Presskit: Overview

CONTENT

Press Releases

- eurammon Symposium 2020: «Heating and Cooling with Natural Refrigerants - a Way to Decarbonization»

Background

- eurammon – The Association for Natural Refrigerants
- eurammon – Portrait
- eurammon – Executive Board
- Natural Refrigerants – For a Sustainable Future
- Fit for the Phase-Down: the Main Fact and Figures of the F-Gas Regulation
- eurammon – Policy Statement

Press Release

eurammon Symposium 2020: «Heating and Cooling with Natural Refrigerants - a Way to Decarbonization»

Politicians, international organizations, operators, planners, system engineers – all came together virtually for the first digital edition of the eurammon Symposium 2020. Over 500 participants have attended the Symposium over the course of six days, listening to international experts discussing heat pumps with natural refrigerants and the associated possibilities for waste heat recovery.

Fifteen international experts have shown that natural refrigerants contribute to meeting the increased ecological requirements, giving insights into current legislation and technical regulations, as well as discussing new solutions regarding heat pumps with natural refrigerants. In the following you will find four abstracts of key presentations held at the eurammon Symposium 2020.

Nicky Cowan, Star Renewable Energy

«Design Aspects of River Water, Ammonia Heat Pumps for District Heating»

A water source heat pump can be split up into a few repeatable sections for every project: the Water Source, the Heat Pump and the Heat Network.

The heat pump can almost be thought of as the easy part as its design is the outcome of the river's parameters and the heat network. With these projects, rivers and oceans broadly behave the same throughout the year so the defining parameters often lie with the district heating temperature profile and capacity required.

In rivers you have: fresh water, salt water or a mix of both. Salt water is more arduous in terms of material selection for equipment when operating on an open loop style and there is the added challenge of mussel seeds getting into the pipes. This leads to the first point in any project of determining what your river is made of, what lives in it, its temperature range, and its depth. If you are on a tidal section, you also require data for the river height fluctuations.

Next, it is about putting a plan together for dealing with it. Appropriate materials for the heat pump, a suitable abstraction pump, appropriate filtration to minimize particle sizes and remove mussels from the system. You can even install a self-cleaning system on the evaporator.

The district heating network flow and return temperature range plays such a big part in the heat pump efficiency. Lower network temperatures mean a more efficient system (roughly 1.5% efficiency increase per 1◦C flow temperature reduction) and so does an increased ΔT

(more subcooling) however many sites where heat pumps will be deployed are already existing and it may be difficult to improve. Thermal storage can also boost your efficiency and reduce OPEX as you can store in advance of peak electricity and run flat out on/off with the heat pump instead of part load.

Dr. Frank Rinne, Emerson Commercial & Residential Solutions

«AURORA/Heavac: BOREALIS 3.0: Heat Pump for Green Climate in Electric Buses»

AURORA/HEAVAC have decided to use the green refrigerant R290 in the further development of the heat pump. The GWP value (global warming potential) of R290 is 3 and thus significantly below the future value of 150 required by the new F-Gas regulation. The required refrigerant quantity has been significantly reduced compared to the current series production level with R 407C: The filling quantity for a 12m city bus is now only approx. 1.5 kg. Due to the low refrigerant quantity in connection with the architecture of the heat pump (chiller), there is no restriction in the operating approval of the entire vehicle. With R290, the vehicle manufacturer is just as likely to receive the «blue angel» as with R744 (CO2).

In addition, the natural, halogen-free refrigerant offers a number of advantages over the CO2 solutions currently on the market:

- R290 performs better than CO2 in both heating and air-conditioning operation. The COP values (coefficient of performance) achieved with R290 in heating mode are 2.75 significantly higher than the COP value of 2 achieved with R744 at outdoor temperatures of -10°C with COP 2.75. At 40°C outdoor temperature R290 achieves an EER value (Energy Efficiency Ratio) of 2.3 (CO2: 1.1).
- At a constant 18 bar (heating) or max. 20 bar (air conditioning), the working pressures for heating and air conditioning with R290 are significantly lower than those of CO2 applications (118 bar heating / 138 bar cooling). Highly resistant pipes and heat exchangers are no longer necessary with R290, thus saving not only costs but also weight.
- R290 also enables the use of scroll compressors instead of the piston technology required with CO2. This means a significant reduction in moving parts and therefore less maintenance.
- The simple and familiar system configuration does not require any special qualifications of workshop personnel.

