The International Journal of Refrigeration (IJR) is now available online for all IIR members. This latest development offers access not only to the electronic version of the paper journal, but also to a whole range of new services. The hard copy of the journal will still be published at least for some time.

Thanks to these new services, IIR members will have access to all IJR articles from the beginning (1978), i.e. approximately 4,500 articles of the best science in the field of refrigeration. They will be able to access the latest articles published online, without having to wait for the issue of the hard copy of the journal. And to keep up with the latest articles, they will be able to subscribe to customised electronic alerts based on their specific needs. Many other practical services are offered at the same time, including exporting references, sharing articles, details on the number of citations per article, etc.

The IJR is by far the best scientific journal in the field of refrigeration and these new services make it even easier to use. Don’t miss out and become a collective or individual IIR member, if you are not already one!

To benefit from this new service or for more information, please visit the IIR website at www.iiffir.org > Publications > International Journal of Refrigeration. Best wishes for 2017, a promising year starting with this New Year’s gift!

Didier Coulomb
Director General of the IIR

La Revue Internationale du Froid (RIF) est désormais accessible en ligne pour tous les membres de l’IIF. Ce n’est pas seulement l’accès à la version électronique de la revue sous forme papier qui est ainsi offert mais tout un éventail de nouveaux services. La RIF au format papier continuera quant à elle à être diffusée au moins pour quelque temps encore.

Grâce à ces nouveaux services, les membres de l'IIF auront ainsi accès à tous les articles de la RIF depuis l’origine (1978), soit environ 4,500 articles représentatifs de la meilleure science dans le domaine du froid. Ils pourront accéder aux articles les plus récents parus en ligne sans devoir attendre la parution du numéro de la revue sous forme papier. Et pour se tenir immédiatement des derniers articles parus, ils pourront s’abonner à des alertes électroniques personnalisées selon leurs besoins. De nombreux autres services pratiques sont offerts par la même occasion, y compris l’export de références, le partage des articles, les détails sur le nombre de citations par article...

Thermodynamics of the working fluids and refrigerated products, and of the cycles used to transfer heat from low to higher temperature is essential for all topics covered by the IIR. Also, the transport properties of working fluids and refrigerated products and the momentum, heat and mass transfer processes investigated in this commission are essential for most of the topics covered by the IIR. In this respect, Commission B1 is interwoven with all the other commissions of the IIR.

In the framework of the IIR’s Strategic Plan, Commission B1 has drawn in 2005 a list of research priorities, some of which are still relevant. For instance one of these topics was “advanced universal concepts of TEWI and/or LCCP (Life Cycle Climate Performance)” which has very recently (January 2016) resulted in the Guideline for Life Cycle Climate Performance and a related Informatory Note. This guideline has been developed by a working group under leadership of Prof. Yunho Hwang, vice-president of Commission B1. Some of the other 2005 research priorities are still actual but new challenges have also shown up as a follow up to the Paris agreement of December 2015. It is our job as researchers in industry or academia to meet those challenges.

IIR’s Commission B1 includes 61 experts from 22 IIR member countries on four continents, as illustrated in the pie diagram, and is extremely active, participating in many IIR activities aimed at promoting knowledge related to thermodynamics and transfer processes of refrigeration and heat pump systems.

Since the last IIR International Congress of Refrigeration in August 2015, Commission B1 has participated in 3 IIR conferences and 5 IIR-co-sponsored conferences.

La RIF est de loin la meilleure revue scientifique dans le domaine du froid et ces nouveaux services la rendent davantage facile d’utilisation. Profitons-en et devenons membre collectif ou individuel de l’IIF si vous ne l’êtes déjà !

Pour bénéficier de ces nouveaux services ou pour en savoir plus, rendez-vous sur le site web de la RIF www.iiffir.org > Publications > Revue Internationale du Froid.

Avec nos meilleurs vœux pour l’année 2017 qui commence bien avec ce cadeau de nouvel an !

