and will not be used in new equipment in the US and other countries starting in 2020.

Opteon XP30, which has a pending ASHRAE number of R514A has a low global warming potential (GWP) of below 2, and is safe,

non-flammable, efficient and thermally stable. The SNAP listing followed Chemours' announcement in November of 2015 that the company had officially broken ground on the world's first full-scale production facility for HFO-1336mzz. The new site, with expected production beginning mid-year 2017, will provide increased capacity for low GWP refrigerants and foam blowing agents.

Source: <http://www.racplus.com>

High-efficiency propane heat pumps

At Purdue Conferences 2016 at the United States, Miquel Pitarch *et al* in their paper 'High Efficiency Heat Pump with Subcooling for Sanitary Hot Water Production Working with Propane', argued that the environmental performance is playing an increasingly important role alongside energy efficiency and safety considerations when designing new heat pumps. A heat pump "needs a working fluid (refrigerant) in order to absorb heat from one area and reject it into another," Pitarch's paper explained.

With global efforts to phase down HFCs underway, natural refrigerants – which the researchers point out are "harmless to the ozone layer, with no influence upon greenhouse effect or very less than traditional refrigerants" – are ready replacements. CO₂ and propane have already been successfully harnessed for residential heat pump systems. Researchers at the University of Valencia, Spain, set about designing a propane heat pump based on a water-to-water system to heat or cool as necessary, using the water inlet as a temperature reference point.

By operating in a subcritical cycle for sanitary hot water produc-

tion and harnessing sub-cooling, their system has been shown to be 31% more efficient than conventional technology. "Heating COP is improved by adding sub-cooling in the propane cycle. The benefits obtained from producing sub-cooling are higher than the COP degradation due to the increase of condensing temperature," the researchers explained.

Source: <http://www.hydrocarbons21.com>

Eco-friendly cooling technologies in Thailand

In a joint effort by Germany and the United Kingdom together with GIZ (a German company that specialises in international development) supporting climate-friendly and energy-efficient cooling technologies, Thailand's refrigeration and air-conditioning industry is prepared for the next development phase. Under the project titled "Refrigeration and Air Conditioning Nationally Appropriate Mitigation Action" (RAC NAMA), they provide support to Thailand's effort to reach its energy-saving and climate-protection targets.

It supports the cooling industry's aim of staying competitive and is expected to attract international climate finance to the country. "On the supply side, the RAC NAMA project aims to support Thailand in preparing for the next generation of refrigerants by cooperating with the responsible ministries and agencies in Thailand to define safety standards and building codes in line with international best practices. The project will also train servicing staff to prepare the sector for

different safety challenges," said Tim Mahler, at GIZ Thailand.

GIZ was contracted by the British-German NAMA Facility to implement the project with total funding of 14.7 million euros (Bt572.5 million). The project first aims to direct demand towards more energy-efficient products by demonstrating best practices of energy performance standards, labels and other incentive schemes. Second, the project aims to increase the demand for energy-efficient and climate-friendly technologies by setting up a financial incentive scheme that increases the attractiveness of such technologies in Thailand.

Source: <http://www.nationmultimedia.com>

Sri Lanka plans solutions to harmful chemicals

The Sri Lankan government has taken steps to gradually remove from use material harmful to the ozone layer, and introduce ozone-friendly alternatives and technologies, according to the provisions of the Vienna Convention and Montreal Protocol. Limitation was thereby, in 2013, placed on the chemical Hydrochlorofluorocarbons (HCFC), used in the services and maintenance of refrigerators and air conditioners.

Cabinet approval was given to President Maithripala Sirisena's proposal that a committee of representatives from relevant ministries, departments and institutions be appointed to make short and long-term recommendations in this regard.

Source: <http://www.dailynews.lk>

R404A replacement

New refrigerant R448A, from Honeywell Fluorine Products, the United States, a lower global warming potential (GWP) replacement refrigerant for R404A, have successfully completed trials at ASDA, the United Kingdom. The 14-month trial in existing R404A systems has shown system energy savings of more than 10%. R448A, marketed by Honeywell as Solstice N40, is one of a number of alternatives to R404A, which is due to be phased out in Europe due to its high GWP of 3922. Only minimal adjustments were needed to adapt the R448A in existing R404A systems and all operating conditions, such as discharge temperatures, were well within the strict demands of compressor manufacturers.

“The ASDA trials proved to us that Honeywell’s new refrigerant can help us save money on energy while also reducing ASDA’s carbon footprint,” said Brian Churchyard, at ASDA. R448A is a nonflammable, non-ozone-depleting HFO blend for low and medium-temperature refrigeration equipment including supermarket chillers, frozen food cases, cold rooms and blast freezers. It is designed to replace R22, R507 and R404A for both new equipment and retrofits. With a reduced GWP 1387, R448A comprises the HFCs R32 (26%), R125 (26%) and R134a (21%), and HFO components R1234yf (20%) and 1234ze(E) (7%).