The safety concept of the BOREALIS 3.0, designed according to EN378, takes all possible risks into account: This was realized among other things by a hermetically closed refrigerant circuit with a small amount of refrigerant. Furthermore, a self-contained coolant zone without ignition sources is implemented with automatic venting. Used sensors are designed in ATEX standard.

In the new heat pump generation, the system topology has also been optimised, thus implementing a modular design. As a result of this and the reduced installation space, BOREALIS 3.0 can also be optimally integrated into existing vehicle structures. Since no

additional conditioning of the batteries is required, the necessary installation space, the installation effort and above all the costs for the entire system are reduced.

Hermann Renz, BITZER Kühlmaschinenbau GmbH
«Hydrocarbon Heat Pumps for Light Industrial Applications»

Heat Pumps with hydrocarbons as refrigerant can be understood as one of the future key technologies for sustainable heating solutions.

The presentation focuses on the thermodynamic properties of Propane (R290) and Propylene (R1270) showing their specific benefits for efficient heat pump solutions. Further emphasis is given on the selection of compressor(s) and main system components. In this connection the influence of hydrocarbons to compressor lubrication is described including related measures for reliable operation.

Due to the highly flammable nature of hydrocarbons specific safety provisions have to be considered in design, installation and operation. For this reason, mainly lower capacity units with small refrigerant charge are being offered as of today. However, a robust safety concept is also possible with larger units which is explained in detail on basis of a light industrial heat pump for ground source loop and (waste) heat recovery.

Alexander Cohr Pachai, Johnson Controls Denmark
«Heating and Cooling with Natural Refrigerants – a Way to Decarbonisation»

Ursula von der Leyen has stated: «I want Europe to become the first climate-neutral continent in the world by 2050», and she goes on, «our current goal of reducing our emissions by 40% by 2030 is not enough.» Inspired by this statement, Mr. Alexander Cohr Pachai demonstrates how part of the decarbonisation needed to reduce the impact of space heating and industrial processes can be obtained by using heat pumps.

Heat pumps using natural refrigerants can be used for temperatures well over 200°C with various natural refrigerants at different temperature levels in both commercial and industrial applications. An example from Denmark is a cascade system with the working pair R718/R717 (water/ammonia), which demonstrates that the industry can utilise heat/the energy from almost any source to produce heat and avoid using fossil fuels. In this case, the energy is produced by wind turbines in a wind park, which on a clear day can almost be seen from the roof of the machine room.

It is high time for politicians as well as the industry to change the development and modern lifestyle if we are to meet the targets set by Ursula von der Leyen, and governments need to support this vision. Many words have been spoken, but the clock is ticking, 2050 is less than 30 years away, and we are still foot dragging.

eurammon – the Association for Natural Refrigerants

We are an association of companies, institutions and individuals with one goal: to encourage a sustainable approach in refrigeration engineering. eurammon has therefore been advocating the use of natural refrigerants since its foundation in 1996. The initiative sees its mission in providing a platform for information and knowledge sharing – be it for scientists and researchers, politicians, as well as the public at large.

Whether in the food and beverage industry, in air-conditioning, in sport and recreation facilities, hospitals, the chemical, pharmaceuticals or the automotive industry – cooling and refrigeration technologies are essential to our civilization and affect every one of us. That is why we have set our minds to using natural refrigerants – to substantially contribute to an eco-friendly and sustainable refrigeration technology. Welcome to eurammon.

eurammon – where Natural Refrigerants are Passion

eurammon has dedicated itself to the use of natural refrigerants in Europe and all around the world for more than 20 years. Our mission is clear: Since day one in 1996, we have been spreading general awareness and acceptance of natural refrigerants – thereby reducing possible reservations against their use. As an association of companies, institutions and individuals, eurammoni s dedicated to promoting natural refrigerants in the interest of a healthy environment, and to further develop a sustainable approach to refrigeration.