Didier Coulomb
Directeur Général de l’IIF

Editorial

Activities of IIR’s Commission B1 on “Thermodynamics and Transfer Processes”

Carlos Infante Ferreira

One of the latest ones was the very successful 12th IIR-Gustav Lorentzen Conference on Natural Refrigerants, which took place in Edinburgh, United Kingdom, from 21 to 24 August 2016 and was attended by 264 delegates. A total of 147 papers have been presented during this event dealing with diverse topics including commission B1 topics as optimum system design, heat transfer processes, sorption processes, new “not-in-kind” refrigeration cycles, thermodynamics and heat and mass transfer of refrigerant-oil systems and component optimization. Five members of Commission B1 contributed to the scientific committee of this conference. A joint Commissions B1-B2-E1-E2 business meeting was organized during this conference, allowing commission members to review ongoing projects.

The 864 participants and 478 papers presented during the IIR-co-sponsored 2016 Purdue Conferences (Compressor Engineering, Refrigeration & Air Conditioning and High Performance Buildings), held in Purdue University, West-Lafayette, USA, from 11 to 14 July 2016, confirm the large interest in the refrigeration topics and specifically those related to thermodynamics and transfer processes. Also during these conferences, a joint Commissions B1-B2-E1-E2 business meeting was organized, allowing commission members to review ongoing projects.

Upcoming IIR events involving Commission B1 include the TPTPR2017, the 5th IIR Conference on Thermodynamic Properties and Transfer Processes of Refrigerants, which will be held this spring from 23 to 26 April 2017 in Seoul, South Korea. This is a conference mainly (but not only) on Commission B1 topics, and I hope that all Commission members will attend this event. In May 2017, the 7th Conference on Ammonia and CO2 Refrigeration Technologies will be organized in Ohrid, Macedonia and in September 2017, the 9th International Conference on Compressors and Coolants will be organized in Bratislava, Slovakia. In May 2018, the 12th IIR Conference on Phase-Change Materials & Slurries for Refrigeration & Air Conditioning (PCM 2018) will be held in Orford, Canada. In June 2018, the 13th IIR-Gustav Lorentzen Conference on Natural Refrigerants - GL2018 will be held in Valencia, Spain.
Spain. Finally, the 25th IIR International Congress of Refrigeration (ICCR2019) will be held in August 2019 in Montreal, Canada. The IIR Working Group “Phase-Change Materials and Slurries for Refrigeration and Air Conditioning” (chaired by Dr. Laurence Fournais) has been extremely active for a long time. It has organized the PCM 2016 conference in Karlsruhe (Germany) last May and it will organize the upcoming PCM 2018 conference in Orford (Canada). Dr. Andrej Kitanovski, a Commission B1 member, contributed to the international advisory board of Thermag VII, the conference associated with the activities of the IIR Working Group “Magnetic Cooling”, last September in Turin, Italy. An IIR Informatory Note on Solar Cooling has been prepared by Prof. Renato Lazzarin and will soon be published. An IIR Informatory Note on Cogeneration / Trigeneration, prepared by Prof. Michel Feidt, has just been published.

Mid 2016, the Commission B1 members have been consulted on several topics. Although only a limited number of members responded, the majority showed interest in participating more actively in the IIR Working Group on Magnetic Cooling; the research interests of the different members are quite diverse but there is a large interest in transfer processes in refrigeration / heat pump equipment. Finally, I would like to thank all Commission members who have taken part in Commission B1 activities and the IIR staff who facilitated these activities. Your contributions are highly appreciated.

Carlos Infante Ferreira
President of the IIR’s Commission B1

Upcoming events

IIR events

- Co-organized by UNEP, ASHRAE, UNIDO and the IIR, the first international conference on Sustainable Management of Refrigeration Technologies in Marine and Off-Shore Fisheries Sectors will take place April 6-8, 2017 in Bangkok (Thailand). Refrigeration, freezing, ice making and air-conditioning equipment are fundamental for mobile marine and fishery operations as well as sustaining economic livelihoods. With an emphasis on refrigeration, the conference will focus on the fisheries sectors as well as the mobile marine sectors.

