

INDUSTRY KNOWLEDGE

May 2023

The future of refrigeration, AC and heat pump technology

An overview by Dr Rainer Jakobs

Chillventa 2022 showed that companies from the refrigeration, AC and heat pump sectors were able to maintain or in some cases expand their sales, despite ongoing social and economic challenges like delivery problems, Russia's war of aggression against Ukraine, or the effects of the Covid-19 pandemic. Although the prospects for the sector are very promising, there is still a range of existing and new challenges to be faced. Dr Rainer Jakobs (DMJ Beratung) discusses the outlook for the industry until the next Chillventa in October 2024.

Refrigeration, AC and heat pump sector on the up: Ambitious plans for expanding the use of heat pumps

The government's target of installing six million heat pumps by 2030 is clear evidence of the recognition by policymakers that heat pumps represent an important building block for the energy transition. "The heat pump sector will make a key contribution to finally tackling the major tasks in the building sector. It has already provided support in advance by investing billions in the expansion of production capacities," says Dr Martin Sabel, Managing Director of the BWP (German Heat Pump Association). In recent years, the industry has managed to achieve massive increases in the expansion of heat pumps. According to the BWP, 236,000 heat pumps were installed in Germany in 2022, equivalent to an increase of 53 percent compared with the previous year. The majority were used within the scope of renovation works "generally involving radiators and higher flow temperatures" (**Source**).

Currently, production capacities in the sector are being increased, based on the German coalition government's announced 65 percent rule for renewable

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energies when heating systems are being replaced. “The sales figures for January and February 2023 (29,000 heat pumps each month) mean that the target of 350,000 heat pumps for this year is within reach,” concludes Dr Martin Sabel (**Source**). Positive developments for the heat pump sector are expected particularly for detached and semi-detached homes and neighbourhood use, but also for commercial and industrial applications such as converting oil and gas systems to industrial heat pumps or utilising waste heat from data centres. By 2024 alone, the government is planning to install half a million heat pumps. Nevertheless, the high cost of electricity and the electricity-to-gas price ratio continue to present a challenge (**further information**). In Germany, electricity per kilowatt hour is currently around 3.3 times as expensive as gas – in Sweden and the Netherlands, it is around 1.2 to 1.5 times (see PDF in download area).

Opportunities offered by hybrid systems

Climate-induced global warming is causing an increase in the number of hot days (> 30°C) per year, resulting in a continuing increase in demand for air conditioners in both workplaces and homes. In this context, a combination of different systems can be practical, e.g., air conditioning systems in conjunction with a heat pump (air/air) or solar panels combined with air conditioners. The latter is economically and ecologically efficient because at high temperatures a lot of energy can be generated through solar radiation that can then be used directly for air conditioning. The refrigeration segment must also cover a constantly rising demand in the market, whereby hybrid systems that can provide both cooling and heat are becoming increasingly important. To be able to meet both cooling and heating in one system is the ultimate challenge and makes the use of waste heat one of the most important tasks in refrigeration technology.

Challenges for the refrigeration, air conditioning and heat pump sector

The previous principle of just-in-time deliveries is being pushed to its limits (and will reach them) due to ongoing international challenges like trade, system and competition disputes or disrupted supply chains. For example, producers are having to keep inventory again, and the importance of supplier diversification is being reassessed. When looking for suitable alternatives,

the principle of the circular economy and automated production in your own country may offer solutions and could be promoted by the German “Supply Chain Act”.

Discord over new F-gas Regulation

Due to the amendments to the F-gas Regulation and discussions about PFAS, refrigerants represent another ongoing challenge that affects all sectors. Various comments on the vote in the EU parliament on 30 March 2023 illustrate the different attitudes to the regulation:

- **APPLiA: Major setback for heat pumps in Europe**
- **EFCTC: Members are disappointed**
- **CoolingPost: “Disastrous” for Spain**
- **EPEE: EU risks shooting itself in the foot**
- **CoolingPost: A “missed opportunity”**
- **EHPA: Ban jeopardises REPower targets**
- **JARN: Accelerates HFC Phase-out**
- **CoolingPost: Vote sets “unrealistic” goals**
- **EIA: Welcomes ambitious F-gas vote**
- **EHPA: ... must avoid stifling clean heating**

Shortage of skilled personnel also evident in refrigeration, AC and heat pump sector

The shortage of skilled personnel is a major challenge in all areas of society. In the refrigeration and air conditioning segments, this is aggravated by the fact that the industry has so far received little attention from the public. Although the sector is small, it is very attractive, albeit comparatively unknown. At least now there is a recognition that there has been little investment in building the image and familiarity of the sector to date. One area of refrigeration technology that the public has not been very familiar with so far is cryogenic engineering. The LNG terminals (LNG = liquefied natural gas = -162 °C) built at what the government calls the “new German speed” have brought cryogenic technology into the public eye for the first time. The idea that these terminals could also be used later for liquid hydrogen at a

temperature of -253°C is correctly located in the field of cryogenic technology for the purposes of clarification.

Subsidies and professional development for the sector

On 1 April 2023, the German Federal Ministry for Economic Affairs and Climate Action launched its Heating Optimisation Funding Programme. This programme supports training in both the design and installation of heat pumps in existing buildings, as well as on-site coaching (on-the-job training). “Over a period of 30 months, at least 17,500 tradespeople a year, and around 3,000 designers and energy consultants, are to be trained in the use of heat pumps in existing buildings” (**Source**).

The trend towards the use of flammable refrigerants necessitates relevant initial and ongoing training and professional development workshops: Nowadays, a refrigeration specialist also needs to be an energy consultant who can help users to implement and comply with all regulations, as users are not generally familiar with them.

At a glance

- The use of oil and gas for heating is on the way out; heat pumps are an accepted solution and are being promoted by means of targets and subsidies.
- Hybrid systems are becoming increasingly important from the point of view of “energy performance”.
- The circular economy will be a key building block in overcoming current economic challenges.
- The lack of skilled personnel will affect the capacities of the various sectors in all areas.
- The question of the direction that refrigerants will take in the future needs to be clarified.

Recommendations

- The utilisation of waste heat offers a huge and rapidly increasing potential.

- The technologies of refrigeration, heat pumps, energy storage and “energy networks” are already available and are continually being improved and developed.
- New business models are being developed based on waste heat utilisation, e.g. heat trading, heating and cooling networks, and energy networks. In future, unused waste heat is to be avoided.
- Designers and equipment manufacturers should always review all options and provide the operator with comprehensive advice – and this calls for creativity.

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