La Conférence de Paris sur le climat de décembre 2015 a permis de transformer ces promesses en réalités. À cet effet, il faut mettre en place des modalités de mise en œuvre, au niveau international, mais aussi au niveau de chaque pays.

Les récentes Note d’Information de l’IIR sur le rôle des politiques énergétiques, ainsi que sur les politiques énergétiques. En partenariat avec les différents organismes des Nations Unies, l’IIF s’attache à aider les pays, en particulier les pays en développement, à mettre en place des politiques efficaces, tant en matière d’atténuation du changement climatique (limitation des fuites, changement des frigorigènes, technologies économiques en énergie...), que d’adaptation (conditionnement d’air...) à un réchauffement qui a déjà et aura lieu de toute façon. Mais l’IIF continuera aussi à promouvoir l’utilisation du froid, réduire les pertes alimentaires est ainsi non seulement utile pour lutter contre la malnutrition, mais permet également de diminuer l’impact de l’agriculture sur le climat ; la récente Note d’Information de l’IIF sur le rôle du froid dans l’économie mondiale le prouve. Une coalition entre l’IIF et les Nations Unies, associée au secteur privé dans le domaine, a d’ailleurs été annoncée par la FAO.


Didier Coulomb
Directeur de l’IIR

The first IIR-UNEP Joint Experts’ Meeting on Cold Chain Management in Hot Climates

The IIR and the United Nations Environment Programme (UNEP) agreed to join efforts in addressing this issue by promoting the provision of state-of-the-art technical support to developing countries for more efficient management of the Cold Chain Sector. Their first joint action will be to organize the first international Experts’ Roundtable Meeting on “Cold Chain Management in Hot Climates” at the end of May, in Dubai (UAE). The Roundtable Meeting will be chaired by Halima Thraya and supported by the Ministry of Industry and the Ministry of Environment of Tunisia.

In warm countries, where microbial growth is fast, as a result of high temperatures, the use of refrigeration must be regarded as essential. More than 80% of the world’s population lives in developing countries (the majority of these countries have a warm climate: equatorial, tropical or Mediterranean) and it is estimated that 35% of the population of these countries live in towns with increasingly severe food supply problems as they are still without refrigeration. However, in warm/developing countries, the emphasis is put on an increase in agricultural production and they are very little inclined to refrigerate agricultural products. It is the reason why post-production losses are considerable, whether in the field, during transportation, in storage or during distribution. These losses can be defined as “a decrease in food quantity or quality”.

The IIR Working Group (WG) on “The Cold Chain in Hot Climate Countries” lead by Halima Thraya (Delegate of Tunisia) has been actively working on the problematic, organizing an initial meeting on the subject at the ICR2015 in Japan involving WG members and others experts in the field. In collaboration with the FAO, this WG is currently writing-up a Policy Brief on how to encourage development of a continuous and efficient cold chain, destined for publication before May 2015. This conference, the COP 21, has enfin fixé un cadre et des objectifs. Il reste à en préciser les modalités de mise en œuvre, au niveau international, mais aussi au niveau de chaque pays.

La première étape consistera à organiser la première réunion internationale des experts, à laquelle pourront être invités des représentants de l’industrie, du secteur environnemental et des gouvernements. Certains thèmes clés seront présentés à ce premier événement, notamment la question de la réglementation, les politiques technologiques, l’économie de l’énergie, les économies d’énergie et la formation.

LeRoundtable meeting is organized at expert level only and participation will be coordinated through specific invitations addressed by the IIR and UNEP to the concerned developing countries to nominate local experts from the refrigeration sectors in hot climate regions and/or networks in hot climates, in order to build bridges between industry, environment and governments. Some industry representatives may be invited, where new technological developments need to be presented with non-commercial aspects.
**Past events**

- A landmark international event for all economic spheres and industrial sectors, the United Nations Conference on climate change (COP21) held in Paris, France in December 2015, saw major advances in a matter that concerns us all: the impact of refrigeration on the environment.