- With the key theme “Creative Refrigerants for Low Carbon and Green Buildings”, the 5th IIR International Conference on Thermophysical Properties and Transfer Processes of Refrigerants (TPTPR) on April 23-26, 2017, in Seoul (South Korea), will bring together experts to discuss and exchange in the areas of cycle analysis, theoretical and experimental techniques, and thermophysical property data analysis. Early bird registration open soon.

- Attracting an increasing number of attendees year upon year and covering an even wider scope of technologies, the 7th Conference on Ammonia and CO₂ Refrigeration Technologies will take place from May 11-13, 2017, in Ohrid (Macedonia). Early bird registration open until March 31.

International Exhibition

- One of the biggest exhibition platforms on refrigeration technologies in Asia, this year the ACREX India 2017, will take place in Delhi (India) from February 23-25. A seminar on refrigeration will be organised in parallel and the IIR Director General will participate, thanks to the IIR-ASHRAE partnership agreement signed in June 2016.

New IIR Informatory Note

- Offering high efficiency through the recovery of thermal waste, cogeneration and trigeneration are valuable alternative technologies for producing energy. However, they should be further developed across the industry and academic sector. The results and achievements of the project were presented by the technical partners. The workshop presentations are available for download from https://goo.gl/7yy7V4.

Funded by Framework Programme 7 (FP7), this
3-year European project began in January 2014 and will officially terminate on December 31, 2016. The third and last ELICIT Newsletter, which highlights the achievements and results of the different work packages, is ready for download from http://elicit-project.eu/elicit-newsletter-2015/

- The SuperSmart European project consortium is seeking the views of stakeholders on draft criteria and a compliance verification for refrigeration equipment to ensure refrigerants and heat recovery used for food retail stores. This is the chance to actively participate in the design of the draft criteria for the future EU Ecolabel. Please take part in our survey here: https://goo.gl/y0GBYo. Also, 7 training reports on energy-efficient food stores have been launched online. These reports have been developed to introduce stakeholders active in Europe’s food retail sector to the existence of non-technological barriers and general ways on how to remove them. The reports can be downloaded for free from https://goo.gl/NqVwU.

- Refrigerated expressions for fresh food delivered anywhere

Epta France won the prestigious Janus de l’Industrie French award for the third consecutive time for its innovative #EPTAbricks. These are connected, refrigerated lockers that can be installed along the commuters’ route, for example by companies’ premises, to enable them to collect the fresh and frozen products they purchased on-line from retailers’ websites 24/7. This solution guarantees to preserve the temperature for 24 hours and more, while enabling brands to get closer to their customers and reduce the carbon footprint by avoiding home deliveries. Intended for mass distribution, these lockers represent an alternative or complementary solution to the “click & collect” or “drive-up” systems.

Epta has designed these first refrigerated lockers which also took advantage of this innovation, including remote monitoring of #EPTAbricks (ordering of the products and checking the proper functioning of the lockers), #EPTAcloud (communication screen (collection process) and the interface program with online merchants.

- The IIR is delighted to welcome the following members:

Principal members: Islam Baset, Ireland; David Borrego Santamaria, Spain; Philippe Matonog France; Yoji Onaka, Japan; Matsumoto Takahiro, Japan; Michael Weiss, Austria; Xi Wu, China.

Junior members: Claudia Capo, France; Kevin Cornelis, Belgium; Etienne Mainini, France; Juliette Morin, France; Gianfranco Mota-BabILONI, Sweden; Gabriel Pount, France; Yvaria Tchane Yomi, France.

In the news

Markets and figures

- World refrigeration equipment market

By taking into account the cost of equipment, construction and services, JARN predicts that the global refrigeration market value amounted to USD 90 billion in 2015, with commercial applications representing 63.3%, industrial applications 31.1% and transportation 5.6%. Regarding commercial applications, by considering refrigeration equipment only, the global market value amounts to USD 38 billions with refrigerated display cases representing 49%, beverage coolers 14%, ice machines 8% and vending machines 6%. In terms of regions, North America is the largest market, accounting to 32.8% of the global commercial refrigeration market, followed by Europe (24.2%) and Asia (23.9%). However, it is the explosive growth in several Asian countries including China and India that has boosted the development of the global market. JARN, September 25, 2016

