The refrigeration and air conditioning (RAC) industry is remarkable for its contribution to sustainable development and indeed to the United Nations’ Millennium Development Goals. Preservation of perishable food and medicines has resulted in reducing poverty and protecting human health. The improvement of life expectancy and the near eradication of diseases like polio could not have been possible without refrigeration or cooling. At the same time, productivity and the quality of life could not have been enhanced without maintaining comfortable working conditions through climate controls. The RAC industry has also proven its ability to rise to environmental challenges, notably the protection of the Earth’s ozone layer.

The refrigeration sector saw the Montreal Protocol’s requirement of eliminating CFCs as an opportunity to innovate, and indeed it is rising to the challenge. Before the Protocol entered into force, nearly 40% of the 1 million tons of global CFCs were used annually by this industry in the early 1980s. At that time, only a few businesses and governments were optimistic that RAC technology could be developed to meet the challenge of effectively eliminating the use of CFCs. However, over the last 15 years, the industry underwent a technological revolution, starting with pioneering work in leak-detection, containment, best practices, recovery, recycling and reducing initial refrigerant charges. The industry showed a progressive shift towards more sustainable solutions by moving from CFCs to transitional HFCs refrigerants, followed by hydrocarbons, CO₂ and “not-in-kind” technology.

Now, as the Montreal Protocol reaches its 20th Anniversary and the Kyoto Protocol approaches its 10th, the world is recognizing the important links between ozone depletion and climate change, and that the nexus of both lies in the RAC industry. A recent study has confirmed the tremendous contribution of the Montreal Protocol to mitigating climate change. By phasing out CFCs, HFCs and other chemicals under the Montreal Protocol, more than 5 Gigatonnes equivalent of CO₂ have already been eliminated – representing more than 25% of the world’s greenhouse gases (GHGs) emissions compared to 1990. This surpasses the Kyoto Protocol’s target of reducing GHGs by 5 times. The RAC industry played a major role in this achievement, and needs to apply the same focus and determination on the next great challenge: climate change.

The RAC industry has been responsive to the changes it has faced until now. It will now have to be responsive to another change – climate change. The potential of this sector in technology innovation is yet to be fully utilized, and I encourage the industry to rise to the challenge.

As we announced in the latest issue of the Newsletter, this special issue on the environment was prepared jointly with the United Nations Environment Programme (UNEP). 2007 is a very important year for the future of the global environment and the refrigeration sector.

Several reports – such as Stern report1 at the end of 2006 – have shown that combating climate change is not only necessary for preserving the environment but also the best way to develop national economies. The GB, bringing together industrialized countries and the biggest developing countries, in June 2007 announced actions against climate change and proposed to accelerate the phase-out of HFCs. The United Nations Conferences on the ozone layer in Montreal (September 2007) and on climate change in Bali (December 2007) will probably propose new measures. It is the IIR’s mission, as an intergovernmental organization, to attend these meetings and to deliver statements. Our partnership with UNEP is essential.

We need to combine two actions: reducing the energy consumption of units, which represents 80% of the current impact of the refrigeration sector on global warming and 15% of the worldwide electricity consumption; reducing emissions and progressively replacing the refrigerants which have an important impact on the ozone layer or as greenhouse gases (CFCs, HFCs). The refrigeration sector is vital for human life. We need sustainable development. The success of the Montreal Protocol is our success. It shows our ability to meet this challenge in a responsible manner, taking into account the various impacts of the technologies and uses on the environment and the situations of the various countries.

All sectors have to participate in these efforts. All countries have to take measures suited to their contexts. The IIR provides guides and organizes conferences, especially this year, in order to help you contribute to this effort.

Didier Coulomb, 
Director of the IIR

---

1. www.hm-treasury.gov.uk/independent_reviews/...limate_change/ sternreview_index.cfm

Focus

As we announced in the latest issue of the Newsletter, this special issue on the environment was prepared jointly with the United Nations Environment Programme (UNEP).

2007 is a very important year for the future of the global environment and the refrigeration sector.

Several reports – such as Stern report1 at the end of 2006 – have shown that combating climate change is not only necessary for preserving the environment but also the best way to develop national economies. The GB, bringing together industrialized countries and the biggest developing countries, in June 2007 announced actions against climate change and proposed to accelerate the phase-out of HFCs. The United Nations Conferences on the ozone layer in Montreal (September 2007) and on climate change in Bali (December 2007) will probably propose new measures. It is the IIR’s mission, as an intergovernmental organization, to attend these meetings and to deliver statements. Our partnership with UNEP is essential.

