

# A View of the Future: Heat Pumps, Lower GWP Refrigerants, Digitalization

**NUREMBERG, GERMANY**—When Chillventa's entrance gates opened for the first time in four years recently, the 844 exhibitors were uncertain of what to expect. When the three-day fair (and one of the premier refrigeration technology events in the world) ended, the verdict was in—30,773 visitors had packed the stands and aisles of the show.

Though there was a small drop in the number of exhibitors and visitors compared to 2018, exhibition stands were bigger with no falloff in visitor quality. About 81% were directly involved in the purchasing and procurement decisions in their businesses, according to Elke Harreiss, Chillventa's executive director. "From manufacturers to plant operators, dealers, designers, architects and tradespeople, everyone was there once again," she said.

To Petra Wolf, a member of NürnbergMesse's executive board, it was the enthusiasm on the faces of exhibitors and visitors that impressed her the most. "As an industry with vast potential for the future, there were many important things to discuss," she said.

## Future on Display

Refrigerant choices in Europe are shaped by the European Union's (EU) F-gas regulation (EU 517/2014) that aims to reduce F-gas emissions by two thirds of 2014 levels by 2030. This is being achieved by a quota system for hydrofluorocarbons (HFCs) (R-32, R-410A, R-134a, for example). In April, the European Commission unveiled a revision of the F-gas regulation to further reduce emissions by at least 55% by 2030 and also make Europe climate neutral by 2050. This means tightening the quota system for HFCs reducing the potential climate impact of the new HFCs coming onto the EU market by 98% between 2015 and 2050 to the extent that F-gases would only be used in new equipment where no suitable alternatives are available.

German manufacturer Efficient Energy GmbH exhibited its Bluezero® technology that uses water (R-718) as a refrigerant. The climate-neutral certified chillers of its

eChiller product family dispense entirely with fluorinated refrigerants. Water has a global warming potential (GWP) of zero and does not fall under the F-gas regulation. Cooling can be distributed by either water or air.

MIRAI INTEX, founded in Switzerland, exhibited what it calls "nothing but air." MIRAI's refrigerating technology uses air, with its zero GWP, as the refrigerant. Air is not a subject of F-gas regulation. The air cycle is widely used in air separation plants as a cooling stage to obtain cryogenic cold, to liquify natural gas, as well as in aircraft air-conditioning systems.

## Ammonia Among the Solutions

GEA Heating & Refrigeration Technologies was one of the companies offering ammonia-based solutions. The company announced expansion of its semi-hermetic product portfolio, presenting two new screw compressor models: GEA CompaX 350 and 400. For the GEA BluX chiller, there will be major technical enhancements and adaptations for optimal implementation to the compressors. GEA promotes ammonia (R-717) as a compliance path to F-gas regulation because of its ozone depletion potential (ODP) and GWP of zero. The company says its solutions provide high efficiencies by using ammonia and state-of-the-art motor and compressor technology.

## Propane

Europe's F-gas regulation has also raised the profile of propane, R-290, as a refrigerant choice. When mechanical refrigeration was first introduced, propane was among the commonly used, first-generation refrigerant choice, but its popularity decreased as nonflammable refrigerants came into the market. Now because of its low ODP and GWP, propane is winning favor again. In 2019, the European Commission increased the charge limit of R-290 to 500 g (1.1 lb) from 150 g (0.3 lb) to boost its use.

Panasonic announced that next year it will release three new home models of its Aquarea L Series heat pumps

using propane (R-290). The air-to-water technology that captures heat energy from the ambient air, transferring it to heat domestic water and cool the house, has a Seasonal COP of up to 5.12. It is the first of the Japanese manufacturers to announce shifting to R-290 from R-32 as an alternative for the European market and is a part of Panasonic's Green Impact plan to reduce CO<sub>2</sub> emissions from its own operations to virtually net-zero by 2030.

### Good Place to Find Heat Pumps

Last year, heat pump sales grew by 34% in Europe, according to the European Heat Pump Association, with 2.18 million heat pump units sold in 21 countries—nearly 560,000 more than in 2020. This brings the total number of installed heat pumps in the EU to 16.98 million, covering around 14% of the heating market.

The U.K. announced its target to install 600,000 heat pumps by 2028 as part of its Heat Pump Ready Programme. The key objectives of the plan are to reduce costs and increase the performance of domestic heat pumps, to minimize disruption in homes during installation of heat pumps and to develop financial models that support an increase in heat pump deployment. The German government has its new Climate Action Programme 2030 that bans the installation of oil-fired heating systems from the year 2026 in buildings where more climate friendly alternatives are available. Rebates paying up to 40% of the cost are available for replacing old oil-fired heating systems with more climate friendly energy sources for heating. Also, the government is making available millions in research grant funding for projects aimed at decarbonizing heating and cooling and accelerating the transition to heat pumps. On October 10, the Fraunhofer Institute of Solar Energy Systems announced that it had set a new record for efficiency in heat pump refrigeration cycles using propane.

According to regulators, even when powered with electricity entirely from fossil-based generation, a heat pump consumes about a third of primary energy compared to a classic boiler to provide the same heating capacity. Its efficiency is due to using available process waste heat or other heat sources from the environment.