“R407F, a gas sold by Honeywell as Genetron Performax LT, continues to lead the way as the most successful reduced GWP alternative to R404A in supermarkets. With even lower GWP and similar performance, we fully expect Solstice N40 demand will

continue to grow and even exceed its level of adoption in the coming years,” said Julien Soulet, at Honeywell. In the EU, both Solstice N40 and R407F can be used to retrofit systems placed on the market before 2022 and service is available for an indefinite time. Solstice N40 can be used in new commercial installations below 40kW and in all industrial installations after 2022.

Source: <http://www.coolingpost.com>

Compressor with ultra-low GWP refrigerant

Torad Engineering LLC, the United States, has tested a new 40-ton spool compressor designed specifically for medium pressure refrigerants such as R-134a, as well as low and ultra-low global warming potential (GWP) refrigerants like R-513A and HFO-1234yf. The company said the new spool compressor has demonstrated improved efficiency and performance characteristics compared to scroll, screw, and magnetic bearing centrifugal compressors. The technology is targeted toward commercial chillers with compressor capacities under 100 tons, where the spool compressor has a cost advantage over legacy compressors.

Financial support for the project came from five leading global manufacturers of commercial compressors and chillers. “Closed cycle testing of the prototype spool compressor proves the technology is an attractive alternative to legacy compressors utilizing medium pressure refrigerants. The spool compressor’s excellent performance at both full-load and part-load chiller conditions combined with its low manufacturing

cost provides a viable path to affordable, high-efficiency chillers,” said Joe Orosz, at Torad.

“Worldwide regulatory groups have made it pretty clear that ultra-low GWP refrigerants (GWP < 10) will be mandated in the future; the only real question is how soon. The air conditioning industry is facing a genuine challenge regarding the delivery of ultra-low GWP air conditioning products that are more energy efficient while at the same time being affordable. Torad’s spool compressor has the potential to help meet these challenges,” said Greg Kemp, Torad’s founder and CEO.

Source: <http://www.achrnews.com>

Low GWP refrigerant R514A

Trane, the United States, is expanding its range of CenTraVac centrifugal chillers in the US and Canada with models running on the lower GWP refrigerants R514A and R1233zd. From next year, Trane will offer small tonnage CenTraVac chillers for markets like office and municipal buildings with a choice of the current refrigerant R123 or the low GWP HFO blend R514A. Starting now, Trane will also offer large tonnage CenTraVac chillers for applications such as industrial and large commercial buildings and data centres with the HFO R1233zd.

Although a very efficient refrigerant with a GWP of just 77, R123 is an HCFC and will be banned from use in new equipment by 2020 due to its, albeit small, ozone depletion potential. In the US, it will still be allowed to be used to service existing equipment and for export until 2030. R514A,

developed by Chemours, the United States, as Opteon XP30, is considered a drop-in replacement for R123. With a GWP of just 2 under AR5, R514A blends the HFO 1336mzz(Z) with trans-1,2-dichloroethene, a gas not previously used in refrigerants. Like R123, R514A has a B1 toxicity classification.

“We are pleased to bring our customers new choices for achieving their building, business and sustainability goals without compromising safety, performance or efficiency,” said Dave Regnery, at Ingersoll Rand. To provide customers maximum flexibility, Trane will offer a service option that requires minimal rework to convert existing CenTraVac chillers with R123 to R514A. It will also extend its availability and price guarantee on R123 for customers purchasing a CenTraVac chiller using the refrigerant.

Source: <http://www.coolingpost.com>

R-22 replacement refrigerant

Refrigerant manufacturer Bluon Energy, the United States, announced that its TdX 20 refrigerant was given the preliminary ASHRAE number of R-458A with an A1 safety rating. Based on more than six years of R&D and numerous validated users, TdX 20 is a multi-phase, zeotrope refrigerant blend developed as an R-22 replacement.

TdX 20 is designed to serve as a drop-in replacement for R-22 refrigerant – no oil change or modifications are required, just minor fine-tuning. It improves the performance of existing HVAC and refrigeration systems by reducing compressor workload resulting in less amp draw and

lower compressor head temperature (at like capacity). It reduce energy consumption by up to 25 percent with its smooth amp utilization.

“This preliminary classification is the last step in a list of accomplishments for final approval by ASHRAE. TdX 20 is the equipment- and environment-friendly refrigerant that the marketplace has been waiting for in that it is extremely affordable, easy-to-install, reliable, saves energy, and extends the life of building owners’ current HVAC and refrigeration equipment,” said Douglas Reinke, at Bluon Energy.

Source: <http://www.achrnews.com>

New cooling system for commercial refrigeration

Cooltech Applications (Cooltech), France, has launched first commercial magnetic cooling system for its magnetic refrigeration system (MRS) product line. The magnetic cooling system utilizes a water coolant instead of a refrigerant gas – a major contributor to climate change – resulting in an eco-friendly solution that consumes minimal energy. With cooling powers between 200W and 700W, the MRS product line is optimized for a wide range of products in commercial refrigeration, including medical refrigerators, display cabinets, beverage dispensers, store plugins, and wine cellars, a market that is worth over \$20b a year.