Technologies sustaining a healthy environment and climate have no nationality - that is why eurammon operates and thinks beyond national borders. We champion sustainable solutions in refrigeration at national and international levels by uniting leading global companies in the field of natural refrigerants. eurammon has an excellent global network of co-operation agreements and memberships with international and national associations and institutions. eurammon is now compromised of almost 80 members in 27 countries around the globe – and counting.

eurammon – where Knowledge is Key

eurammon regards itself as a centre of competence for the use of naturally working fluids in refrigeration. And because with great knowledge comes great responsibility, the association sees its mission in providing a platform for information and knowledge sharing – whether you are a professional user or consultant for natural refrigeration plants, a politician or an interested individual. eurammon provides all interested parties with the latest news in the cooling and refrigeration technology, insightful case studies or informative papers. In short: We share with anyone interested in refrigeration - the natural way.

We do not only provide extensive information material and share our know-how, but also actively engage hands-on: eurammon delivers services on all matters associated with the planning of major refrigeration plants, including permits or technical guidelines for their operation. eurammon also provides specific project experience – such as support with institutional legislation for the various European countries – and connects its members with institutions, universities, or other relevant members.

eurammon – where the Future is Now

eurammon embraces social responsibility. As a partner to governments, business and non-governmental organisations, the association contributes to developing and implementing future-proof solutions in refrigeration. Refrigeration must do its part for sustainability, and we at eurammon are convinced that natural refrigerants will have an important share in providing eco-friendly and sustainable solutions to customers and the industry – now and in the future.

eurammon brings together scientists with technical experts from the field of industrial refrigeration, and thereby contributes to accelerating the evolution of innovative approaches and viable technologies. We are confident that our dedication to advancing professional research combined with the strong personal commitment of our eurammon-members will lead us to a more sustainable, eco-friendly future.

eurammon Executive Board

Bernd Kaltenbrunner (chairman)

Bernd Kaltenbrunner is Managing Director of KWN Engineering GmbH, an engineering and consulting company for machine construction and refrigeration technology in Seekirchen/Austria. Born in Austria, Bernd Kaltenbrunner has a degree in industrial engineering and a Master's degree (MSc) in production management. Bernd Kaltenbrunner was elected chairman in 2016.

Monika Witt (vice chair)

Monika Witt, born in 1963, is managing director of the Th. Witt Kältemaschinenfabrik GmbH in Aachen. She studied mechanical engineering at the RWTH Aachen and finished with a diploma in the field of process engineering. In 1991 she started as a project engineer for air separation plants at Messer Griesheim GmbH in Krefeld and moved in 1993 to MG Industries USA, a subsidiary of Messer Griesheim GmbH Germany. In 1996 Witt joined the family business Th. Witt Kältemaschinenfabrik where she took over the managing position in 1998. Monika Witt was elected vice chair in 2016.

Mark Bulmer

Mark Bulmer is the Global Market Segment Manager in the Food & Beverages Division of Georg Fischer Piping Systems in Schaffhausen/Switzerland. He focuses primarily on the market development of pre-insulated plastic piping systems for refrigeration technology and the development of plastic systems particularly for the food & beverages industry. Mark Bulmer studied mechanical engineering at Newcastle Polytechnic/England before starting his career at Georg Fischer in England. In 1994, Bulmer moved to the company headquarters of Georg Fischer Piping AG in Schaffhausen.