With a recognized general political impetus, the Paris Agreement, which was adopted during COP21, is of the utmost importance. It provides an accepted common framework for all nations, to implement ambitious national measures in order to reduce greenhouse gas emissions. Alongside governments and administrations, Didier Coulomb (Director General), representing the IIR, took to the stand to give a statement. The IIR will continue to actively follow the international discussions on climate change and HFCs in 2016, and will partake in these (the next COP is scheduled in Marrakech, Morocco in November 2016), whilst taking an active role in the implementation of nationwide and international efforts.

- The 27th Meeting of the Parties to the Montreal Protocol (MOP27) took place in Dubai, United Arab Emirates, on November 1-5, 2015. Various events were organized in anticipation of the meeting (open-ended Working Group meetings, a forum on alternative refrigerants) in order to prepare negotiations on a phase-down of HFCs. Various side-events were also organized by the IIR and the United Nations Environment Programme (UNEP) and other organizations on such topics as fisheries, sustainable cold chain, the certification of technicians. The IIR Director General presented a statement during the high-level session of the meeting. A new meeting of the Parties will take place in Geneva, Switzerland in April 2016. MOP27 final report is available here: http://goo.gl/Nn8R6x

- The 46th International HVAC&R Congress and Exhibition, Serbia

Last December, the Serbian HVAC&R society organized in Belgrade (Serbia) its annual International HVAC&R Congress and Exhibition. More than 800 visitors attended the event and 80 scientific articles were presented from 22 worldwide countries. The IIR took the opportunity to reward Mr. Marko Kolaric and Mr. Marko Ozgovic with IIR winner certificates of the IIR student competition, as they were not able to attend the ICR2015 in Japan to receive them. www.kgh-kongres.rs

- The 8th edition of the Pôle Cristal Symposium, co-sponsored by the IIR, took place on October 8, 2015 in Dinan, France. It focused on three topics: greenhouse gas emissions, energy management and renewable energies. http://www.pole-cristal.fr/

- Carrier, an IIR corporate member, organized in Singapore, on December 1-3, 2015, a “World cold chain summit”. The aim was to discuss ways to handle food waste, particularly in developing countries. Didier Coulomb was a keynote speaker. A book “Food foolish: The Hidden Connection Between Food Waste, Hunger and Climate Change” was presented on this occasion, as was a proposal to organize a worldwide coalition against post-harvest losses (see “In the news/Briefs”).

- The Mt. Lebanon gas pipeline in the Lebanon, which was completed in October 2015, is a major step in the energy transition in the country. It will help to reduce the country’s dependence on imported gas and will improve the reliability of the national gas network. The pipeline is part of a larger project, the National Natural Gas Pipeline Project (NNGPP), which aims to connect Lebanon to the regional gas market and reduce its reliance on imported gas.

- The 12th IIR-Gustav Lorentzen Conference on Natural Refrigerants (GL2016), Edinburgh, UK, will attract an international audience of researchers and industrialists and address critical issues on the future of the phase down of HFCs. Early bird registration open until May 19, 2016.

- The 2nd IIR Workshop on Cold Applications in Life Sciences in Dresden, Germany, on September 5-9, 2016 will provide an interdisciplinary scientific platform for discussion and exchange of experiences between R&D-institutes and industry.

- The 7th International Conference on Magnetic Refrigeration at Room Temperature (Thermag VII) to be held in Turin, Italy, is the ideal environment for the presentation of the latest developments in the field of magnetocaloric materials and cooling techniques. The conference will offer an exciting technical program, with invited and contributed oral presentations as well as a number of poster sessions. Call for abstracts open until February 29, 2016.

- Discounts on IIR conference registration fees

IIR Members receive a discount on IIR conference registration fees of up to the equivalent of a one-year individual IIR membership from a paid-up Member Country.

- IIR co-sponsored conferences

- LNG18 in Perth, Australia, a conference co-organised by the IIR, promises to be a prominent international event in the LNG sector, showcasing the continued growth and development of the global LNG industry.

- The 8th Ibero-American Congress of Refrigeration Science and Technology (CYTEF2016) will take place in Coimbra, Portugal. This edition is organised by ADAI (Association for the Development of Industrial Aerodynamics, University of Coimbra) and by SECYTEF (Spanish Society of Refrigeration Sciences and Technologies). Early bird registration ends March 15, 2016.

