

Press release

## Natural and sustainable cooling with R723

**Frankfurt (Main), 06-09-2016. Our society's awareness of the importance of a sustainable and environment-friendly use of resources is steadily increasing. More and more companies and institutions are coming to realize that there are environment-friendly alternatives worth looking into for their refrigeration systems. Natural refrigerants such as ammonia dimethyl ether help to protect the environment and improve sustainability.**

According to an analysis by the Umweltbundesamt (German federal environmental agency) in 2014, refrigeration alone accounts for 14 percent of Germany's overall energy consumption, and is responsible for about five percent of direct and indirect greenhouse gas emissions. In consideration of national and international climate protection goals, it is imperative that climate-friendliness in the refrigeration sector be improved. An important contribution can be made by using natural refrigerants such as ammonia dimethyl ether (R723), which is particularly environment-friendly with an ozone depletion potential (ODP) of 0 and a global warming potential (GWP) of 8. It also offers great investment security for operators of refrigeration systems since the refrigerant bans of the EU regulation on fluorinated greenhouse gases don't apply to it.

### Efficient for low refrigerating capacity ranges

The refrigerant ammonia dimethyl ether consists of 60 percent (by mass) of ammonia (R717) and 40 percent of dimethyl ether (RE170) – a propellant gas whose refrigerant properties are similar to those of isobutane. Thanks to its azeotropic boiling behavior, the mixture can be used like a mono-refrigerant, i.e. there is no concentration shift during evaporation or condensation. R723 is particularly efficient in the low capacity range up to 100 kW. The circulating volume flow rate of the vapor phase is about 150 percent of that of ammonia, which means acceptable pipe cross sections and flow velocities even for lower refrigerating capacities. Also, ammonia dimethyl ether has a higher volumetric refrigerating capacity than ammonia, so it is possible to obtain considerably higher refrigeration capacities with the same quantity of R723. In refrigerating systems tested with both ammonia and R723, the COP (coefficient of performance) improved by 7 percent when using the latter. Beside its energy efficiency, the azeotropic mixture also features a high performance coefficient and good oil solubility. “In principle, ammonia-based cooling

systems can be filled and operated with R723. However, the individual application must always be taken into consideration – this is why the conversion should always be clarified with the individual component manufacturers," explains Bernd Kaltenbrunner, member of eurammon and CEO of KWN Engineering GmbH. The energy efficiency of the azeotropic mixture is complemented by a high performance coefficient and a high level of oil solubility. A further great advantage results in the about 15 K lower compression end temperature. This allows that piston compressors reach a larger temperature stroke and enable the use of air-cooled condensers.

R723 is also environment-friendly, cost-efficient, and readily available in sufficient amounts. R723 systems have been in use for many years. All components are available and sold as "ready to plug in" condensing units or chillers. Another advantage: The relevant authorities treat R723 cooling system like R717 systems, and therefore do not require more extensive safety measures," says Kaltenbrunner. Its low acquisition costs, along with being future-proof and reliable, make the natural refrigerant a popular choice for planners and operators of refrigerating systems.

### **An environment-friendly add-on for existing systems**

These aspects were also in the focus of a project realized by eurammon member Th. WITT Kältemaschinenfabrik GmbH for Herrmannsdorfer Landwerkstätten, a food-producing company. The family-owned business from Bavaria doesn't only set great store by organic farming and food processing, but makes a point of pursuing a holistic sustainable subsistence strategy. This is why the company, when planning a new refrigerating system, looked into environment-friendly alternatives that were not only durable and energy-efficient, but also used natural refrigerants. The idea was for a new cooling system to add to the capacity of the existing one, an ammonia-operated chilled-water system. Herrmannsdorfer Landwerkstätten also wanted their system to be reliable, safe, and easy to maintain.

Against this background, eurammon member Th. WITT Kältemaschinenfabrik GmbH installed a chilled-brine compact refrigeration unit, tailor-made for the specific requirements, charged with 20 kg of the natural refrigerant ammonia dimethyl ether. Using two reciprocating piston compressors, the system has a refrigeration capacity of 64 kW, and is equipped with an evaporator and two condenser fans. Thanks to the combination of R723 as a refrigerant and air-cooled condensation with EC fans, the refrigeration unit can reach a very high energy efficiency under both full and partial load. Despite being completely encased, the refrigerating system can be easily cleaned and serviced thanks to removable

side parts. Equipped with a UMTS modem and a W-LAN connection, the entire system can be monitored via the internet.

### **Perfect cooling components for meat processing**

The refrigerant R723 also played the leading part in a project of another eurammon member, HKT Huber-Kälte-Technik GmbH. The refrigeration engineering experts from Halfing, Bavaria, are currently supporting ABC Foodmachinery s.r.o., a company based in Bratislava, in a project for one of their clients from the meat-processing industry, and contributed an R723 refrigeration unit for the construction of a new external refrigerating system. The unit has a refrigeration capacity of 135 kW. At the same time, the cooling set is equipped with heat recovery as full condensation. Therefore, the maximum heating power is 180 kW. This performance is achieved with a fill quantity of merely 7.5kg R723 coolant. The condensers are operated with the fully synthetic alkyl benzene oil.

Regarding the conceptual design of the system, two aspects were of particular importance to the client: energy efficiency and low operating costs. Also, the new solution should use natural refrigerants, be long-lived and durable, and help to reduce CO2 emissions. A special challenge for the planners and fitters was to install the system on the flat roof of the plant, because this required additional measures during assembly and installation. With this newly installed cooling system, the client now possesses the region's largest R723-based system for poultry production.

### **Economically sensible and climate-friendly**

Efficient, environment-friendly, energetically advantageous, cost-efficient, and readily available in sufficient amounts: The list of advantages for R723 is long and convincing. The natural refrigerant is especially efficient in the low and medium range of refrigeration capacity - a cooling solution for all kinds of requirements. R723 cooling systems are a good option to operate industrial cooling systems with a natural coolant. Together with R744 and the hydrocarbons, this gives us another option to use a more environmentally-friendly and climate-friendly system technology," sums up Kaltenbrunner.

## Captions

Picture 1:



The environment-friendly and cost-efficient refrigerant R723 convinced the food-producing company Herrmannsdorfer Landwerkstätten.

Picture 2:



eurammon member Th. WITT Kältemaschinenfabrik GmbH installed a chilled-brine compact refrigeration unit, tailor-made for the specific requirements of Herrmannsdorfer Landwerkstätten.

Picture 3:



eurammon member HKT Huber-Kälte-Technik supported the company ABC Foodmachinery s.r.o. based in Bratislava and contributed an R723 refrigeration unit for the construction of a new external refrigeration system.

### About eurammon

eurammon is a joint initiative of companies, institutions and individuals who advocate an increased use of natural refrigerants. As a knowledge pool for the use of natural refrigerants in refrigeration engineering, the initiative sees as its mandate the creation of a platform for information sharing and the promotion of public awareness and acceptance of natural refrigerants. The objective is to promote the use of natural refrigerants in the interest of a healthy environment, and thereby encourage a sustainable approach in refrigeration engineering. eurammon provides comprehensive information about all aspects of natural refrigerants to experts, politicians and the public at large. It serves as a qualified contact for anyone interested in the subject. Users and designers of refrigeration projects can turn to eurammon for specific project experience and extensive information, as well as for advice on all matters of planning, licensing and operating refrigeration plants. The initiative was set up in 1996 and is open to companies and institutions with a vested interest in natural refrigerants, as well as to individuals e.g. scientists and researchers.

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