We need to combine two actions: reducing the energy consumption of units, which represents 80% of the current impact of the refrigeration sector on global warming and 15% of the worldwide electricity consumption; reducing emissions and progressively replacing the refrigerants which have an important impact on the ozone layer or as greenhouse gases (CFCs, HFCs). The refrigeration sector is vital for human life. We need sustainable development. The success of the Montreal Protocol is our success. It shows our ability to meet this challenge in a responsible manner, taking into account the various impacts of the technologies and uses on the environment and the situations of the various countries.

All sectors have to participate in these efforts. All countries have to take measures suited to their contexts. The IIR provides guides and organizes conferences, especially this year, in order to help you contribute to this effort.

Didier Coulomb, 
Director of the IIR

---

1. www.hm-treasury.gov.uk/independent_reviews/...limate_change/ sternreview_index.cfm
This industry has undergone a continuous evolution towards solutions less durable in passing the CFCs, HFCs, and their equivalent CO₂ and technologies of substitution.

Maintenance, at the end of the 20th anniversary of the Protocol of Montreal and the 10th anniversary of the Protocol of Kyoto, the world recognized the liens important between the ozone layer and the slowing down of the changes climatiques, but also the fact that the industry is at the heart of these two phenomena. A recent study has confirmed the contribution of the Protocol of Montreal to the attenuation of changes climatiques.

The Frigocyl HCF-22 has until now been used to the mise en œuvre of the Protocol of Montreal. However, the consumption of this fluid increases annually, to the point of 20% to 35% per year in the countries of development. A partnership worldwide is necessary to develop and deploy the technologies alter-
Climate change issues

IPCC Report 2007

The IPCC 4th Assessment Report Climate Change 2007, which was released in May 2007, provides very valuable figures on greenhouse gas (GHGs) emissions, including those of fluorinated gases (CFCs, HCFCs, HFCs) used in refrigeration.

In 2004, the global emissions of CO₂, CH₄, N₂O, HFCs, PFCs and SF₆ – the 6 gases governed by the Kyoto Protocol – and weighted according to their global warming potential (GWP), was 49 Gigatones of carbon dioxide equivalents (GtCO₂-eq), as compared with 28.7 GtCO₂-eq in 1970 (+70%). Annual emissions of all fluorinated gases are estimated as being 2.5 GtCO₂-eq (5.1%). Stacks of these fluorinated gases are much larger and currently represent about 21 GtCO₂-eq.

Emissions of CFCs and HCFCs which are ozone-depleting substances (ODS) – and also greenhouse gases – controlled under the Montreal Protocol accounted for some 20% of total GHG emissions by 1975, with slight fluctuations during the period 1975-1989. Once the phase-out of CFCs was decided, the CFCs’ + HCFCs’ share in total GHG emissions fell rapidly to 8% (1995) then 4% (2000). It is estimated that CFCs will be reduced to about 1-2% of total GHG emissions for the year 2015 – dependent on the scenario chosen – whereas emissions of all other GHGs are estimated at about 55 Gt CO₂-eq.

The percentage of HCFC emissions in the total of CFC and HCFC emissions for the year 2015 is projected to be about 70% independently of the scenario chosen.

Emissions of HCFCs were 0.55 GtCO₂-eq (1.1% of total GHG emissions) in 2004 and are projected to be 1.2 GtCO₂-eq in 2015 (2.2%).

www.ipcc.ch

G8 statement

The Group of Eight leading industrialized nations (G8) met with 5 major emerging countries (Brazil, China, India, Mexico and South Africa) early June in Heiligendamm and published a statement demonstrating a far greater will to address climate change than in the past. Highlights include:

- “Improving energy efficiency worldwide is the fastest, the most sustainable and the cheapest way to reduce greenhouse emissions and enhance energy security”;
- “We will consider seriously the decisions made by the European Union, Canada and Japan, which include at least a halving of global emissions by 2050”;
- “We will also endeavour under the Montreal Protocol to ensure the recovery of the ozone layer by accelerating the phase-out of HCFCs in a way that supports energy efficiency and climate change objectives;
- “...the implementation of energy efficiency in buildings and the use of renewable energies, especially of cooling and heating, taking into due consideration the different situations of new and existing buildings, and development and deployment of low- and zero-carbon buildings.”