- A multidisciplinary congress with a focus on energy efficient building and HVAC system performance, the 12th REHVA World Congress (CLIMA 2016) to be held on May 22-25 2016 is a must for stakeholders in the building sector.

- Held annually, the 2016 Purdey Conferences, co-sponsored by the IIR, will take place on July 11-14, 2016.

- The Healthcare Cold Days in Lyon, France on November 22-23, 2016 is a biennial event that brings together all stakeholders in the refrigeration, health and cosmetics sectors. Call for abstracts open until March 30, 2016.

Please consult our conference calendar on the last page for full details.

**European projects**

- ELICIT is progressing well

On November 12-13, 2015, a technical reviewer appointed by the European Commission visited the Cambridge head office in Cambridge (UK) to assess the work carried out within the framework by the ELICIT consortium. The EU project progress meeting was the occasion to present the results achieved in the project’s first 18 months. The ELICIT project was impressed by the high quality of the materials and on-the-ground data provided during the meeting. He highlighted that the ELICIT website developed by the IIR was very sophisticated. As followed, he will publish the technical review report of the project to the EU Commission Project Officer. http://elicit-project.eu/elicit-presents-results-at-18-month-technical-review/

- CRYOHUB: a new EU project for the IIR

In April 2016, the IIR will kick-off a new 3.5-year research project so called “CRYOHUB” funded by the new EU research and innovation framework programme “Horizon 2020”. Composed of 14 EU partners, the CRYOHUB consortium will investigate and extend the potential of large-scale Cryogenic Energy Storage (CES) and will apply the stored energy for both cooling and energy generation. By employing Renewable Energy Sources (RES) to liquefy and store cryogens, CRYOHUB will balance the power grid, while meeting the cooling demand of a refrigerated food warehouse and recovering the waste heat from the equipment and the cold source. In this project, the IIR role will be principally to contribute to dissemination activities as previously projects.

**New IIR publications and services**

- New Informatory Note on The Role of Refrigeration in the Global Economy

Based on statistical data, the 29th IIR Informatory Note highlights the importance of the refrigeration sector, which is expected to grow further in the coming years due to increasing cooling needs in various areas and global warming. The report identifies a major and increasing role in today’s global economy, with significant contributions made in food, health, energy and environmental domains that policy makers need to better take into account.

Key figures illustrate the importance of
refrigeration:

- Roughly 3 billion refrigeration, air-conditioning and heat pump systems in operation worldwide,
- Approximately 300 billion USD global annual sales of aforementioned equipment,
- Almost 12 million people employed worldwide in the refrigeration sector,
- About 17% of the overall electricity used worldwide is consumed by the refrigeration sector.

This Informatory Note was prepared by Didier Coulomb (Director General of the IIR), Jean-Luc Dupont (Head of the Scientific and Technical Information Department) and Audrey Pichard (Informatory Note writer).

**New Informatory Note on Heat-Sensitive Health Products**

A significant number of health products (vaccines, insulin, labile blood products, biotechnology products, tissue, organs etc.) are heat-sensitive and a change in their storage temperature can render them unusable, inefficient or even dangerous. Among the top 10 medicines sold across the world, only one does not have any specific temperature requirements. Confronting the issues raised with the latest advancements in temperature control, these health products throughout the distribution chain is essential, with health and economic factors being the priority.

In this 30th Informatory Note, the IIR has defined the issues and challenges that need to be addressed in order to ensure that reliable cold chains, along the distribution chain of products essential to public health, are put in place.

This Informatory Note was prepared by Gérald Cailler (Member of the IIR Executive Committee and President of Section D “Storage and Transport”) and Marie Boned.