Thomas Spänich

Thomas Spänich, born in 1964, became a member of the eurammon executive board in 2004. The refrigeration engineer is currently senior director for product engineering, product management and application engineering at GEA Refrigeration Germany GmbH, Berlin. Spänich studied thermal and hydraulic mechanical engineering at the Technical University of Dresden and obtained his degree in refrigeration technology in 1990. He began his professional career that same year as a development engineer with Kühlautomat Berlin GmbH. He held before his current position several management positions within GEA.

Andrew Stockman

Andrew Stockman is our latest member of the eurammon executive board and takes over the offices of Georges Hoetericx. Currently he is the Managing Director for Europe and the Middle East at EVAPCO Europe Group headquartered in Belgium. Born in New Jersey (USA) in 1976, Andrew Stockman graduated at the Pennsylvania State University in Mechanical and Electrical Engineering in addition to his already achieved degree in Computer Aided Design from the York Technical Institute. After a few, more design-focused positions, he started his career at EVAPCO in 1997 with stations in Maryland, in Shanghai, Denmark and Belgium. During his career, Andrew Stockman gained a broad experience in Industrial and Commercial HVAC, Refrigeration, Ice Thermal Storage and Heat Transfer.

Natural Refrigerants – for a Sustainable Future

Between Tradition and Future

Natural refrigerants such as ammonia or carbon dioxide have a long-standing tradition – especially in food production and storage, where they have been in use for over 100 years. Did you know that the first shipment of frozen meat took place in 1873, when James Harrison installed a vapour compression refrigeration system on a sailing ship to send frozen beef from Australia to the United Kingdom?

In more recent times, technological evolution and innovations have helped to establish natural refrigerants economical and safe solution for new fields of application – the sports industry, recreation sectors, hospitals or pharmaceuticals and the automotive industry. Thesenatural refrigerants include ammonia, carbon dioxide, hydrocarbons such as propane, propene and iso-butane, water and air. Natural refrigerants are both ecologically sustainable and economically viable - in short:the future of refrigeration technology.

Nature as Developer

Ammonia, hydrocarbons, carbon dioxide, water and air – all of these natural refrigerants occurin nature's material cycles without human interference, hence the term “natural”. Ammonia constitutes an interesting case: While it is manmade for use in the refrigeration process, ammonia is nonetheless a natural refrigerant – since it occurs in nature in this form, such as the natural nitrogen cycle or in people's daily perspiration.

Natural refrigerants such as carbon dioxide are set apart from synthetically produced refrigerants, which fall into three groups: The first group are the so-called chlorofluorocarbons (CFCs and HCFCs), which have ozone depletion potential. The second group consists of fluorocarbons (FCs and HFCs) – while they do not harm the ozone layer, some of them have a considerable direct global warming potential (GWP). The third and newest group are co-called Hydrofluorolefine (HFO), which have neither ozone-depleting potential and only low global warming potential, but seem to have a negative effect on the environment, particularly water, although this is not fully investigated.

Unbeatable Climate Protector and Economic Saver

In the light of global efforts for climate protection, there is a vital interest in natural refrigerants. Because – unlike some synthetic refrigerants – they do not deplete the ozone layer and have a negligible effect on the direct greenhouse effect. Thanks to their great efficiency, natural refrigerants do not contribute much to the indirect greenhouse effect – a fact that is confirmed in comparative calculations using the Total Equivalent Warming Impact (TEWI)-method.

The use of natural refrigerants is also well worth it from an economic viewpoint: The refrigerants themselves are very inexpensive, which has a positive effect not only on the initial charge of a plant, but also, from a leakage point of view, on the operating costs. In addition, natural refrigerants are highly efficient, which keeps the energy requirement of a plant low.

Depending on the type and size of the system, the investment costs of plants using natural refrigerants may be higher – but by the same token, these are offset by reduced operation costs. In efficiency studies spanning several years, natural refrigeration plants are often several steps ahead of their competitors. Reasons include lower leakage-related costs, the low cost of maintenance, as well as – and this is particularly relevant for industrial plants – their low energy consumption. Add to this the relatively inexpensive disposal of natural refrigerants at the end of a facility's service life – you have product that is beyond comparison. In other words: natural refrigerants are unbeatable – from an economic as well as an environmental point of view.