Ozone layer issues

A recent policy article recommends “further adjustments to strengthen the Montreal Protocol and provide further assurance against the threat of abrupt climate change”.

According to the authors, “the Montreal Protocol’s successful work to protect the ozone layer is far from done. The year 2006 experienced the near largest ozone hole ever recorded over Antarctica, and new data indicates that the recovery of the ozone layer above the Antarctic will be delayed by 15 years, with a return to pre-1980 levels not occurring until 2065. This delay can be mitigated through two actions: one is to curb higher than anticipated emissions of hydrochlorofluorocarbons (HCFCs) by 2015; the other is to limit the adverse impacts from emissions of CFCs currently contained in products and equipment (known as ‘banks’) that will be emitted to the atmosphere once those products and equipment reach the end of their useful lives. Emissions from CFC banks by 2015 could equal approximately 7.4 GtCO₂-eq – more than seven times the size of the emissions reductions initially targeted by the Kyoto Protocol. These actions also will delay the impacts of climate change. They should be undertaken as part of a broader effort to ensure that the Montreal Protocol systematically considers and takes into account the climate impacts of Ozone Depleting Substances (ODS) and their substitutes, and minimizes the impact of its strategies on climate.”

The authors also highlight the following issues:

- “The accelerated phase-out of HCFC-22 in the developed and developing countries will avoid the projected increase of HCFC-22 production and emissions of its “super greenhouse gas” HFC-23 by-product. The combined climate emissions of HCFC-22 and HFC-23 are projected to reach 1 GtCO₂-eq by 2015. HFC-23 destruction projects have dominated the Clean Development Mechanism (CDM) market, accounting for 52% of all project-based carbon volumes transacted in 2006 and 64% in 2005.”
- “Illegal trade currently is estimated to represent about 10-20% of all trade in ODS, which for CFCs alone comprises 7 000-14 000 tons per year, with a value of USD 25–60 million. The Montreal Protocol instituted a licensing system for the transboundary shipments of ODSs to combat illegal trade, but this remains a critical issue.”
- “The concept of Life Cycle Climate Performance (LCCP) should be considered as a rational way of assessing climate impacts of ODS substitutes since it makes it possible to “calculate the “cradle-to-grave” climate impacts of the use of ODS in equipment, measuring the direct GWP of ODS as well as the indirect GWP from GHG emissions from power generation used in operating the equipment, placing a premium on energy efficiency.”

http://www.igsd.org/about/publications/ProtocoleDeMontreal.pdf (en français)

China Closes Ozone-Depleting Chemical Plants

On July 1, China, the world’s largest producer of CFCs and halon, shut down five of its six remaining plants, putting the country two and a half years ahead of the Montreal Protocol’s 2010 deadline for phase-out of the two ozone-depleting chemicals. The facilities were closed during a symbolic ceremony organized by Chinese authorities in recognition of chemical companies’ efforts to stop manufacturing products that harm the ozone layer and as part of the global ‘Remembering Our Future’ initiative sponsored by UNEP. The shut-down of the five facilities, in Chiangzhou City, near Shanghai, will bring China’s CFC production to just about 550 metric tons, down from 5 000 metric tons in 1998. The remaining production is being kept strictly to produce CFCs for metered-dose inhalers, used in the treatment of asthma and chronic obstructive pulmonary disease. The closure of the Chinese plants now puts India and South Korea as leading producers of the two ozone-depleting chemicals in Asia Pacific, with a remaining combined production level of about 15 000 metric tons.Achim Steiner, UNEP’s Executive Director, said: “On the 20th Anniversary of the Montreal Protocol, with more than 95% of the ozone-depleting substances being phased out, the Protocol is among the great success stories of recent years. This success undermines how, with political will, creative financing mechanisms and the support for industry and NGOs, the international community can rise to the challenge of sustainable development.” Katherine Sierra, Vice-President for Sustainable Development at the World Bank, said: “The closure of CFC production facilities in China is marking a significant milestone not only for the Montreal Protocol, but also for the cooperation bet-
mised that no ozone depleting substances they will place at Games. McDonald’s has pro-
in nearly 4000 beverage cooling appliances
in. As an introduction, some findings can be
presented, based upon a recent paper by R. Radermacher.