Only IIR members can currently download these notes: [http://goo.gl/WdQioV](http://goo.gl/WdQioV)

Not a member yet? Learn about IIR member benefits: [http://goo.gl/VQzn8g](http://goo.gl/VQzn8g)

**A new HFC information resource at your fingertips**

The IIR has expanded its information services with a comprehensive tool that provides you with the latest on HFCs, which is a hot topic in the context of the international discussions on a phase-down of HFCs. A new section entitled “HFCs: What’s New?” is now available on the IIR’s Web site: [www.iflir.org > Markets and Figures > HFCs: What’s New?](http://www.iflir.org)

This new service aims at providing all relevant information in order to follow regulatory developments related to HFCs and to know what to do. The new section includes:

- The latest news relating to HFCs prepared by the IIR,
- Basic documents: regulatory texts, recommendations, summaries,
- A list of all the relevant documents on this theme referenced in the Fridoc database.

**The IIR member news**

The IIR is delighted to welcome the following members:

- **Private members:**
  - Mohammed Sanusi ABUBAKAR, Nigeria; Sigurdur BERGSSON, Iceland; Geert DOORNBOS, Netherlands; Bakartxo EGILEGOR, Spain; Adam LACK, USA; Jose Luis LAZARO, Spain; Jose ROMANILLOS, Spain; Adam LACK, USA; Jose Luis LAZARO, Spain; Jose ROMANILLOS, Spain;
  - Adam LACK, USA; Jose Luis LAZARO, Spain; Jose ROMANILLOS, Spain;

- **Junior members:**
  - Dan Merry BIBALOU, UK; Tao HE, USA; Mitch KNAPKE, USA; Marko OKULIG, Serbia; Heber SILVA, Brazil; Florian WAGNER, UK.

**In the news**

**Markets and figures**

**2014 world chiller market**

Impacted by the economic slowdown in China – the world’s largest chiller market – the global chiller market started to slow and posted a continuous drop in its growth rate. Based on BSRIA data, global chiller market scale was USD 8.46 billion in 2014, a 0.6% increase from 2013. By chiller type, centrifugal chillers reached USD 2.16 billion; reciprocating, screw and scroll chillers reached USD 5.39 billion; and absorption chillers over 350 kW were USD 0.91 billion.

This growth is expected to increase to USD 2.34 billion in 2015. By region, Europe is expected to grow at a rate of 4.2%, while APAC region is expected to grow at a rate of 3.3%. The expectation is that the market will grow by a CAGR of 5% until 2018.

According to a study by bigEE, the South Africa air-conditioning market is expected to grow by a CAGR of 8.6% to 2018. About 2.6 million electric air conditioners are in use in South Africa (reference year 2010). The average annual consumption of these air conditioners amounts to about 3,100 kWh. In total, this causes additional power consumption of 8.1 TWh representing 3.2% of the total electricity consumption. As model calculations show, enormous efficiency improvements can be achieved, especially if old inefficient models are replaced by modern efficient ones. [http://goo.gl/8YmvtR](http://goo.gl/8YmvtR)

**Refrigerant news**

**HFCs are weak ozone-depleting substances**

According to a NASA study, published in Geophysical Research Letters in October 2013, the ozone depletion caused by HFCs is small but not zero. Ozone depletion potentials (ODPs) for HFCs range from 0.39x10^{-3} to 30x10^{-3}, approximately, 100 times larger than previous ODP estimates that were based solely on chemical effects. However, frost mass, CFC-11 causes about 400 times more ozone depletion than the HFCs, while HCFC-22 causes 8 times more ozone depletion. Ozone depletion by HFCs results from a combination of stratospheric temperature and circulation changes. HFCs warm tropospheric and stratospheric temperatures, since many...
HFCs are strong radiative forcing compounds with long atmospheric lifetimes. This warming has an indirect ozone depletion effect by accelerating temperature-dependent chemical reactions. http://goo.gl/T1aKuT

A new GIZ study analyses the management and destruction of ozone depleting substances (ODS) – particularly used as refrigerants – in particular in developing countries. Banks are defined as “total amount of ODS contained in existing equipment, chemical stockpiles, foams and other products not yet released to the atmosphere”. The total estimate of reachable ODS banks, i.e. banks available for management, is 5,354 kt. This corresponds to 3,037 kt ODP and 16.8 Gt CO₂ eq.

