

# **Heat pumps in industrial processes – a key technology of future energy systems**

*Veronika Wilk, Franz Helming*

*AIT Austrian Institute of Technology GmbH*

*Giefinggasse 2, Vienna, Austria*

## **Introduction**

The climate crisis will affect our lives for a long time to come. There will have to be further technological development and reorientation in our societies. In the field of heat pumps, a development has been taking place for several years that was clearly underestimated and is considered a hidden champion. This is clearly evident in the heating of buildings, but also applies to the energy supply of industrial processes. As a key technology, the heat pump will be an essential element for decarbonization and will be used on a large scale. In a significant number of industrial processes, required utilization temperatures were not possible with heat pumps a few years ago. The development and demonstration of so-called high-temperature heat pumps has overcome this barrier. This article provides insight into two areas of application for this cross-sectional technology and shows its potential.

## **High temperature heat pumps in drying processes**

High-temperature heat pumps were successfully demonstrated in the process heat supply of drying processes in the H2020-project DryFiciency. Demonstrators were developed, manufactured and operated in this project. These water-to-water heat pumps were operated with utilization temperatures of up to 160°C in an industrial environment. The component manufacturers involved are now preparing their products for market launch. This will provide new opportunities for plant designers and installers to enable their customers to increase energy efficiency and thereby decarbonization. For some operators of drying processes, these plants will be a first point of contact with high-temperature heat pumps and will lead them to analyze their processes for the applicability of such heat pumps.

## **High temperature heat pumps for saturated steam generation**

Steam serves as an efficient medium for heat transfer and as a reaction agent in a variety of industrial processes. With the further development of high-temperature heat pumps with utilization temperatures above 100°C, the generation of saturated

steam is obvious. This has been recognized and taken up by heat pump manufacturers. Two main types of low-pressure steam generation have become established. The so-called direct steam generation and the steam generation using a water-to-water heat pump using a flash tank. In the H2020-project BAMBOO, these types of heat pump steam generators are being investigated and demonstrated in an industrial environment. Heat pump manufacturers are close to entering the market with their products.

### **Conclusion and market outlook**

The industrial heat pump is predicted to play a significant role in future process heat supply. This contribution summarizes the market volume outlook from studies [1,2] and the IEA's "Net Zero by 2050" report [3]. Demonstration projects such as DryFiciency and BAMBOO are paving the way for heat pump manufacturers, plant manufacturers and users of industrial heat pumps. They guide technological development and reduce development risk. Field testing is underway or in preparation for the near future to achieve a high number of operating hours and prepare the market for high penetration.

### **References**

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