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EXPERT KNOWLEDGE

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Challenges for the Industrial Heat Pumps

What are the challenges for the industrial heat pumps?

High temperature heat pumps are covering the temperature range from 100 to 140 °C, what is expected in the future?

District heating is changing from fossil fuel boilers to industrial heat pumps. Denmark is leading this development.

Learn more about these issues.

Research and practical applications show increasingly clear that industrial heat pumps (IHPs) are fit for purpose to provide heating/cooling to industrial applications and district grids. The latest outcomes of the [HPT TCP Annex 48](#) show more than three hundred good practices of IHPs in a variety of applications such as drying, washing, evaporation, and distillation processes. Industries that can benefit from this technology extend over a wide field such as food and beverage processing, forest products, textiles, machinery, and chemicals.

What are the challenges for IHPs today?

High temperature heat pumps (HTHPs)¹ High temperature heat pumps with heat sink temperatures in the range of 100 to 160°C are expected to become increasingly commercialized in the coming years. Major applications have been identified, particularly in the food, paper, metal and chemical industries, especially in drying, sterilization, evaporation, and steam generation processes. With the **Kigali amendment** to the Montreal protocol and the **EU-F-Gas Regulations** there are not many options at hand regarding suitable refrigerants. Replacement fluids for the currently applied HFCs are required. The actual research gap in the field of HTHPs is to extend the limits of efficiency and heat sink temperature to higher values, while using environmentally friendly refrigerants.

Minimizing Refrigerant Charges^{2,3} Heat exchangers play a vital role in any energy-related system. This also applies to IHPs applications. It is strongly recommended to devise systems that require a minimum amount of refrigerant. By doing so, the price aspect and the potential damage from an accidental leak can be minimized to a greater extent.

Replacement of Steam Boilers⁴ In recent years, Japanese manufactures overcame the difficulty of commercializing heat pumps for industrial use, and installation examples have been reported. Among them, the heat pump system capable of supplying steam with temperatures at 120°C and above is only the Steam Grow Heat pump, which is commercialized in 2011. These IHPs are today under development in different countries.

Integration in District Heating^{5,6,7,8} In Denmark the political goal is to reach 0% CO₂ emission in 2050 and ca. 55% renewable energy (RE) share 2030 including 100% RE based electrical power including 100% phase out of coal in power production.

District heating is used in 65% of all dwellings and will be a major contributor to reach this. As the energy system is transforming to be based on electrical power, IHPs are a central technology. Both tools support the introduction of heat pumps to the market as well as Danish research to reach more efficient systems. In a Swedish research project “Heat Pumps in District Heating Systems” new combinations of HPs and district heating systems have been investigated.

Drying Processes⁹ In industrial processes 12-25% of energy is used for drying. Inefficiency is leading to 11.3 EJ of energy loss in the EU. Technically and economically viable solutions for upgrading idle waste heat streams to process heat streams at higher temperature levels up to 160°C will be elaborated. The key elements are two high temperature vapour compression heat pumps. The solution will be demonstrated and validated under real production conditions in operational industrial drying processes in three leading European manufacturing companies from the pet food, food and brick industries.

The European Heat Pump Summit 2019 will present many different lectures around about the Industrial Heat Pump and their applications with a lot of detailed information about the challenges and the possibilities.

All in all, the European Heat Pump Summit 2019 provides an international platform for professional dialogue and discussion, where industry networks can be built up and cultivated. [Secure your ticket now!](#)

- ¹ High Temperature Heat Pumps, C. Arpagaus, NTB, University of Applied Science, Switzerland, Chillventa CONGRESS 2018, Nuremberg [Link](#)
- ² Minimizing refrigerant charge, Z. Ayub, Isotherm Inc., Texas, USA, Foreword, HPT Magazine Vol. 37 No.1/2019 [Link](#)
- ³ Low Charge Evaporators for Industrial Heat Pumps, Z.Ayub, Isotherm Inc., Texas, USA, HPT Magazine Vol. 37 No.1/2019 [Link](#)
- ⁴ Experimental performance evaluation of heat pump-based steam supply system, T. Kaida et al., 2015 Mater. Sci. Eng. 90 012076 [Link](#)
- ⁵ Industrial Heat Pumps in District Heating in Denmark, Lars Reinholdt, Chillventa CONGRESS 2018, Nuremberg [Link](#)
- ⁶ New ways of combining Heat Pumps and District Heating, M.Lindahl, RISE, Sweden, HPT Magazine Vol. 36 No.13/2018 [Link](#)
- ⁷ Very High Temperature Heat Pump (120°C) Installed at Ghent, Heating District Network, J-M Fourmigue, EPI-EDF, European Heat Pump Summit 2019 [Link](#)
- ⁸ Flexible operation of heat pumps in district heating systems to unlock synergies between the heating and power sector, W. Meesenburg, DTU, European Heat pump Summit 2019 [Link](#)
- ⁹ DRYFICIENCY, <http://dry-f.eu/>, Project Coordinator Veronika Wilk, Scientist at AIT Austrian Institute of Technology [Link](#)

For more information please visit: <https://www.hp-summit.de/en>

Contact for press and media

Bertold Brackemeier, Ariana Brandl
T +49 9 11 86 06-82 85
F +49 9 11 86 06-12 82 85
ariana.brandl@nuernbergmesse.de

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