At the moment, less than 50 % of the reachable banks are in developing countries but the amount of manageable ODS in banks will gradually shift from developed countries to developing countries over the next few years. Not all reachable banks can be recovered at a reasonable level of effort and cost, which is defined as the technical feasibility. Destruction technologies can be categorized in high temperature incineration, plasma technologies, and other non-incineration technologies. There are currently 16 TEP approved technologies for the destruction of ODS. Recovery and destruction vary significantly between subsectors and range between less than 10 (commercial refrigeration) to over 100 (steel faced foam panels) USD per kg ODS. http://goo.gl/FU4OTb

French Environment and Energy Management Agency (ADEME) published in September 2015 a study conducted by Cemafroid and IRSCTEA on the containment of refrigerating plants. This study is based on a general literature review and an online questionnaire sent over to 500 equipment owners/installers in France. In 2012, 9% of the refrigerant was in the refrigerant bank, including 40% for R134a. The distribution of the refrigerant bank is the following: mobile air-conditioning (27%), industry (20%), chillers (15%), air conditioning (14%), commercial refrigeration (11%), heat pumps (5%), domestic refrigeration (5%) and transport (3%). The fugitive leakage rate for all refrigerants appears to be about 17%. A more than 20% variation in charge has significant impact on energy consumption. The components that make up assemblies used in refrigeration and air-conditioning are not inherently leak-proof. What is at issue is how they are assembled. The tightening torque is an important parameter on supplied by the manufacturer, which must be complied with by using a torque wrench. The authors stress the importance of reducing the number of welded or soldered connections and prohibit the use of Schrader connections. All valves must be capped.

In their presentation on this study during IIR ICR2015*, E. Devin et al specified that survey data of the total number of annually detected leaks represent “small leakages” with a flow rate between 5 and 10 g/ year. At the same time, from 4% to 8% of the leaks have a rate of between 500 g/year and 5 kg/year. The “large leakages” contribute to 70% of total mass losses. The authors stress that leakage detection procedures should be more standardized. The study also raises the technical relevance of substantially increasing the detection thresholds of the detectors to make leak testing more effective. http://goo.gl/Tg7C2k

EU F-Gas Regulation phase-down: BRA stresses the vital part of reclaimed/recycled HFCs

The report “Putting into Use Replacement Refrigerants” produced by an Action Group made up of members of the British Refrigeration Association (BRA) aims to help industry players meet some of the requirements of the EU F-Gas Regulation. A 2nd consultation force on January 1, 2015, especially the ban on using refrigerants with a GWP of more than 2,500 from the year 2020. Reclaim refrigerant can be used for servicing until 2030. It is generally accepted in the industry that reclaim (92%) available, is likely to reduce substantially well before 2020. According to the report, it is not going to be possible in terms of human resources or financing for all R404A systems to be replaced or charged with new refrigerants by 2020. These number ranges between 12,000 to 20,000 systems in the UK. Changing 10% of existing systems using R404A each year is the fastest rate at which replacement can reasonably achieved. A working hypothesis would be that 5% are replaced by low-GWP systems and the other 5% by change of refrigerant. If this were to be achieved, migration away from R404A systems would be complete by 2025. To keep the remaining R404A systems going, it will be necessary to use recycled or reclaimed R404A. It is crucial that R404A removed from systems is kept for servicing systems that remain in use. Owners of refrigeration systems are expected to ensure they manage product removed, and that it is recycled or reclaimed. The period of maximum stress will be when virgin R404A becomes short and there are still a large number of R404A systems in use.

This is likely to be around 2019 to 2021. http://goo.gl/00qTP

Nigeria commissions first hydrocarbon refrigerator plant

According to the Nigerian Guardian, the Nigerian Federal Government, in collaboration with UNDP, has commissioned a pilot hydrocarbon refrigerator plant, in the village of Irolu in Ogun State. Ibrahim Jibril, Minister of State in the Federal Ministry of Environment, said the project was designed to demonstrate the feasibility of replacing the current use of HFCs with hydrocarbon-based technology. The minister said the commissioning of the plant would be followed up by a well-structured training/certification programme for Nigerian refrigeration and air-conditioning technicians nationwide on the safe use of HC refrigerants in their applications. http://goo.gl/Uo0Cvk