“Heating and cooling accounts for more than half of the energy consumed in Germany, and the government is throwing its weight behind key technologies like heat pumps,” says Robert Hermann, CEO of Germany Grade & Invest. The potential for heat pumps in home heating in

Germany, the most populous member state of the EU, is immense. It is estimated that heat pumps could be used in some 17 million of Germany's 19 million residential buildings. Heat pump manufacturers are jumping in to meet this environmental demand created by the government's push to reduce CO<sub>2</sub> emissions and at the same time meet consumers' demand for more comfortable homes with the option of cooling added for an increasingly warm climate.

Sandro Matic, president of Emerson Commercial & Residential Solutions in Europe, spoke of the need to deliver “future-proof solutions” to customers by providing sustainable solutions that help customers reduce their environmental footprint and address regulatory challenges. To this point Matic said, “Challenges fuel innovation. We are using innovative technology to overcome today's and tomorrow's challenges.”

As the EU is committed to phase out fossil fuels in heating, air-to-water heat pumps are expected to take over the market due to their sustainability and cost efficiency benefits. Regulations require the use of refrigerants with lower global warming potential to limit their impact on climate change. At the same time, original equipment manufacturers (OEMs) are compelled to develop future-proof systems based on different refrigerants and bring them to market as quickly as possible.

To meet demand, Emerson showcased its range of innovative refrigeration solutions released for natural refrigerants CO<sub>2</sub> (R-744) and propane (R-290) and for low GWP A2L alternatives. The commercial refrigeration portfolio Emerson displayed at Chillventa was tailored to different store formats and included solutions for centralized and decentralized architectures as well as integral display case architectures.

### Digitalization Path to Energy Efficiency

A common refrain heard when visiting stands was that customers are calling for solutions to achieve maximum energy efficiency, citing skyrocketing energy prices and the growing number of regulations worldwide that are pushing companies to their limit in terms of their energy budgets. The International Energy Agency (IEA) estimates that global energy intensity needs to improve at a rate that is two to three times higher to meet Europe's target of net zero emissions by 2050. This means the rate of improvement should increase by more than 4% a year between 2020 and 2030. For comparison,

the rate at which energy intensity improved was 1.7% between 2010 and 2020.

BITZER, the compressor and electronic components manufacturer, announced its digitalization solution to achieve improved energy efficiency. Technical progress and delivering customer-specific solutions are making components and systems increasingly complex, Bitzer said, meaning control and operation is requiring more and more time — and thus money. Due to the lack of skilled workers, BITZER is addressing a growing market for support services based on utilizing digital information from RAC equipment.

Carrier Commercial Refrigeration announced that it can help its customers reduce energy usage up to 40%. In response to sharp increases in energy costs globally, Carrier has launched its new Energy Optimization Program, a broad portfolio of EcoDesign-compliant products and solutions to provide businesses — from small commercial applications to large industrial installations — access to an array of modern energy and cost-efficient technology. As part of this program, Carrier offers on-site energy evaluations during which

it provides custom recommendations on how to reduce energy consumption at the customer's site.

“We understand the uncertainty our customers are experiencing with the unprecedented spike in energy prices, and we are partnering with them to help reduce energy costs while continuing to maximize merchandising opportunities,” said David Appel, President, Carrier Commercial Refrigeration. “We have a strong portfolio of energy-efficient products that can make a real difference for our customers to reduce their energy cost exposure now and prepare for an unpredictable 2023. These solutions may ultimately be the difference between a store remaining open or shuttering its doors. We are committed to working with our customers to meet this challenge head on and are offering on-site energy evaluations to help them better understand their energy usage and alternative solutions.”

### The Next Chillventa

The next edition of Chillventa will take place on October 8 and 9, 2024, as always, in Nuremberg, Germany.

— W.S. Comstock, *Special to ASHRAE Journal* ■

## Women in Cooling

**NUREMBERG, GERMANY**—World Refrigeration Day (WRD) and the United Nations Environment Programme (UNEP) OzonAction described the new International Network for Women in Cooling (INWIC) at the Chillventa trade fair in Nuremberg, Germany.

INWIC aims to help address the qualified worker shortage by making the field more attractive to women. This recently launched initiative connects women currently working in the sector, empowering them to progress in their career and to become visible role models to attract the next generation of female engineers and technicians.

“By bringing together women from all continents, INWIC enables the sharing of experiences, successful local policies and career opportunities, which would not be available otherwise,” said Sonja Wagner with UNEP. “It provides an opportunity for women to learn from each other, understand how to bring positive

change in each cultural context, and to promote the beneficial environmental aspects of the refrigeration, air conditioning and heat pumps (RACHP) profession.”

A recent survey of 800+ women from all continents conducted by the International Institute and INWIC found that the top five challenges faced by women entering in the cooling sector were: difficulties in managing a healthy work-life balance, lack of career advancement opportunities, stereotypes or prejudice about women from clients or customers, no other female colleagues in their organization, and limited training opportunities to further develop their skills.

INWIC has the support of leading national and global cooling associations. It will launch with an online platform with mentoring guidance and role model profiles in the coming weeks. ASHRAE is a founding partner of INWIC. ■