“The MRS200 was successfully demonstrated last year at the Medica tradeshow in one of our medical refrigerating equipment. We are looking forward to replacing compressor-based

units in the near future and expect a very positive market reaction to this major innovation,” said Jochen Kopitzke, at Kirsch International, a leading manufacturer of medical equipment. Based on the magnetocaloric effect (MCE), which is the heating or cooling of magnetic material caused by applying a magnetic field to it, the MRS eliminates the harmful gases that are used in compression-based refrigerators.

The magnetic unit operates at low pressure with low rotational speed virtually eliminating vibrations, cutting noise to less than 35 decibels (db), and reducing maintenance costs. The whole system enjoys a quasi-indefinite lifespan. The MRS400 is in beta testing at three sites in various configurations and is presently available for integration. An MRS version generating high cooling power – 20 kilowatt (kW) and beyond – is under development for industrial applications. *Contact: Cooltech Applications. Tel: +33-0-388-104-790; E-mail: v.delecourt@cooltech-applications.com.*

Source: <http://www.businesswire.com>

National HFC Inventories

OzonAction has published a new report “National Hydrofluorocarbon (HFC) Inventories: A summary of key findings from the first tranche of studies”, as part of the UN Environment’s work programme. The report summarises the findings of HFC use from the first six completed HFC inventories - Bangladesh, Chile, Colombia, Ghana, Indonesia and Nigeria - all UNDP-assisted countries. This report includes preliminary results from Kyrgyzstan (UN Environment assisted), Viet Nam, Moldova and Sri Lanka

For more information, access:

<http://www.ccacoalition.org>

Alternative for cleaning of medical devices

AGC Chemicals Americas, the United States, offers a series of fluorinated solvents that provide medical device manufacturers a safer, highly effective and environmentally friendly alternative to halogenated solvents. The AsahiKlin AE-3000 Series of solvents are approved for use as precision cleaning solvents, defluxing agents for electronic circuitry, carrier solvents for silicone and fluorinated lubricants, and moisture displacement fluids.

The products have no flash point, no ozone depletion potential (ODP) and low global warming potential (GWP), enabling manufacturers to more easily meet increasingly strict environmental regulations. The products also have low surface tensions, low viscosities and high liquid densities. In addition to providing improved solutions for medical device manufacturers, the AE-3000 Series is ideal for manufacturers in the defense, electronics, aerospace and optics industries. *Contact: AGC Chemicals Americas, Inc., 55 E. Uwchlan Avenue, Suite 201, Exton, PA 19341, USA. Tel: +1-610-423-4300.*

Source: <http://www.medicaldesignandoutsourcing.com>

Industrial cleaners as ideal nPB replacement

Techspray, the United States, a leading manufacturer of precision cleaners for electronics, and industrial and electrical applications, has introduced PWR-4 solvent cleaners. PWR-4 solvents are ideal replacements for n-propyl bromide (nPB) and other toxic industrial solvent because they

are safer, non-flammable, and cost effective. PWR-4 quickly blasts off oils, greases, fluxes, silicones, dirt and grime.

PWR-4 is available in aerosol or bulk for vapor-degreasing, ultrasonic and immersion cleaning. It is engineered to remain stable and effective over thousands of cycles in vapor degreasing equipment. PWR-4 is stabilized and safe for metals such as aluminum, magnesium, titanium, and brass. PWR-4 Flux Remover (part #3401) quickly cleans the most difficult baked-on R, RMA & no-clean fluxes from electronic assemblies. PWR-4 Industrial Maintenance Cleaner (#3400) quickly cleans the most difficult greases and oils from electronics, relays, and motors.

n-Propyl Bromide (nPB), Trichloroethylene (TCE), and Perchloroethylene (Perc) are three examples of harmful chemicals that are commonly used in industrial applications because they are non-flammable, have high solvency, and are relatively inexpensive. Because of safety concerns, they are under close scrutiny by OSHA, EPA, and local agencies. *Contact: Techspray – Asia, ITW Contamination Control Electronics Asia, 3A International Business Park, ICON@IBP, #06-16, Singapore 609935, Tel: +65-9299-6679; E-mail: dcheng@itwccce.com.*

Source: <http://www.facilityexecutive.com>

Atmospheric plasma cleaner

Plasma Etch Inc, the United States, a leader in plasma innovation, recently introduced the 'Plasma Wand.' The Plasma Wand is an easy-to-use, handheld plasma cleaning system that requires input gas to operate. With a low starting price, the plasma wand

is the most cost effective way to experience the benefits of plasma cleaning. By removing organic material and activating surfaces, the company touts the ability to improve the strength of bonds.

Plasma cleaning works well on materials including glass, plastic, rubber and even metal. Plasma is the most environmentally friendly way to clean. There are no chemicals involved and no hazardous waste to dispose of. For most applications, the Plasma Wand doesn't need an input gas. Input gases can be used if a specialized nozzle is purchased. *Contact: Plasma Etch, Inc., 3522 Arrowhead Drive, Carson City, NV 89706, USA. Tel: +1-775-883-1366.*

Source: <http://www.news.thomasnet.com>

Electronic grade coating

Developed by 3M, the United States, the 3M™ Novec™ 2202 Electronic Grade Coating is a fluorinated polymer diluted in 3M™ Novec™ 7200 Engineered Fluid, a segregated hydrofluoroether solvent, providing a clear, low viscosity, low surface tension coating solution. It forms a thin, transparent fluorinated polymer coating when dry, adding durable anti-smudge and easy-to-clean properties.