- World chiller market

According to BSRIA, world chiller demand in 2015 to USD 7.7 billion, a decline of 6.9% over 2014. 14% of this demand is to economic slowdowns in China and emerging countries. China is the largest market (USD 2.4 billion) and its chiller demand dropped by 13.9% over 2014. Demand in India is the highest, accounting to 12.4% to USD 1.3 billion. In the US, which has posted moderate economic recovery, 2015 chiller demand came to USD 1.1 billion (+9.0%). JARN, November 25, 2016

- According to Marketsandmarkets, the global evaporative condensing unit market is projected to grow from USD 1.6 billion by 2026, at a Compound Annual Growth Rate (CAGR) of 7.2% between 2016 and 2026. See more on https://bit.ly/2bnx1c.

- African AC market begins to shine

The African AC market remained mostly flat during the 2012-2015 period in which it experienced less than 5% growth from 2.42 million units to 2.53 million units. During this period, imports of ACs have been restricted in many African countries suffering from foreign currency shortages. However, according to Chinese Customs, market consumption in Africa since AC imports from China to Africa increased by 19% in the first half of 2016 compared with 2015. Egypt, Nigeria, and South Africa represent about 40% of the AC market. JARN, September 25, 2016

- European heat pump market

According to EHPA, European heat pump market grew for the third consecutive year in 2015. In 2015, heat pump sales in Europe have reached the highest number ever recorded: 890,302 units. Year-over-year, 12% more heat pumps were sold in the 21 European countries covered by the EHPA report. In terms of sales volume, Spain was the leader (27,879), followed by Italy (+20,182) and France (+15,727). Assuming a useful life of 20 years, the stock of heat pumps installed at the end of 2015 was 8.4 million units. With approximately 120 million residential buildings in Europe, the heat pump market share in the building stock is 7%. This whole stock saved 120.73 TWh of final and 56.79 TWh of primary energy. It represents 25.36-36.88 million tons of CO2 emissions saved. This is almost the amount of CO2 emitted by China in 2010.

Employment in the heat pump sector represented about 48,000 jobs in 2015, including 17,000 in heat pump manufacturing, 15,000 in heat pump installing, 9,000 in component manufacturing and 8,000 in service and maintenance.

EHPA European heat pump market and statistics report

The IIR members benefit from a -10% discount on the European Annual Heat Pump Market Report

India ice cream market is expected to grow fast

Ice cream market in India grew at a moderate pace over the past few years, on account of increasing market share of private branded ice cream products entering the Indian market and improving cold storage facilities. Moreover, India is the largest producer of milk, as the country accounts for over 1/5th of global milk production, thereby offering ice cream market in the country with large volume of raw material for manufacturing of ice creams.

Ice cream market is forecast to exhibit a CAGR (Compound Annual Growth Rate) of over 17% during 2016-2021 due to growing number of flavors, coupled with rising purchasing power. https://goo.gl/DAF

Refrigerant news

Kigali decisions and consequences

As announced in the October 2016 issue of the IIR Newsletter, during the 28th Meeting of the Parties (MOP28) on October 15, 2016, in Kigali, Rwanda, representatives from nearly 200 nations unanimously agreed to a legally binding agreement to phase down hydrofluorocarbons (HFCs). Under the Kigali Amendment to the Montreal Protocol, developed (A2) countries will begin to reduce their HFC consumption from 2019, while developing countries (A5) will begin to freeze it in either 2024 or 2026 for Gulf and some South-Asian countries. Finally, A2 countries will reduce their HFC consumption by 85% in 2036 while A5 countries will reduce it by either 80% in 2045 or 85% in 2047 (see details in the latest issue of the IIR Newsletter).

According to the UNEP, the Kigali Amendment is the single largest contribution the world has made towards keeping the global temperature rise “well below” 2 degrees Celsius, as agreed during the Paris climate conference under the Kyoto Protocol last year. Besides, the Paris Agreement entered into force on November 4, 2016, thirty days after the date on which at least 55 parties, representing at least 55% of the total greenhouse gas emissions, have ratified it. 122 Parties have now ratified the Paris Agreement, which enters into force on January 1, 2019, provided that it is ratified by at least 20 parties. If that condition is not met by January 1, 2019, the Amendment will take effect 90 days after 20 parties ratify it.