Fit for the Phase-Down: the Main Facts and Figures of the F-Gas Regulation

The European Union's climate and energy strategy with its so-called "20-20-20 targets" has resulted in a legislative package which aims among others to bring about a 20% reduction in greenhouse gas emissions by the year 2020. This is an ambitious undertaking that encompasses various specific measures. One of these refers to the use of partly fluorinated hydrocarbons or so-called F-gases. To minimise their impact on global warming, in April 2014 the EU Council adopted Regulation (EU) No 517/2014 on fluorinated greenhouse gases as the long-awaited revision of the F-Gas Regulation. New regulations such as the ban on refrigerants that have a particularly strong impact on the climate should help the EU to achieve its climate targets and promote the use of technologies in the refrigeration and air-conditioning branch which significantly reduce the environmental impact. Europe is thus setting new global standards for reducing CO2 emissions. The revised F-Gas Regulation will be applied from 1 June 2015 onwards. But what does it mean in specific terms for manufacturers, system planners and operators? eurammon has put together the most important facts and background data.

Core elements of the revised F-Gas Regulation in detail

The targets of the revised F-Gas Regulation will be implemented with the following package of measures:

- **Phase-down**: The F-gases available on the market will be gradually reduced.
- Restrictions on use: F-gases that are particularly harmful to the climate will be gradually prohibited completely.
- **Quota system**: F-gas quotas will be allocated to the manufacturers and importers in order to control the actual consumption of F-gases.
- **Leak tests**: To avoid leakages, stricter regulations will apply in future to leak tests on refrigeration and air-conditioning systems.
- **Extended operator obligations**: Operators are responsible for ensuring that installation, maintenance, servicing, repairs or decommissioning is performed only by certified personnel.

Phase-down – gradual reduction in the available quantity of F-gas

The EU will be gradually reducing the permitted total quantity of F-gases as from June 2015. The reference point (100%) consists of the mean available quantity of F-gases available on the market in the period 2009 to 2012. Working on this basis, the total quantity available in the EU will be reduced to 21% in six stages through to 2030. In order to take account of the differing climate impact of the various refrigerants, the quantity of F-gas is stated in tonnes of CO2 equivalents rather than an absolute value in kg. The CO2 equivalent is easily calculated with the following formula: quantity of refrigerant in kg multiplied by the corresponding global warming potential (GWP).

2015	2016-17	2018-20	2021-23	2024-26	2027-29	ab 2030
100%	93% 7% reduction	63 % (44% reduction)* first drastic reduction	45 % (60%)*	31 % (72%)*	24 % (79%)*	21 % (81%)*

*Percentage values in brackets show the effective consumption reduction (CO2 equivalent) including the refrigerant consumption to be considered from 2017 on for pre-charged equipment imported into the EU (determined with 12% on basis of the quantity of 2015).

Restrictions on use – prohibition of certain F-gases with high GWP

From 2020 onwards, stationary systems may no longer use refrigerants with a GWP > 2,500. This also applies to the maintenance of plants with a new refrigerant having more than 40 t CO2 equivalent – which corresponds approximately to about 10 kg filling of R404A and R507A. The only exemptions are systems in military use and systems that cool products to temperatures below -50 °C. Existing systems may still be operated through to 2030 and refilled, but only with recycled F-gases. In a second stage, from 2022 refrigerants in "multipack centralised refrigeration systems" (at least two compressors, a number of cooling devices and a refrigerating capacity of more than 40 kW) are permitted to have only a GWP < 150. Excluded from this is the primary refrigerant circuit in cascade systems in which F-gases may be used with a GWP <1500.