Novec 2202 coating helps to improve the lubricious feel of a variety of glass and glass-like surfaces such as displays, touch screens and mobile electronic device components. Thermal curing provides added durability, chemical resistance and abrasion resistance. Novec 2202 coating is non-flammable, non ozone-depleting, low in toxicity, low in GWP, RoHS compliant, and VOC exempt (per U.S. EPA). *Contact: Electronics Materials Solutions Division, 3M Center, Building*

224-3N-11 St. Paul, MN 55144-1000, USA. Tel: +1-800-810-8513.

Source: <http://www.multimedia.3m.com>

Alternative solvent line

Tri-V™ from Chemtronics, the United States, is a non-toxic, high performance solvent line. It replaces toxic chemicals like n-propyl bromide (nPB), trichloroethylene (TCE), and perchloroethylene (Perc). The powerful solutions are suitable for vapor degreasing, ultrasonic cleaning, and soak and wipe applications. Tri-V is non-flammable and can be used on energized equipment for safer cleaning without sacrificing performance or increasing cost. It is also stabilized and safe for metals such as aluminum, magnesium, titanium, and brass. In addition, the cleaners are non-corrosive with a boiling point of 118° and no flash point.

Three products – Electro-Wash, Max-Kleen, and Flux-Off – make up the Tri-V high performance solvent line. Each penetrates hard to reach areas, evaporates quickly, and leaves no residue. The Electro-Wash® Tri-V Precision Cleaner removes soil, oxides, flux, grease, oils, dirt, dust, and other contaminants from electronic components and assemblies. For use on transformers, circuit breakers, and the like, it comes in 12 ounce aerosols and one gallon, five gallon, and 53 gallon containers. Max-Kleen™ Tri-V is a suitable solvent for most electronic and electrical applications.

Max-Kleen™ removes all types of soils – including oxidized oil, tar, grime, and grease – from motors and relays. It is available in a 20 ounce aerosol and one gallon, five gallon, and 53 gallon containers with a dielectric strength of >30

kV (liquid). Flux-Off® Tri-V Flux Remover is for removing heavy encrusted flux deposits from electronic assemblies; this helps ensure reliable circuitry. Some flux residue can promote short circuits and corrosion, degrading or destroying the PCB. *Contact: Chemtronics, 8125 Cobb Center Drive, Kennesaw, GA 30152, USA, Tel: +1-800-645-5244; Fax: +1-770-424-4267; E-mail: askchemtronics@chemtronics.com.*

Source: <http://www.facilityexecutive.com>

Fast-curing release agents for molded elastomers

LORD Corporation, the United States, has announced the availability of a proven family of fast-curing release agents designed for use with molded elastomers. Suitable for rubber-to-metal part manufacturing facilities, LORD LokRelease solutions offer semi-permanent, anti-stick surface coating for easy part removal from molded Elastomers. Presented in aerosol, aqueous and solvent-based solutions, a single application allows for multiple molding cycles, eliminating post-finishing problems. Containing no Class I or Class II ozone-depleting substances; release agents also reduce rust and corrosion in steel molds.

LORD® LokRelease™ Mold Release solutions are formulated to increase time between mold-picking and to reduce mold fouling in the rubber-to-substrate molding processes. “Now commercially available, our mold releases have been used in LORD rubber-to-metal part manufacturing facilities for several years,” says Chris Schneider, Manager, Tech Services, LORD Corporation. “Building on more than 90 years of experience with

world-leading in-mold bonding adhesives, LORD LokRelease solutions provide a semi-permanent, anti-stick surface coating for fast, easy part removal from molds.”

Applications for LORD LokRelease Mold Release include industrial rubber-to-substrate molding, automotive rubber-to-substrate molding and other molding processes such as injection, compression and transfer molding.

Advantages of the LORD LokRelease Mold Release solutions include the following:

- **Versatility:** LokRelease is available in three convenient product forms of aerosol, aqueous and solvent-based solutions.
- **Process Enhancer:** Provides quick, easy part release and produces low build-up, allowing more production time between mold cleanings.
- **Manufacturing Efficiencies:** A single application allows for multiple molding cycles.
- **Improved Appearance:** Reduces defects caused by sticking and is nontransferable, eliminating post-finishing problems.
- **Environmentally Recommended:** Contains no Class I or Class II ozone-depleting substances; contains no 1, 1, 1, trichloroethane or methylene chloride. A water-based coating reduces rust and corrosion in steel molds.

Substrates compatible with LORD LokRelease include EPDM, Natural rubber, Nitrile, Neoprene, Epoxy/plastic laminates, Silicone, Fluoropolymer and Plastic.