In the last 2 decades, R&D has focused on
reducing first the ozone-depleting then the global-warming impact of refrigerants.

“Natural refrigerants, especially carbon
dioxide and hydrocarbons, are making
inroads in some parts of the world.

Meanwhile, other opportunities for the
advancement of air-conditioning and refrig-
eration technology offer important and
far-reaching opportunities that have poten-
tially larger environmental benefits than
refrigerant selections. One R&D area that
can provide energy efficiency gains is impro-
ving the performance of cooling system components. As an example, the develop-
ment of oil-free compressors offers an
important opportunity. The elimination of oil has the potential to significantly improve
heat exchanger performance and will allow
engineers to design a new generation of
heat exchangers that go beyond flat-tube
technology, with much smaller flow chan-
nels. Alternative cooling technologies such as
thermoelastics, thermoacoustics, acous-
tic compression, magnetic cooling, and gas cycles such as the Stirling cycle open up
even more possibilities. When considering
these alternative cooling technologies and what they do best, the initial success may
come from skillfully integrating them with
apour compression rather than displacing
apour compression. One example may be the
use of thermoelastics for subcooling the
refrigerant in a traditional vapor com-
pression system”. Radermacher concludes that
instead of focusing on refrigerants which have little impact on total global war-
ming,”a clear and convincing reduction in
global warming potential results from aggres-
sively pursuing energy efficiency
improvements”.

1. Researching Beyond Refrigerants, R. Radermacher,
www.applicancemagazine.com

Solar air conditioning

With high summer temperatures, air-condi-
tioning and thermal comfort are increas-
ingly important issues, but raise the chal-
 lenges of high energy consumption and of
environmental consequences. Three recent
 projects use solar energy to operate air-
conditioning systems:

- The Californian-based company SolCool
is to launch a hybrid solar powered air
conditioner, SolCool Millennia version 4,
which runs on solar panels, from a wall soc-
tet or batteries that can run 12-24 hours in
the case of power cuts and insufficient sun-
light. The panels use small photovoltaic (PV)
solar cells to power the 5.3 kW air-condi-
tioning system. Version 4 can also provide
heating and has attachments for purifying
water, and running lighting or ceiling fans. It
addresses the fact that peak demand for
cooling is during the day and the installation
of solar panels on a roof costs 20 000-40
000 USD before subsidies, a price which
might be discouraging to consumers but is
likely to be cost-effective in the longer run.

According to SolCool, this system’s energy
efficiency rating (EER) equals 30. To give a
clearer idea of what this means, bear in
mind that the US Department of Energy’s
federal Energy Star rating
standard is granted to air
conditioners with an EER of
9.7.

www.solcool.net

- Givaudan, a French perfume manufactu-
er, has decided to use a system combining
solar panels with a powerful insulation
system for its 5000 m² head office near
Paris: 300 m² of solar roof panels in vacuum
tubes produce temperatures of 72°C that
operate a 110 kW lithium bromide absorp-
tion plant. A secondary fluid consisting in
chilled water flows within the ventilation
system. Insulation is provided by glass walls
within an airtight outer glass casing.

Givaudan expects the payback period to be
12 years.

www.actu-environment.com

- Haribo’s museum goes solar

Haribo’s sweets museum in Uzès near
Nimes in the South of France is now using
solar cooling. The number of visitors is on
the rise and a new building has been added
to the museum to cope with the influx:
additional area of 1113 m² on two floors,
829 m² of which are heated and cooled –
that is a volume of 2486 m³. The solar a/c
installation called Suniverse is based on 28
flat collectors with a surface of about 50m²
and an absorption unit with a nominal
cooling capacity of 10 kW. Furthermore,
14°C cold ground water is available through-
out year when the cooling capacity of the
absorption unit is not sufficient (e.g. on hot
summer days). Warm water is also produ-
ced using the solar installations and com-
trolled by 35-45°C water waste from the pro-
duction process.

www.refripro.eu/page.php?lg=en&rub=01&
srch=01&id_actu=00880&select_1=
www.sonnenwaerme-ag.com