MAC news

Germany taken to court by EU over Daimler’s use of R134a

Daimler had previously refused to use R1234yf in its Mercedes car air conditioning systems due to concerns over its flammability and continued to use R134a. However, R1234yf is a HFC and R134a is a HCFC. The UK government has confirmed in October 2015 that fluorinated (“F-gas”) refrigerants can be sold to unqualified persons servicing MAC systems. Countermanding a previous notice, the UK Environment Agency has now announced that by changing restrictions on refrigerants only to apply those recovering F-gases from MAC systems. http://goo.gl/FS2q

UK: uncertified persons can buy F-gases for the servicing of MAC systems

The UK government has confirmed in October 2015 that fluorinated (“F-gas”) refrigerants can be sold to unqualified persons servicing MAC systems. Countermanding a previous notice, the UK Environment Agency has now announced that by changing restrictions on refrigerants only to apply those recovering F-gases from MAC systems.

Doing Cold Smarter

In the recent “Doing Cold Smarter” study led by the Birmingham Centre Energy Institute, the authors stress that “even in a temperate country such as Britain, cooling is everywhere, and vital to many aspects of civilization: food, medicine, energy, data and industry.” They underline that cooling demand is booming: “Worldwide energy demand for space cooling will overtake space heating by 2060, and outstrip it by 60% at the end of the century.” However, the authors stress that “we clearly need to do cold smarter” and believe the answer is to radically improve efficiency by developing a new Cold Economy…” “Cooling poses a massive environmental challenge, but could also represent a major business opportunity for British companies.”

According to the report, it is not going to be possible in terms of human resources or financing for all R404A systems to be replaced or charged with new refrigerants by 2020. These number ranges between 12,000 to 20,000 systems in the UK. Changing 10% of existing systems using R404A each year is the fastest rate at which replacement can reasonably achieved. A working hypothesis would be that 5% are replaced by low-GWP systems and the other 5% by change of refrigerant. If this were to be achieved, migration away from R404A systems would be complete by 2025. To keep the remaining R404A systems going, it will be necessary to use recycled or reclaimed R404A. It is crucial that R404A removed from systems is kept for servicing systems that remain in use. Owners of refrigeration systems are expected to ensure they manage product removed, and that it is recycled or reclaimed. The period of maximum stress will be when virgin R404A becomes short and there are still a large number of R404A systems in use.

This is likely to be around 2019 to 2021. http://goo.gl/00qTP

Food waste and the cold chain

The recent book “Food Foolish” by J. M. Mandick and E. B. Schultz calls attention to the extraordinary social and environmental opportunities created by wasting less food and the central role of the cold chain in this context. We do not produce enough food to feed the world. However, one-third or more of the food we produce each year is either lost or wasted. Finally, over 800 million people are chronically hungry. Food waste also has a devastating impact on the environment. The embodied CO2 emissions in food waste alone represent 3.3 billion metric tons. If food waste was a country, it would be the third highest emitter of greenhouse gases (GHG) in the world behind China and the USA. In this respect, the modern cold chain is an indispensable tool: only about 10% of perishable foods are refrigerated worldwide and transport refrigeration alone could avoid a quarter of food waste in developing countries. The cold chain is a phenomenon of the modern world, but only a fraction today of what it might someday become. Vegetables and fruits account for 40% of all food waste. Combined with meat, fish, seafood, dairy, the total is more than 50%. A cold chain created to protect fruits and vegetables can be deployed to preserve foods that comprise nearly ¾ of the entire food chain – the most nutritious foods on the planet. For example, India produces 28% of the world’s bananas yet represents just 0.3% of all internationally traded bananas. With an improved cold chain, the number of bananas transported could grow from 4,000 to 190,000 containers providing an additional 95,000 jobs as many as 34,600 smallholder farmers.

http://foodfoolishbook.naturalleader.com/
R410A/R22 alternatives for AC in high-temperature environments

The final US Oak Ridge National Laboratory report – presented during MOP27 in Dubai – compares the performance of low-GWP alternative refrigerants to HFC R410A in mini-split air conditioners (ACs) under high-temperature conditions. It looks at 4 R410A alternative refrigerants: the single component HFC refrigerant R32, Arkema’s ARM-71A, Chemours’ DR-55, Honeywell’s L-41 (R447A) and Mexichem’s HPR-2A, all A2L refrigerants with GWPs comprised between 295 and 904.