Contact: LORD Corporation, 111 Lord Drive Cary, NC 27511, USA; Web: www.LORD.com

Source: <http://news.thomasnet.com>

Fire suppression systems with NOVEC 1230

Rotarex Firetec, Luxembourg, has launched its FireDETEC object protection systems with NOVEC™ 1230 Fire Protection Fluid. The system is a private label of Fire Fluid Technologies, Inc, the United States, utilizing the proven FireDETEC technology, and carrying the UL and FM listing approval. FireDETEC pre-engineered systems are available with CO₂, FM-200 suppression agents in addition to the NOVEC™ 1230 Fluid.

NOVEC™ 1230 Fire Protection Fluid from the 3M company, the United States, is one of the leading and fastest-growing HFC alternatives that works quickly, cleanly and efficiently to suppress a fire. The Fluid is gaining popularity worldwide for its neutral environmental profile. With the addition of our new NOVEC™ 1230 systems, our customers now have a stronger choice of proven-effective halon-substitute suppression agents, particularly where they are concerned about environmental impact.

FireDETEC systems represent a new approach in fire suppression. They are designed to protect individual objects at high risk to fire, such as vehicle engines, electrical cabinets, CNC machines and chemical handling cabinets. Installed directly inside this business-critical machinery and equipment, it suppresses a fire at its source, by extinguishing a fire quickly before it can spread, damage is minimal and is limited to a small area. *Contact: Rotarex Firetec Headquarters, 24 rue de Diekirch, B.P. 19, 7505 Lintgen, Luxembourg. Tel: +352-327-8321; Fax: +352-*

3278-32854; Email: info@firetec.rotarex.com.

Source: <http://www.rotarexfiretec.com>

High pressure water mist system

Fogmaker, Sweden, has developed a method that suppresses with the help of three basic mechanisms. The high pressure in combination with special nozzles creates microdroplets with an average size of 50 µm. In the evaporation process the watermist cools the burnt gases and hot parts in the engine compartment. One calorie is needed to warm one gram of water +1°C, but 540 times more to evaporate the same quantity of water from + 0°C to vapour. The effective cooling contributes to a rapid extinguishing and reduces the risk of re-ignition.

The microdroplets evaporate immediately upon contact with heat. In the evaporation, 1 litre of water forms 1700 litres of water vapour. The vapour increases the water content of the air and prevents a new supply of oxygen to the fire. The Fogmaker extinguishant also includes a low concentration, environmentally friendly AFFF (Aqueous Film Forming Foam) coating the fuel, preventing its contact with oxygen, resulting in suppression of the combustion. *Contact: Fogmaker International AB, Sandvägen 4, Box 8005, SE- 350 08 Växjö. Tel: +46 470-77-2200; Fax: +46-470-77-2210; E-mail: info@fogmaker.com.*

Source: <http://www.fogmaker.com>

Clean agent fire protection technology

Developed by Benelux Fire Protection, The Netherlands, FS49C2® provides a Halon 1301 re-

placement system, offering the same optimum characteristics yet with minimum impact on the environment. FS49C2® systems are installed to protect computer rooms, engines, transformers, switchboards and other areas at risk. These systems are designed for a quick discharge that fills the room quickly and efficiently without endangering personnel.

The FS49C2® system was developed with almost identical characteristics to Halon 1301 systems which can easily be converted to FS49C2® system, using existing hardware and with minor technical adjustments as well as a slight increase in gas storage volume. The Ideal choice FS49C2® system is considered the best and most ideal choice for a new installation or upgrade/replacement of an existing Halon 1301 system to an environmentally friendly system.

FS 49 C2® is the ideal extinguishing agent of choice for a new system as it is safe, clean and when used, leaves no residue to be cleaned up, mopped up or scraped off. Any residue is usually harmless to any equipment, hence production downtime, if any, is greatly reduced. Furthermore, FS 49 C2® is quick acting, which keeps fire damage to a minimum. *Contact: Benelux Fire Protection, Po Box 287, 2990 AG Barendrecht, The Netherlands. Tel: +31-0-180-625-844; Fax: +31-0-180-625-845; E-mail: info@bfp-g.com.*

Source: <http://www.bfp-g.com>

Solar Chill

This global initiative is developing a solar-powered vaccine cooler to improve the health of children in developing countries.

For more information, access:

<http://www.solarchill.org>

New foam blowing agent

The Chemours Company (Chemours), the United States, has announced that leading spray foam manufacturer, Icynene, the United States, is utilizing Opteon™ 1100 foam blowing agent for use in its high-performance spray foam insulation solutions. Icynene plans to use Opteon™ 1100, and add it to its portfolio of new polyurethane spray foam products that help deliver superior insulation performance with a lower global warming impact.

Opteon™ 1100 helps meet Icynene's need for a non-flammable, high efficiency and low global warming potential (GWP) blowing agent for use in polyurethane foams. The excellent thermal conductivity and spray ability help Icynene to improve the performance of its foam insulation, while the low GWP enables them to support their customers in helping meet the upcoming regulatory driven conversions across North America, the E.U. and Japan.