In Kigali, countries also agreed to provide adequate financing for HCFCs reduction, the costs of which is estimated billions of dollars globally. The exact amount of additional funding should be agreed at the next MOP29 in Montreal, at the end of 2017. Parties also took a step forward on other key issues: regarding energy efficiency, the Technology and Economic Assessment Panel (TEAP) has been requested to identify efficiency opportunities in the refrigeration sector related to a transition to climate-friendly alternatives, and Parties are invited to provide relevant information on energy efficiency innovations by May 2017. Regarding safety, Parties “recognized the importance of the timely updating of international standards for flammable low-GWP refrigerants, and supported the promotion of actions that allow for the safe market introduction, manufacturing, operation, maintenance, and handling of zero-GWP and low-GWP refrigerants that are alternatives to HCFCs and HFCs.” On the initiative of a consultative group led by China, TEAP has been requested to establish a task force to liaise and coordinate with standards organizations, to support the timely revision of relevant safety standards.

Kigali decisions and repercussions are undoubtedly crucial for the refrigeration sector and well beyond as demonstrated by some figures: about 14,000 articles were published in the global media in October 2016 only on this issue and over 830,000 people sent messages on various social media channels. https://goo.gl/XYqtv https://bit.ly/2e67iSr

HFC supply within the EU drops by 29% in 2016

According to a new report published by the European Environment Agency (EEA) in December 2016, the supply of HFCs within the EU declined by 29% to 183.3 Mt of CO2e in 2015
the first year of the phase-down mechanism – compared to 2014. However, this figure is notably 12% up on 2013, suggesting massive pre-phase-down buying in 2014. In November 2016, the EEA reported that the total amount of compliance-relevant HFC refrigerant in circulation in the EU amounted to 168 Mt CO₂e, and within the cap amount for the year of 183 Mt CO₂e. These latest figures from the EEA include the HFCs contained in pre-phase-down equipment, which are not included in the phase-down figures until 2017. In terms of CO₂e, HFCs account for 85% of total F-gases supplied to the market, Total F-gas stocks, which includes F-gasses PFCs, SF₆, and other perfluorinated compounds, was 214.5 Mt CO₂e. R134a and R125 – a component of R404A – continued to be the HFCs supplied in bulk in the EU in 2015, followed by R143a and R32. Comparison with previous figures reveals increasing in the use of R32 and reduction in the use of R404A.

EU F-gas implementation: EC Consultation Forum outputs
As an environmental organization, the IIR participated in the 2nd meeting of the Consultation Forum, the role of which is to provide advice and expertise to the European Commission on the implementation of the EU F-gas Regulation. Consult document meetings here:

https://ec.europa.eu/clima/events/articles/0106_en

Standards and training were among the topics discussed during this meeting.

• A new EC report on problems caused by standards to using alternative refrigerants to HFCS and based on responses from 24 member states was presented. It concludes that “standards (international, European and national level) regarding the use of flammable refrigerants – mainly hydrocarbons but also HFCs – appear to be an important barrier to the phase-out of fluorocarbons (F-gases) for air conditioning systems”.

• Another EC report on availability of reduced overall CO₂e emissions.

Cold chain news
• India: the cold chain could help increase the quality, reach and profitability of fruits and vegetables, while reducing CO₂e emissions.

According to the Centre for Public Policy Research (CPPR), every year in India, roughly 18% of fruits and vegetables are wasted due to the lack of post-harvest storage infrastructure. Yet, India is the world’s second largest producer of fruits and vegetables, although only 1.5% of India’s global product exports concern this activity. In India, only 2% of products are held or transported using cold storage facilities. The lack of cold chain leads to massive food losses that can reach 20 to 50% of total production, in a country where malnutrition still concerns a majority of people. Investment in the cold chain – specifically pre-cooling and transport refrigeration equipment – can reduce such food losses up to 76%, and it could also cut carbon dioxide equivalent (CO₂e) emissions: that is what Carrier showed with its report. The study, on the production of kiwifruit, is a citrus fruit grown in the Punjab region, conducted by the Indian School of Business, under the direction of the National Center for Cold-chain Development of India and Carrier Transicold India, and in collaboration with Balaji Kinnow.