Radiative cooling + PCMs

Radiative Cooling in the Sub-
Saharan Desert

A new way of lowering temperatures
without using electricity has recently been
developed. Iterrae, a French company, has
discovered a way of using radiative
cooling, a phenomenon that takes place at
night, when the Earth is cooled by the 0 K
temperatures that can be found in outer
space. A “Sahel granary”, designed to keep
grain cool, was constructed in Burkina
Faso with the support of the UN and the
World Bank. Radiative cooling is particular-
ly perceptible on dry and clear night as air
humidity acts as an insulant and the infrared radiation can transfer low temperatures more readily. In those conditions, the radia-
tion can be absorbed by a black body, in this case black anodized aluminium. With outdoor
temperatures of 28°C it is possible to obtain an indoor temperature of 10-15°C in a
100m³ volume and on a 130m² surface area, the equivalent of 30-80W/m². This sys-
tem could be very useful for the storage of harvests and food in poorer, desert areas
lacking power networks. However, in order to shave off the effect of temperature
peaks, Y. and P. Fayet, who invented the sys-
tem, used expanded graphite filled with a
phase-change material (PCM) such as an
alkane or paraffin, in order to store the
cooling energy gathered at night. This inno-
vative system has a huge potential for free,
environmentally friendly cooling in devel-
oping areas, but is still very costly to imple-
ment at this stage. www.iterroc.org

Ice storage

Ice storage is not only beneficial in eco-

tomic terms, it is also energy-saving, noise-
free and helps extend the life of the systems.
It consists in keeping a certain amount of ice,
as a way of storing “cold”, in order to use it
later. It was initially restricted to water chil-
ners, but has been used more recently in cen-
tralized air-conditioning systems using variable
refrigerant flow or volume (VRF/VRV), in
Japan where, unlike in Europe, peak electri-
city consumption period is in the summer
because of AC. Ice storage generates savings
as it can shift AC systems electricity to cheap
rate hours as the ice can be used during peak
hours. Full ice storage refers to systems in
which refrigerating units are cut off comple-
tely during peak times during which refrigera-
tion is provided thanks to the stored ice.
Partial ice storage refers to systems in which
refrigerating units run continuously and the
ice storage is used as a supplementary
cold source when needed.

Ice storage also generates energy savings since
it enables compressors to operate per-
manently at their nominal rate (at which their
energy efficiency is optimal) regardless of
external temperature. Storing ice is also
more efficient than storing chilled water because of
its latent heat. www.refipro.co.uk

Nanotechnology applications

Nanopackaging market worth billions
Global sales of nanotechnology-related pro-
ducts approached 739 million € last year,
and the food packaging industry could be
worth as much as 22 billion €, according to
a new study that provides an insight into
future market trends. Helmut Kaiser conduc-
ted the study and considers that nanotech-
nology will change 25% of the food packag-
ing market, currently worth 74 billion €, in
the decade to come. The market will be driven
by new applications designed to extend
shelf life, to incorporate antibacterial func-
tions and to make packaging interactive.
Three years ago, less than 40 nanopackaging
products were on the market, whereas over
400 are now available. Sales have risen from
150 million € in 2002 to 635 million € in
2004, with total demand at 724 million € in
2006. Among the virtues of nanopackaging:
thanks to nanoparticles, packaging and
bottles can be made lighter and stronger,
with better thermal performance and less
gas absorption, ensuring longer shelf lives
and reduced transportation costs; nano-
structured films can be used to prevent
micro-organisms from entering food; nano-
sensors can be embedded in packaging to
enable consumers to monitor the condition
of the food; the gas and water vapour per-
meability of plastics can be engineered to
preserve foods including fruit and vege-
tables and also beverages and wine.
www.packwire.com/news/ing.asp?hn=76538-
helmut-kaiser-nanotechnology-shelf-life

Nano-insulation

It is claimed that a new material using nano-
technology and consisting in a micron-thick-
ness film with tiny cells containing a vacuum
could reduce the energy consumption of refrigera-
ting units by as much as 20%. Nanoskin was developed by General
Applications, a British Company and could be applied to the inner wall of refrigerators
during the manufacturing process to enhan-
cise insulation. www.acr-news.com

Briefs

Thermoacoustics

A project led by the University of Nottingham
(UK) aims at developing a device acting as a
refrigerator, cooker and power generator,
using biomass fuels such as wood. The SCO-
RE (Stove for COoking, Refrigeration and
Electricity) is based on the use of thermoao-
coustics, which uses the generation of sound
waves when gas is unevenly heated. These
pressure sound waves can operate mechanani-

cal motion, as in a Stirling engine, but they
can also be used to pump heat when emitted
through an inert gas such as nitrogen or
helium, with the aid of a heat exchanger:
This process can go on uninterruptedly as the
sound waves alternately cool and heat the
gas in the heat exchanger and is definitely a
more efficient and healthier way of using wood
as fuel than the traditional open fire. The SCO-
RE team aims at producing these devices in
significant numbers within 5 years.