In addition, the unique chemical structure helps provide outstanding stability and versatility, thus maximizing the range of customer formulations and geographic product considerations. Chemours also announced that it is close to starting up the world's first full-scale production facility for HFO-1336mzz, which is the chemical name for Opteon™ 1100. *Contact: Andrew Abloeser, Global Marketing Communications Consultant, The Chemours Company, Tel: +1-302-773-4502; E-mail: andrew.abloeser@chemours.com.*

Source: <http://www.prnewswire.com>

Innovative foam solutions

BASF, Germany, is expanding its range of high performance foam products with the innovative, certified compostable particle foam ecovio® EA. The product is predominantly biobased and, like all of the grades under the ecovio® brand, it supports the biological cycle through its certified compostability. The excellent properties of the patented particle foam make it particularly suitable for transport packaging for high-value or delicate goods where a high level of impact resistance and robustness is vital.

The product properties are similar to those of EPS and boast outstanding energy absorption and very good resilience even when subjected to multiple impact loads. The high biobased content and the certified compostability make ecovio EA particularly attractive wherever a fossil packaging solution no longer meets customers' requirements for a biobased and biodegradable transport solution.

ecovio EA is the first expandable, closed-cell foam material which is biobased and certified compostable. It consists of the biodegradable BASF polymer ecoflex® and polylactic acid (PLA), which is derived from corn or other sugar-generating plants like manioc. To produce ecovio EA, expandable granules are charged with the blowing agent pentane in an innovative process. This step enables trouble-free pre-expansion of the material on conventional EPS pre-expanders and subsequent molding.

Source: <https://www.basf.com>

Integral skin foam innovation

The Dow Chemical Company (DOW), the United States, has launched a new polyurethane integral skin foam that may lower global warming potential (GWP) by up to 99.9% while sustaining the comfort level and durability of previous polyurethane systems. DOW's ComfortScience customized I-Skin solutions, formulated with hydrofluoroolefin, are designed for North American companies and brand owners impacted by the Significant New Alternatives Policy, announced by the U.S. Environmental Protection Agency (EPA).

Integral skin foam is used in a number of market applications, including automotive interiors, furniture components, office chairs, household leisure goods and wheelchairs. Its lightweight flexibility and resistance to chemicals makes it great for furniture, especially with its extended shelf-life. Other benefits of DOW's polyurethane solutions, including Voralux for furniture, are its soft touch and its abrasion and chemical resistance.

"We realize ... the Environmental Protection Agency's blowing agent regulation brings a unique set of technical issues to the industry. DOW scientists thrive on challenges like this. For years, we have put our innovation engine to work to develop low GWP solutions, and our experts are available to guide companies through smooth and seamless transitions to bring more sustainable solutions to the marketplace," said Doug Todd, at DOW.

Source: <http://www.furnituretoday.com>

Non-ODS fumigation solution

EDN FUMIGAS from Linde AG, Germany, is a next generation timber and log fumigant. As a replacement for the ozone-depleting methyl bromide EDN FUMIGAS has been shown to have higher more effective toxicity on a large range of timber pests as well as having superior penetration qualities – even into moist logs. These excellent penetration qualities ensure that even wood borer insects are controlled.

With no known insect resistance, EDN FUMIGAS overcomes the problems associated with growing resistance among insects and pests to traditional chemicals and fumigants. EDN FUMIGAS is already registered in Australia and registrations for many other regions are pending. The Linde Group is working with national and international biosecurity groups to establish global fumigation standards to support the lumber trade.

Comparable to methyl bromide in terms of efficiency, EDN FUMIGAS requires less dosage per commodity, has a shorter fumigation period (10 hour fumigation treatment time) and offers improved penetration characteristics. All of which combines to increase your productivity and profitability. *Contact: Linde AG Linde Gases Division, Seitnerstrasse 70, 82049 Pullach, Germany. Tel: +49-89-7446-2339; Fax: +49-89-7446-2071.*

Source: <http://www.cropscience.linde-gas.com>

Scientist fights Southern blight on tomatoes

Vegetable pathologist Anthony (Tony) Keinath, at Clemson University, the United States,

ongoing research on Southern blight – a serious disease that kills tomatoes and more than 500 other crop and plant species – may soon result in a management strategy for vegetable growers that is designed to be effective, economical and environmentally safe.

Keinath is continuing to conduct field trials and laboratory research to determine the sensitivity of Southern blight to several commercially available and legally registered fungicides. “The ultimate goal of this research is to reduce the number of plants that are killed by Southern blight. The main focus has been using fungicides to replace soil fumigants – which is analogous to using a rifle instead of a shotgun,” said Keinath.

Incidences of Southern blight have become more frequent in recent years because one of its most effective combatants was basically taken off the market. Methyl bromide – a fumigant once widely used to control pests in agriculture – was restricted by the U.S. Environmental Protection Agency (EPA) in 2009 after it was determined that the odorless gas was playing a role in the depletion of the ozone layer. Without methyl bromide at their disposal, growers have had to turn to fungicides to protect their crops against Southern blight.