The study shows that the use of refrigerated trucks allows to supply kiwifruits not only to the rest of India, but also for export to Russia, Dubai and Bangladesh: investing in cold chain could thus increase the geographical reach of the supply chain.

The study also assessed the carbon footprint of supply chain activities and revealed that in comparison with greenhouse gas emissions from kiwifruit spoilage, cold chain intervention reduced overall CO₂e emissions by 16%. Moreover, the study corrected misperceptions that the cold chain requires a complex setup from farm to retail and a high cost investment. In the end, every stakeholder along the supply chain can benefit from investing in cold chain: growers, aggregators, transporters, distributors and retailers. The results of the study were released at the Carrier at the company’s World Cold Chain Summit to Reduce Food Loss, held in Singapore in December.

Tunisian cold chain status
During the IIR seminar on the Logistics for Transport and Cold Storage of controlled Temperatures In Hot Countries on October 25, 2016 in Tunis, some valuable figures were provided concerning the situation of the cold chain in Tunisia.

There are 784 cold stores in Tunisia, 590 of which are owned by companies employing less than 10 people. There are also over 10,000 controlled cold storage facilities, including near 40% insulated ones. Furthermore, there are 5 refrigerated bodies manufacturing companies but only certain manufacturers are complying with ATP international agreement requirements while Tunisia signed ATP agreement in 2007. The Tunisian cold chain sector employs around 10,000 people.

Out of the ordinary
A humanoid robot that sweats to keep cool
The 478 papers from Purdue IIR-cosponsored conferences are now available in Fridoc database by using the following direct links. IIR members are entitled to a number of free downloads. Don’t forget to login or register first!

16th International Refrigeration and Air Conditioning Conference: https://goo.gl/baQn4
23rd International Compressor Engineering Conference: https://goo.gl/tZknL
4th International High Performance Buildings Conference: https://goo.gl/NaODk

We present here two interesting papers from the two first conferences.

Evaluating lubricants for lower GWP refrigerant compressor operation
Lubricants are an essential component to refrigerant compressor operation, regardless of the refrigerant used. But to maintain reliable and efficient operation, the choice of the lubricant can vary depending on the type of compressor, the characteristics of the system and mostly the kind of refrigerant.

This paper evaluates five potential candidates as substitutes for R-404A and the potential impact of lubricant interactions. The refrigerants considered are three non-flammable HFO/ HFC (448A, 449A, 452A), one slightly flammable HFO/HFC/CO₂ blend candidate (R290) and one nonflammable HC candidate (R290). Investigation is made on how these refrigerants interact with lubricants (miscibility, solubility, system performance) and if current market lubricants used with R-404A are still good candidates to use with these lower GWP candidates.

Polyol ester (POE) lubricant currently used with R-404A in compressor operation is found to be satisfactory for use with most of the refrigerants investigated and has no negative effect on performance. By using ISO 22 POE lubricant, the effectiveness of R290 when compared to R404A shows better efficiency (+11%) but some capacity loss (-10%), which could be mainly from thermodynamics, but R290 high solubility level could be playing a role. Lubricants like mineral oils, which typically have been unacceptable for use with R-404A due to miscibility concerns, are also not compatible with the HFO/HFC refrigerants studied.

Joseph A. Kamaz, Evaluating Lubricants for Lower GWP Refrigerant Compressor Operation, 16th International Refrigeration and Air Conditioning Conference at Purdue

Direct link to the paper in Fridoc: https://goo.gl/DtyFoT
Alternative refrigerants

Cold-storage facility converted to propane in Colombia

Asocolfores, the association representing flower exporters in Colombia, has replaced an R22-based system with R290 in a 392 m³ cold storage facility for flowers, located in the Savanna of Bogota.