Thermoacoustic engines and refrigeration
units have been used before in high-tech set-
ings, as power sources or cooling units on
spacecraft, satellites and military applications
for example, but have been limited to these
top end applications until now. However, as
thermoacoustic technology is rather simple
and cheap, it is to be hoped that this device
may benefit many people in rural areas in
developing countries.
www.rutherford.wordpress.com

Water savings thanks to hybrid condensers

Hybrid condensers offer significant water

savings versus traditional water-cooled and
evaporative condensers. They also make it
possible to reduce energy consumption and
refrigerant charge. In Australia, where water

savings are a major issue since cities like
Brisbane, Melbourne and Sydney have gone
to level 3 or 4 restrictions, interest in hybrid
condensers is increasing. Three Baltimore
Aircoil’s HXC Intelligent Hybrid Condensers
are now in operation at Granites Goldmine
in the Tanami Desert and such equipment is
set to appear in the plant rooms of many buil-
dings in Australian cities. The hybrid conden-
sers have both an air-cooling mode which is
used on days of low load and low ambient
temperature and an energy-saving evaporative
mode used when the temperature and
load is higher. Generally the switch point sits
between 5 and 10°C. The “intelligent” aspect of the condenser is its patented modulating
dampers, which further increase the dry capa-
city of the unit. The HXCs water efficiency
is “dependent on ambient load and how it is
controlled as well but the maximum is about
70% over a conventional condenser” accord-
ing to Baltimore. Even if hybrid condensers are
more expensive than conventional condensers, they appear to be of great inter-
est in Australia with an estimated 30 000
cooling towers operating, most of them using
5000 to 10 000 litres each per day.
EcoLibrium, March 2007

Canberra Airport has recently ordered a
cutting edge air-conditioning system using
waste heat in order to generate heat and
cooling which will be installed in December
2007. The heat is recovered from the
1200 kW gas generator that produces electri-
city for the airport by an absorption chil-
ler system, which means a significant cut in
energy expenses and a large reduction in
greenhouse gas emissions (a projected
1100 tonnes eq-CO2 per annum). The chiller,
constructed by Broad, can use various heat
sources and was chosen for its flexibility.
Climate Control News, May 2007

Bright future for cool LEDs

Light-emitting diodes (LED), which are
replacing traditional light sources in many
fields, are beginning to be used in refrigera-
ted and frozen display cabinets and are like-
ly to make a big impact on refrigeration for
several reasons.

They are more energy-efficient than tradi-
tional filament or fluorescent lights. Cur-
rently, LEDs can produce 40 lumens per
watt, but 100 lumens seems within reach
over the next few years. In addition, they
become more efficient the colder they run,
in contrast to fluorescent lamps which are
less efficient with decreasing temperature.
The white light produced by LEDs is excel-
sional compared to fluorescent lamps which
are less efficient with decreasing temperature.
The white light produced by LEDs is excel-
sional compared to fluorescent lamps which
are less efficient with decreasing temperature.
The white light produced by LEDs is excel-
sional compared to fluorescent lamps which
are less efficient with decreasing temperature.
The white light produced by LEDs is excel-
sional compared to fluorescent lamps which
are less efficient with decreasing temperature.

F-gas Regulation

The European Union’s “F-gas” Regulation
No. 842/2006 is now applied with effect on
July 4, 2007 in the 27 European Member
### IIR Agenda

#### Conferences organized by the IIR

<table>
<thead>
<tr>
<th>Year</th>
<th>Month</th>
<th>Location</th>
<th>Conference Name</th>
<th>IIR Conference</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>Apr</td>
<td>Prague</td>
<td>Cryogenics 2008</td>
<td>A1, C1</td>
</tr>
<tr>
<td></td>
<td>Sept</td>
<td>Melbourne</td>
<td>HVAC Energy Efficiency Best Practice Conference</td>
<td>E1 with E2</td>
</tr>
<tr>
<td>2009</td>
<td>June</td>
<td>Boulder</td>
<td>3rd Conference on Thermophysical Properties and Transfer Processes of Refrigerants</td>
<td>B1</td>
</tr>
<tr>
<td></td>
<td>Sept</td>
<td>Casta Papiernik</td>
<td>7th International Conference on Compressors and Coolants - Compressors 2009</td>
<td>B1, B2</td>
</tr>
<tr>
<td>2010</td>
<td>April</td>
<td>Algiers</td>
<td>LNG Energy Conference Secretariat</td>
<td>A2</td>
</tr>
</tbody>
</table>