Source: <http://www.newsstand.clemson.edu>

New type of fumigant

Inert Gas Injection LLC (IGI), the United States, has received approval for a new type of fumigant for food storage, transport, and containment structure pest control by the U.S. Environmental Protection Agency (EPA). The product, called IGI CO₂, uses carbon dioxide (CO₂) gas. “Our proprietary CO₂ technol-

ogy and eradication systems provide a patented, biologically and efficient solution that allows us to eliminate targeted species with no residual chemical or other biologically active substances that may harm children, pets, wildlife or the aquifer,” says Al, Dentone, at IGI.

IGI CO₂ used as a pesticide, is different from other chemical agents for pest control because it functions only when released in a confined space, the company says. The gas immediately induces an amnesic effect and pests confined within the space succumb to a lack of breathable air, resulting in the suffocation of the pest. There is no contamination of the soil or other spaces due to lasting chemical and toxic agents. IGI said it plans an international distribution network for its complete line of pest control products as well as provide training on the products.

The first product available that will deliver the EPA approved CO₂ is known as the “Eliminator System” for fumigation of granaries, agricultural product storage facilities, cargo containers and ship holds. Additional labels that are currently under EPA review are for the control of burrowing rodents and bed bugs. The company expects these approvals early next year. “This is a revolutionary breakthrough in the field of pest control and will help remove many caustic and poison chemicals from the market, making our planet a safer place,” said Mr. Dentone.

Source: <http://www.centralvalleybusinesstimes.com>

Environmentally friendly soil sterilization

A research project carried out by the author at the Government Experimental Farm with the collaboration of the University of Malta

Institute and supervised by Dr. Anthony Sacco on soil sterilisation in greenhouses using two environmentally friendly techniques – soil solarisation and biofumigation – has shown that the former is a very effective alternative to using chemicals to sterilise soil and can be used successfully in Malta due to the favourable climatic conditions.

Biofumigation was also found to be efficient but not as much as soil solarisation. Both techniques reduce the use of pesticides, improve yields and hence increase farmers' profits. In the research, the efficacy of soil solarisation and biofumigation were compared using local soil in a greenhouse. The effectiveness of the treatments was assessed through their ability in reducing the nematode population in the soil, together with the crop yield, plant length, plant death, root structure, and also weed control.

Compared to a non-treatment control each treatment had a significant effect on the nematode population; however, soil solarisation was the most effective. Crops cultivated in solarised soil produced a significantly higher yield than crops cultivated in the biofumigated soil. They also reached maturity earlier, had a better rooting system and suffered less from diseases. Both treatments produced a significantly higher crop yield than the control untreated soil. From a weed control aspect soil solarisation proved to be the best choice under local conditions.

Source: <http://www.timesofmalta.com>

X-ray radiation as methyl bromide alternative

Researchers at Gyeongsang National University, Republic of Korea, tested different doses of

X-ray radiation to assess the developmental inhibition effects on different stages of *Drosophila suzukii*, spotted wing drosophila (SWD). Efficacy of a potential quarantine treatment dose was evaluated for its practicality by small scale-up validation test at a commercial facility. X-ray treatments at different doses of 50, 100, 200, and 300 Gy were carried out with eggs, larvae, pupae and adults of SWD. Trial at commercial facility was performed with pupae at 150 Gy.

X-ray radiation inhibited development of all stages of SWD, and the estimated dose to cause 99% mortality or to prevent emergence (ED99) are reported in the results. Irradiation to eggs inhibited hatching, pupariation and adult emergence at 1962, 649 and 31 Gy, respectively. The inhibition of irradiated larvae to adult emergence was 66 Gy. Irradiation to pupae could not inhibit adult emergence completely even at 300 Gy. However, irradiation at 100 Gy and above induced complete adult sterility.

Irradiation to pupae inhibited hatching of F1 eggs at 73 Gy, while for adults, total inhibition of F1 egg hatching was observed at 822 Gy. In trial at commercial facility, radiation at 150 Gy to pupae induced complete adult sterility in all combinations of cross-mating between treated or untreated males and females. The study suggests that X-ray radiation can be recommended as an alternative to methyl bromide as phytosanitary treatment for quarantine purpose. The research has been published in *Int. J. Radiat. Biol.*

Source: <http://www.pubfacts.com>

Alternative to methyl bromide for tomatoes

Following the phase out of methyl bromide, scientists continue to ex-

plore effective, viable, and more sustainable options for vegetable crop production. Among nonchemical alternatives, anaerobic soil disinfestation (ASD) is considered to be one of the most promising methods. ASD has been determined to be effective with a range of crops and environments against several soilborne fungal and bacterial plant diseases, plant-parasitic nematodes, and weeds.

A study in the June 2016 issue of *HortScience* focused on the effects of ASD in an open-field, fresh-market tomato production system. Field studies were conducted to evaluate and compare ASD with chemical soil fumigation (CSF) treatments for controlling weeds and nematodes, as well as for influence on tomato fruit yield and quality. In experiments conducted in southwestern (Immokalee) and northern Florida (Citra), conventional CSF was compared with two ASD treatments, which consisted of amending the soil with 22 Mg·ha⁻¹ of composted poultry litter and two rates of molasses (13.9 and 27.7 m³·ha⁻¹) as a carbon source. Analyses showed that the application of ASD did not negatively affect commercial tomato fruit quality, and that quality and the mineral content of fruit produced with ASD was comparable or higher than that of fruit produced in CSF plots.