The performance of the system was analyzed and results show that R290 provides 10% less of cooling capacity, but increases the Coefficient of Performance (COP) and reduces energy consumption by at least 10%.

To address the limitation on system pressure and refrigerant flammability, Asocolfores put in place several measures. In particular, the system reliability based on the EN 378:2008 safety standard for refrigeration systems and a basic risk assessment under EN 1127-1:2011 was achieved.

According to R290, the maximum concentration level would be 25 g/m³. The high charge is acceptable because the room is only accessible to authorized personnel, and the compressors were trained to safely handle hydrocarbons.

Despite the success of the project, Asocolfores encountered challenges during implementation such as insufficient training, and difficulties in finding local equipment and component suppliers working with R290. According to the National Ozone Unit, “The Colombian flower industry requires approximately 31.1 million kW of cooling capacity. 99% of the installations use R22 and the other 1% use R134a, so there is huge potential to convert those to R290.”

Ministry of Environment and Sustainable Development, 2016 Report

US: first propane cold storage system to be installed?

Newark Refrigerated Warehouse plans to install what may be the first cold-storage refrigeration system in the United States as its primary refrigerant. The system will serve two existing buildings and an additional building that will be constructed when the new refrigeration system starts operating.

The company originally planned to replace the R22 currently used at its facility with low-charge ammonia systems. However, that idea fell through after the company decided on a propane because of improved regulatory pressures on HFCs. So, Newark Refrigerated Warehouse is applying to the U.S. Environmental Protection Agency to use propane for refrigeration under the EPA’s Significant New Alternatives Policy (SNAP) program. If approved, the propane system will contain about 300 kg of propane, which will be confined to a small one-story engine room attached to one of its two cold-storage buildings. The original engine room contains three compressors and four medium temperature rooms, with a total capacity of 880 kW; the second building has one freezer room with a 1055 kW capacity. The propane will be used to cool a calcium chloride brine solution, which will serve as a secondary refrigerant. To ensure safe operation with a flammable refrigerant, the engine room will be IAPR-2 compliant for fully automated controls, and all electrical panels will be located outside the room.

Supermarket refrigerant retrofitting

Within a project started in September 2014, the French international supermarket chain, Carrefour decided to retrofit 175 Ahold supermarket (out of a total of 6,600 shops) refrigeration systems from R407F and R507A to R449A, resulting in an increase of efficiency.

Developed by Chemours as Opteon XP40, R449A is an alternative to R404A/R507A in new and existing commercial and industrial refrigeration systems. It is a non-flammable HFO blend but it has a GWP of 1,397.

Chemours recently announced that R449A was expected to be in over 1,000 supermarket and commercial refrigeration systems worldwide by the end of 2016.

Besides, Honeywell recently announced that the 15,000th supermarket has retrofitted its refrigeration systems with R407F. During a long-term test conducted by ASDA, a supermarket chain in the United Kingdom, R407F consumed 9% less energy than systems using R407A, and around 4% less than systems using R-404A in medium temperature. R407F is a non-flammable blend of HFCs but has a relatively high GWP of 1,394.

Honeywell also announced that they expected over 2,000 supermarket refrigeration systems to convert to R448A refrigerant by the end of 2016. R448A is a non-flammable HFO-1234yf blend with a GWP of 138.

As a comparison, according to Shecco, R744 (CO₂) was installed in around 7,000 supermarkets worldwide, mainly in Europe (over 5,500) early 2016. (see IIR Newsletter No. 335).

Quebec arenas refrigeration system upgrade project

For the modernization of arenas refrigeration systems still using R407F refrigerant blends with a GWP lower than 700. The total investment represents CAD 86 million (EUR 61 million).

According to the Quebec arenas inventory, there are 425 arenas and 75 curling centers, of which 62.4% use HFC-22 refrigeration systems. 30% ammonia, and 7.6% HFO or HFC refrigerant blends with a GWP lower than 700. The investment represents CAD 86 million (EUR 61 million).