Quota system – allocated quotas for more control

In order to control refrigerant consumption, refrigerant manufacturers and importers will be allocated F-gas quotas on submitting a corresponding application. Quantities will be distributed according to the following key: altogether 89% of the total quantity will be shared
out among existing market participants with the remaining 11% reserved for possible increased demand and new entrants. Also, pre-charged systems being imported into the EU will fall under the quota system from 2017. The quotas can be freely traded on the market in the same way as emission rights. The companies are obliged to submit reports on their actual F-gas consumption. The only exemptions from the quota system are production outputs of manufacturers or importers with less than 100 tonnes of CO2 equivalent, military systems or applications for which no demonstrably suitable technical alternatives are available up to now. In addition to these core elements the F-gas Regulation implies further details which need to be considered.

Leak tests – more frequent and more precise checks

The new F-Gas regulation stipulates stricter and more frequent leak checks to minimise leakage in the systems. Hitherto the cycle of checks was defined by the metric quantity of refrigerant in kg. In future, the checking frequency depends on the quantity in tonnes of CO2 equivalent. Regular checks are prescribed already from a refrigerant charge of more

than 5 tonnes of CO2 equivalent. The plan is to halve the checking frequencies if the systems have a leak detection system that informs the operator automatically in the event of any leakage:

Charge in to CO2 equivalent	Frequency of checks	Frequency of checks with leak detection system
5t to < 50t	every 12 months	every 24 months
50t to < 500t	every 6 months	every 12 months
≥ 500t	every 3 months	every 6 months

Extended operator obligations: more responsibility and mandatory certification

With effect from 1 June 2015, system operators face considerably more obligations. They bear full responsibility for ensuring that installation, maintenance, servicing, repairs or decommissioning are performed only by certified personnel or certified companies. However, up to now no pan-European standard system exists with clear guidelines for certification. Moreover, operators are responsible for heeding future prohibitions on use – such as the guidelines for charging their systems, and for complying with prohibitions on buying and selling.

Frankfurt, June 2018

eurammon Policy Statement

Cool, Cooler - Natural Refrigerants

Recent worldwide efforts to step up climate protection have heightened people's interest in natural refrigerants, which have been used successfully in refrigeration technology for over 100 years. In the 1950s and 60s, they were displaced in new plants by synthetic refrigerants, touted by the chemical industry as so-called safety refrigerants. Since that time, numerous regulations were passed that unjustifiably restricted competition.

However, thanks to technological innovations and their effectiveness, natural refrigerants have nevertheless become established as an efficient, safe solution for use in a wide range of industries. The most economically relevant among them are ammonia, carbon dioxide and hydrocarbons – ammonia being acknowledged as the most efficient refrigerant of them all.

Natural refrigerants neither deplete the ozone layer (Ozone Depletion Potential, ODP) nor have a global warming potential (GWP) – like ammonia – or only a negligible GWP. Using natural refrigerants is not only eco-friendly, but also worthwhile from an economic standpoint: The refrigerants themselves are inexpensive and available in vast quantities. Furthermore, they have a positive effect on operating costs due to their great efficiency. Add to that the inexpensive disposal of natural refrigerants once a plant has reached the end of its life – you get a product that is beyond comparison.

Future-oriented, Visionary – eurammon

The benefits of natural refrigerants speak for themselves – that is why eurammon has dedicated itself to the use of natural refrigerants worldwide for more than 20 years. Our mission is clear: Since day one in 1996, we have been spreading general awareness and acceptance of natural refrigerants. As an industry initiative of companies, institutions and individuals, eurammon is dedicated to promoting natural refrigerants in the interest of a healthy environment, and to further develop a sustainable approach to refrigeration. We are confident that our centre of expertise, combined with the strong personal commitment of the eurammon-members and our globally connected network, will lead us to a more sustainable, eco-friendly future.

Whether in the food and beverage industry, in air-conditioning, in sport and recreation facilities, the chemicals and pharmaceuticals industry, in hospitals or in automotives – refrigeration plants using natural refrigerants have proven themselves as an environmentally friendly as well as an economical and reliable solution for producing cold energy. The European association eurammon therefore follows the vision of a future where natural refrigerants are widely used in refrigeration and heating applications.

Frankfurt, April 2020