Cold stores

During the IIR International Congress of Refrigeration, held in Yokohama in August 2015, two valuable papers focused on cold store energy consumption and safety issues:

- Judith Evans et al presented the results of a study* on energy use in cold stores. Cold storage rooms consume considerable amounts of energy. Within cold storage facilities, 60-70% of the electrical energy may be used for refrigeration. Previous surveys demonstrated that energy savings of around 30-40% were achievable by optimizing usage of the stores, repairing current equipment and by retrofitting of energy efficient equipment. As part of a large project on cold store energy performance, internet based surveys were developed and data collected to determine energy usage in different cold store types, sizes and configurations. The data set analyzed was 167 chilled stores, 187 frozen stores and 75 mixed stores in 23 different countries. The specific energy consumption (SEC) for the cold stores examined varied considerably. Data from all stores with the 20% upper and lower values removed show the following mean specific energy consumption: 50.2 kWh/m³/year for chilled stores and 66.2 kWh/m³/year for frozen and mixed stores. A comparison of energy usage in different parts of the world was done. Also mathematical models were developed to assist end users to reduce energy consumption and to identify how much energy a store should use in different usages and configurations.

Specific energy consumption values for refrigerated food cold stores, J. Evans et al.

Direct link to this paper in Fridoc: http://goo.gl/0wF1gj

- Shen Tian et al reported* on a detection method of ammonia leakage. According to some statistics, 12 tremendous ammonia refrigeration systems leakage accidents happened in China from 2010 to 2013 and resulted in a large number of casualties. The accidents caused great damages because the pipelines ruptured suddenly and the leakage accidents tended to spread rapidly, especially from the cold liquid lines. At the same time, operating staff could not cut the risk off without exact knowledge of leakage locations. This demonstrates the importance of improving ammonia automatic detection technology for rapid warning and leakage detection. The ammonia leakage detection method proposed consists in analyzing in real time the transient behaviors of pressure and flow rate in the cold liquid line. A computer program to detect leakage and locate leakage points was developed with LabVIEW. Compared with the experimental results, the detection program shows good accuracy in the detection of small leakages at ± 5% and location determination error less than ± 10% within 10 seconds.

Detection method of ammonia leakage from liquid line of cold storage refrigeration system based on pressure and flow rate, Shen Tian et al.

Available via Fridoc: http://goo.gl/3UBRE5

Briefs

- An alternative metal alloy for magnetic refrigeration? Researchers at the Rochester Institute of Technology have studied a promising new metal alloy that could be used as a magneto-caloric material for magnetic cooling. This study, published in the Journal of Magnetism and Magnetic Materials, showed that the alloy is a cheaper, lighter and more readily available alternative to metals made from expensive rare-earth elements. The NiFeCoCrPdx family is said to have exhibited a second order magnetic phase transition whose critical temperature is tunable from 100 K to well above room temperature. A near 40% enhancement of the refrigerating capacity is said to be achievable. Though rare-earth materials tend to exhibit higher entropy changes, they can suffer from cracking and brittleness, which severely limits their useful lifetime. The so-called high entropy alloys (HEAs) are a class of emerging transition metal alloys that hold great potential for advanced manufacturing, and which may impart magnetocalorics. They are said to offer supply chain and cost stability, and superior mechanical properties such as ductility, corrosion resistance, machinability, all of which ease manufacturing and bolster product longevity. Fe1Co1Ni1Cr1Pdx is an example of an HEA system with tunable magnetic properties.

http://goo.gl/9y7D25

- Use of ejectors for performance improvement in CO2 commercial refrigeration systems