Germany: air-cycle air conditioning systems for high-speed trains

Liebherr has provided eight air cycle air conditioning systems for Deutsche Bahn’s ICE 3.1 (InterCity-Express) high-speed trains. The cooling system is based on an environmentally friendly technology. The so-called process air is taken from the surroundings and expanded with an electrically powered cooling turbine. The resulting reduction in pressure effects a simultaneous reduction in temperature. An air-air heat exchanger is used to draw energy from the inflowing air, which is then released into the process air and expanded in the turbine. In the next step, the process air in the open circuit of the cold-air system is re-compressed to an intermediate pressure and then re-fed to the outside. As cold-air systems only consist of a few components, they are not only of low weight, but also simple and inexpensive to set into operation. In addition, the whole system is characterized by very low operating costs and low energy consumption.

Cool brick, a clue for natural refrigeration in desert environments

Easy access to air conditioning is not always a reality, yet Virginia San Fratello and Ronald Rael, the creative masterminds behind The Emerging Objects Corporation, have potentially found a way to cool indoor air temperatures in
Cryotherapy can successfully help treat recurrent mesothelioma

Cryoablation is widely used to treat a number of cancers, such as prostate, liver or kidney cancer, but its efficiency with mesothelioma is still being tested. Recently, radiologists at UCLA (University of California, Los Angeles) showed that cryoablation can destroy tumour cells, through extreme cold, in patients with recurrent pleural mesothelioma. Some hospitals may offer this therapy to mesothelioma patients before or after surgery, on a palliative or curative basis. The procedure helps relieve the pain associated with mesothelioma, because it can shrink tumours that press against the lungs and other organs. It may also offer long-term management for local recurrences of the cancer.

Unlike other aggressive mesothelioma treatments, this procedure implies very few side effects. As it involves only local treatments, this procedure implies very few side effects. As it involves only local local recurrences of the cancer.

Cryoablation is a safe form of mesothelioma treatment: it is less invasive than open surgery and requires a much shorter recovery time. Based on 110 mesothelioma cryoablation procedures performed at UCLA, the percentage of patients without recurrence was 92.5% after 6 months and 73.7% after 3 years. This technique is still underutilized today, but radiologists at UCLA try to spread the word about the efficiency of this treatment in patients with mesothelioma. https://goo.gl/ULvDp4

Cooling coffee bean to improve flavour

A team from the UK University of Bath and Colonna & Smalls found that chilling roasted beans before grinding resulted in narrower distribution of small particles, which during the brewing process allows the same amount of coffee to have more flavour. The team studied the effect of grinding beans at different temperatures, from room temperature to -196°C, and discovered that the colder the beans the finer and more uniform the particles were from the grind. Small uniform coffee grinds allow for better extraction of the flavour compounds – allowing to brew more coffee and to get more flavour. That simple discovery could have a major impact for the industry, allowing them to produce a high quality drink with quite powerful tools.


Canada proposes HFC phase-down plan

Shortly after the Kigali global agreement to phase-down HFCs, the Canadian government has published on November 26, 2016 a proposal to phase-down its production and imports of these greenhouse gases (GHGs). The proposed amendments to existing legislation on Ozone-depleting Substances and Halocarbon Alternatives Regulations would control the use of HFCs through the phase-down of consumption of bulk HFCs complemented by controls on specific products containing or designed to contain HFCs, including refrigeration and air-conditioning equipment, foams and aerosols.

They call for a 10% reduction by 2019.

Reductions would step up rather steeply in the ensuing years: 35% by 2024, 70% by 2030 and ultimately 85% by 2036 (in CO2 equivalent) in line with the Kigali agreement. Between 2018 and 2040, the proposed amendments are expected to result in cumulative GHG emission reductions from HFCs of 176 Mt CO2e. Based on the social cost of carbon, the benefits of these GHG reductions are valued at about USD 6.2 billion. After industry stakeholders and ordinary citizens have provided input to the Canadian Ministry of the Environment, another document will be published before entering into force six months later.

https://goo.gl/d6O7C

Australia adopts refrigeration safety standards


The adoption of these standards is a “really important step as the HVAC&R industry transitions to a low-emission future,” said AIRAH’s executive manager Phil Wilkinson. https://goo.gl/CSA4HX

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Regulations-Standardization

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