In both locations, the application of ASD provided a level of root-knot nematode control equivalent to, or more effective, than the CSF. Additional results showed that, in Immokalee, the CSF provided the most significant weed control, "but ASD treatments also suppressed weeds enough to prevent an impact on yield," the authors said. In Citra, all treatments, including the CSF, provided poor weed control relative to the Immokalee site.

Source: <http://www.agprofessional.com>

CO₂ as a refrigerant

The IIR guide highlights the application of carbon dioxide in supermarkets, industrial freezers, refrigerated transport, and cold stores as well as ice rinks, chillers, air conditioning systems, data centers and heat pumps. This guide is for design and development engineers needing instruction and inspiration as well as non-technical experts seeking background information on a specific topic.

Handbook on indirect refrigeration and heat pump systems

The Handbook on indirect systems deal with the following topics: 1. Direct and indirect systems; 2. Indirect system solutions; 3. Components; 4. Secondary fluids; 5. Corrosion; 6. Environmental aspects; 7. Projecting and dimensioning; 8. Design and control of system; 9. System construction and installation; and 10. Optimization of indirect systems. An expectation of all involved in producing the Handbook is that it will help to better understand and work with indirect systems.

For the above two publications, contact: International Institute of Refrigeration, 177 Boulevard Malesherbes, 75017 Paris, France. Tel: +33-1-4227-3235

Absorption chillers and heat pumps

The book discusses the fundamental physics and major applications of absorption chillers. The book provides an updated and thorough discussion of the physics and applications of absorption chillers and heat pumps. An in-depth guide to evaluating and simulating absorption systems, this revised edition provides significantly increased consistency and clarity in both the text and the worked examples.

Contact: CRC Press. Tel: +44-0-1235-400524; Fax: +44-0-1235-400525; E-mail: tandf@bookpoint.co.uk

Minimising Quarantine and Pre-shipment (QPS) Uses of Methyl Bromide – Tools for controlling, monitoring and reporting

This publication is intended to help National Ozone Units (NOUs) understand why the close supervision of MB use in QPS applications is important for their countries continued compliance with the Montreal Protocol. It provides information about how to correctly identify MB QPS uses, data management, reporting, stakeholder engagements, and how to control and prevent potential illegal trade of this ODS.

Contact: UNEP DTIE OzonAction, 1 rue Miollis, Building VII, 75015 Paris 15, France. Tel: +331-4437-1450; Fax: +331-4437-1474; E-mail: ozonaction@unep.org

2016

8-10 Nov
Orlando,
USA

2016 Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reductions

Contact: Conference Secretariat
E-mail: mbao_admin@mbao.org
Web: <https://www.mbao.org>

1-2 Dec
Kobe,
Japan

International Symposium on New Refrigerants and Environmental Technology 2016 (Kobe Symposium)

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Kinkinippon Tourist Co., Ltd.
Global Business Management Branch
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1-13, Kanda-Izumi-cho, Chiyoda-ku,
Tokyo, 101-0024, Japan
Tel: +03-6891-9354
Fax: +03-6891-9409
E-mail: jraia2016-gbm@or.knt.co.jp
Web: <http://www.jraia.or.jp>

2017

23-25 Feb
Greater Noida,
India

ACREX INDIA 2017

Contact: ISHRAE
K-43 (Basement)
Kailash Colony
New Delhi - 110 048, India
Tel: +91-11-4163-5655
E-mail: coordinator@acrex.in
Web: <http://www.acrex.in>

7-10 Mar
Goyang,
Republic of
Korea

The 14th Heating, Air-Conditioning, Refrigeration and Fluid Exhibition (HARFKO 2017)

Contact: HARFKO 2017 Office
Tel: +02-2193-4323
E-mail: harfko@ref.or.kr

12-14 Apr
Beijing,
China

CHINA REFRIGERATION EXPO 2017

Contact: Beijing International Exhibition
Center of CCPIT-Beijing
Beijing, China
Tel: +86-10-5856-5888
Fax: +86-10-5856-6000
E-mail: juanjuan@biec.com.cn

23-26 Apr
Seoul,
Republic of
Korea

5th IIR International Conference on Thermophysical Properties and Transfer Processes of Refrigerant

Contact: Prof. Yong Tae KANG
E-mail: ytkang@korea.ac.kr
Web: <http://www.iifir.org>

13-15 Jun
Ho chi Minh,
Viet Nam

RAHV VIET NAM 2017

Contact: Top Repute Co., Ltd.
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Central Hong Kong
Hong Kong
Tel: +852-2851-8603
Fax: +852-2851-8637
E-mail: topreput@top-repute.com

7-10 Sep
Bangkok,
Thailand

BANGKOK RHVAC '2017

Contact: Thai Trade Fair
44/100 Nonthaburi 1 Road
Bang Kra Sor
Nonthaburi 11000
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