Ejector technology conference in Yokohama will focus on using CO2 refrigeration systems. Ejector work reported at the conference shows that in a two-phase ejector an attractive option for improving the efficiency of CO2 commercial refrigeration systems. Transcritical CO2 systems have relatively low throttling loss, meaning that they offer the greatest opportunity for improvement with an ejector. However, the use of ejectors in a system subject to varying ambient conditions and capacity requirements presents a significant challenge, as ejectors have been shown to offer poor performance at off-design or reduced capacity conditions. For example, COP can decrease by up to 17% compared to its optimum at the given conditions if gas cooler pressure varies by 0.5 MPa. In his* presentation at IIR 2015, N. Lawrence and S. Eibel presented two different strategies to achieve higher ejector and cycle performance at varying capacity conditions: variable geometry ejector and parallel arrangement of multiple ejectors. They consider different ejector cycle options with two evaporation temperatures and different uses of the ejector. They have shown with a theoretical model that using an ejector to unload the medium-pressure limits their useful lifetime. In a Co2 booster refrigeration cycle can result in 15% COP improvement, but using an additional ejector to unload the LP compressors resulted in little or no additional COP improvement compared to the single-ejector configuration.

* Study on the use of ejectors for capacity modulation and performance improvement in CO2 commercial refrigeration systems, N. Lawrence, S. Eibel

Available via Fridoc: http://goo.gl/jw9Kk

The world’s most powerful two-phase immersion cooling (2PIC) project, which will be deployed in a 40+ MW data center being constructed by BitFury Group, is currently underway in the Republic of Georgia. Immersion cooling or liquid cooling is growing in popularity across the globe. 2PIC involves placing hardware in an immersible tank of fluid, such as a water-boiling point, such as 3M Novec 7100 fluid (61°C/142°F). As the hardware heats up in the tank, it boils the fluid, and this change in state pulls the heat away from the components. The fluid becomes a vapor, rises to the top of the tank by convection, and returns to the tank as a liquid. This process continues while cooling. However, the fluid behaves like a vapor, not a water-cooled condenser coil and falls back into the tank without the use of pumps. The streamlined system is claimed to deliver up to 95% cooling energy savings with minimal fluid losses.

http://goo.gl/Co7RAL
The proposed changes to Section 608 of the Clean Air Act, published on November 9, 2012, aim at reducing emissions of ozone-depleting substances (ODS) and substitute HFC refrigerants during the maintenance, service, repair and disposal of appliances. The EPA proposes lowering the allowed leak rates to 20% or lower (from 35%) for industrial process refrigeration and commercial refrigeration appliances and to 10% or lower (from 15%) for comfort cooling appliances for both ODS and substitute HFC refrigerants. In addition, under this proposal, an illegal appliance containing 22.7 kg or more of refrigerant would not be allowed to leak more than 75% of its full charge in two consecutive twelve-month periods and remain in use.

The proposed rule were due before January 25, 2016. The EPA proposes lowering the allowed leak rates to 20% or lower (from 35%) for industrial process refrigeration and commercial refrigeration appliances and to 10% or lower (from 15%) for comfort cooling appliances for both ODS and substitute HFC refrigerants. In addition, under this proposal, an illegal appliance containing 22.7 kg or more of refrigerant would not be allowed to leak more than 75% of its full charge in two consecutive twelve-month periods and remain in use. The proposed rule were due before January 25, 2016.

The French Ministry of Environment has definitively excluded the introduction of a tax on refrigerants. He explained that this measure, for a time considered, would no longer be necessary, especially due to the quota policy adopted by the EU within the revised “F-Gas” Regulation. http://goo.gl/Vh54sA

France: refrigerant tax project definitively abandoned

During SIFAr2015 fair, a representative of the French Ministry of Environment has definitively excluded the introduction of a tax on refrigerants. He explained that this measure, for a time considered, would no longer be necessary, especially due to the quota policy adopted by the EU within the revised “F-Gas” Regulation. http://goo.gl/Vh54sA

Spain: F-gas tax level unchanged

In January 2014, the Spanish government put in place a tax on fluorinated greenhouse gases including HFCs with GWP greater than 150. Gradually imposed, the tax was meant to reach its 100% cap in 2016. However, as a result of an amendment to the 2016 General State Budget Bill recently introduced by the Spanish government and approved by the Senate, the tax level will remain the same as in 2015 for another year: 86% rather than the 100% originally planned. https://goo.gl/Tns7TY