**States. This Regulation aims at minimizing emissions of fluorinated greenhouse gases, including HFCs.**

- For stationary refrigeration, air conditioning, and heat pumps over 3 kg charge (6 kg if hermetic), operators must:
  - prevent leakage, and repair any leaks as soon as possible;
  - arrange proper refrigerant recovery by certified personnel during servicing and disposal;
  - carry out regular leak checks (e.g., at least once every three months for applications with 300 kg or more of F-gases) by certified competent staff;
  - maintain records of refrigerants and servicing.
- For non-stationary equipment (e.g., mobile units on trucks) and any other products containing F-gases, operators must ensure that appropriately qualified personnel are used to recover gases, as long as this is feasible and not excessively expensive.

More: www.iior.org.uk

### Out of the ordinary

#### Microcebus danfossi

Danfoss has given its name to a lemur species recently discovered in Madagascar by researchers from the veterinary college Tierärztliche Hochschule (TiHo), in Hanover, Germany. The tiny (30–60 g) lemur is named Microcebus danfossi after Danfoss – and the small company’s German-based heating division has been contributing to further research in the field, as well as to the maintenance of the natural environment of these extremely endangered animals. The researchers at TiHo contacted Danfoss because the company’s German-based heating division had used lemurs in a marketing campaign: the highly efficient, energy-saving features of Danfoss heating components had been compared to the internal heating ‘controls’ of a lemur.

http://www.danfoss.com/NewsAndEvents/PressCenter/PressRelease/Danfoss+ends+its+name

---

**International Institute of Refrigeration**

**Institut International du Froid**

177, bd Malesherbes - 75017 Paris (France)
Tel.: 33 (0) 42 27 32 35 - Fax: 33 (0) 47 63 17 98
E-mail: ifiir@ifiiir.org
Web site: www.ifiiir.org

**IIR Newsletter** is a quarterly publication of the IIR

**Managing Editor:** Didier Coulomb
**Editor:** Jean-Luc Dupont
**Editorial assistants:** Susan Phalippou Mitchell, Gerard Vidal, Cornelia Keizer, Thomas Michineau

**Graphic Design:** Arobace Communication

---

This issue of the Newsletter was prepared jointly by the IIR and UNEP.

For more information:
- UNEP Division of Technology, Industry and Economics - OzonAction Branch:
  ozonaction@unep.fr
  www.unep.fr/ozonaction
- International Institute of Refrigeration (IIR): ifiir@ifiiir.org www.ifiiir.org
  Become a member of the IIR: s.phalippou@ifiiir.org www.ifiiir.org/en/membership.php?rub=1

---

**Press Center/Press Release**

- Danfoss heating components had been highly efficient, energy-saving features of the company’s German-based heating division had been compared to the internal heating ‘controls’ of a lemur.
- Microcebus danfossi after Danfoss – and the small company’s German-based heating division has been contributing to further research in the field, as well as to the maintenance of the natural environment of these extremely endangered animals. The researchers at TiHo contacted Danfoss because the company’s German-based heating division had used lemurs in a marketing campaign: the highly efficient, energy-saving features of Danfoss heating components had been compared to the internal heating ‘controls’ of a lemur.

http://www.danfoss.com/NewsAndEvents/PressCenter/PressRelease/Danfoss+ends+its+name

---

**Graphic Design:** Arobace Communication

---

**International Institute of Refrigeration**

**Institut International du Froid**

177, bd Malesherbes - 75017 Paris (France)
Tel.: 33 (0) 42 27 32 35 - Fax: 33 (0) 47 63 17 98
E-mail: ifiir@ifiiir.org
Web site: www.ifiiir.org

**IIR Newsletter** is a quarterly publication of the IIR

**Managing Editor:** Didier Coulomb
**Editor:** Jean-Luc Dupont
**Editorial assistants:** Susan Phalippou Mitchell, Gerard Vidal, Cornelia Keizer, Thomas Michineau
**Graphic Design:** Arobace Communication