

# EUROPEAN HEAT PUMP SUMMIT

POWERED BY CHILLVENTA

NUREMBERG, 24.–25.10.2023  
CONGRESS + EXPO

Industrial | Commercial | Residential  
Heating & Cooling | Components & Equipment

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NÜRNBERG MESSE

TUESDAY, 24.10.2023 – Hall Brüssel

Challenges and Opportunities for Heat Pumps	
9:15	<a href="#">Introduction [1]</a> Dr.-Ing. Rainer M. Jakobs   Information Centre on Heat Pumps and Refrigeration IZW e.V.
9:25	<a href="#">Europe's Heat Pump market - The numbers, the context, the EU policy [2]</a> Thomas Nowak   European Heat Pump Association
9:45	<a href="#">The UK's Heat Pump roadmap - Leading the way to net zero [3]</a> James Beal   UK Department For International Trade (DIT)
10:05	<a href="#">UK Government's Heat Pump ready programme [4]</a> Dr. George Bennett   UK Government - Department for Energy Security and Net Zero
10:25	Foyer Expo   Coffee break
Research & Development - Refrigerants	
10:50	<a href="#">F-gas and REACH regulations: a risk of the EU Heat Pump market rampup? [5]</a> Alessia Del Vasto   European Heat Pump Association
11:10	<a href="#">HFO Refrigerants in Heat Pumps and their role in cost-effectively reducing GHG emissions and reliance on natural gas [6]</a> Dr. Bruno Yuji Kimura de Carvalho   Honeywell International
11:30	<a href="#">Residential Heat Pumps with Opteon™ XL20 / R-454C - System optimizations results [7]</a> Hans Dieter Küpper   Chemours Deutschland GmbH
11:50	<a href="#">New working fluid R-474A for BEV thermal management [8]</a> Christian Macri   Daikin Chemical Europe GmbH
12:10	Foyer Expo   Lunch break
13:20	<a href="#">R-290 looks like the winning refrigerant for the upcoming packaged Heat Pumps: Can the winner take all? [9]</a> Fabio Polo   Swegon
13:40	<a href="#">Sensing and safety solutions for Heat Pumps using R-290 and other refrigerants [10]</a> Jan Klein Bluemink & Wouter Oosterwijk   Sensata Technologies
Research & Development - Components Systems	
14:10	<a href="#">Design and selection of heat exchangers for commercial and industrial Heat Pumps [11]</a> Gregor Schmidt   thermofin GmbH
14:20	<a href="#">Advantages of application of Saginomiya components in Heat Pump units [12]</a> Marcin Michalak   Saginomiya Europe
14:40	Foyer Expo   Coffee break
Research & Development - Acoustic	
15:10	<a href="#">Engineering a quiet future: Addressing noise pollution of Heat Pumps [13]</a> Simon Waldner   Getzner Werkstoffe GmbH
15:30	<a href="#">Sound localization techniques for the effective optimization of acoustic emissions from Heat Pumps [14]</a> Dr. Thomas Rittenschober   Seven Bel GmbH
15:50	<a href="#">Noise assessment for Heat Pumps: Development of psychoacoustic metric incorporated in fan development [15]</a> Marcel Rössler   ebm-papst Mulfingen GmbH & Co. KG
Research & Development - Components Systems	
16:10	<a href="#">Sustainable heat exchanger technology for commercial and industrial Heat Pumps using natural refrigerants [16]</a> Tommy Angbäck & Stefano Bissoli   Alfa Laval
16:30	<a href="#">Supporting system manufacturers deliver sustainable and efficient solutions in a hyper growing European heating market [17]</a> Andreea Closca   Copeland Europe GmbH
16:50	<a href="#">High temperature Heat Pump with 150 °C condensing temperature [18]</a> Mauro Bonfanti, Xabier Pēna (Tecnalia) & Miguel Ramirez (TNO)   Officine Mario Dorin
17:10	<a href="#">Large scale Heat Pumps for district heating with R-744 [19]</a> Tobias Fuhrer   Bitzer Kühlmaschinenbau GmbH
17:30	<a href="#">Green Heating with Danfoss [20]</a> Mathieu Stoll   Danfoss A/S
17:50	<a href="#">Summary of the 1st day [21]</a> Dr.-Ing. Rainer M. Jakobs   Information Centre on Heat Pumps and Refrigeration IZW e.V.
18:10	Get-together

Subject to change as of 18.10.2023  
All presentations will be held in English.

WEDNESDAY, 25.10.2023 – Hall Brüssel

Heat Pump Application - Residential	
8:30	<a href="#">Modular low-capacity R-290 Heat Pump water heaters enhanced with compact PCM thermal storage [22]</a> Fabrizia Giordano   AIT Austrian Institute of Technology GmbH
8:50	<a href="#">Towards optimal design and operation of Heat Pumps in residential application [23]</a> Jonas Klingebiel   RWTH Aachen University, Institute for Energy Efficient Buildings and Indoor Climate
9:10	<a href="#">Heat Pump efficiency in old single-family houses: Interim results of large-scale field trial [24]</a> Danny Günther   Fraunhofer Institut for Solar Energy Systems
9:30	<a href="#">Full electric buildings with Heat Pumps. indoor air quality, health, energy: The comfort becomes smart [25]</a> Yannic Kleinschmidt   Clivet GmbH
10:00	Foyer Expo   Coffee break
10:30	<a href="#">IoT enabled Heat pumps - Case studies and market opportunities [26]</a> Dr. Veronika Wilk   AIT Austrian Institute of Technology
10:50	<a href="#">How AI and data optimize Heat Pumps energy consumption [27]</a> Ran Roth   Sensibo
11:10	<a href="#">Integral planning tool for thermal renovation and HP application in multi-apartment buildings [28]</a> Prof. Dr.-Ing. Fabian Ochs   University of Innsbruck
High Temperature Industrial Heat Pumps	
11:30	<a href="#">Development of a high-temperature Heat Pump in the KETEC research project [29]</a> Markus Müller   ILK Dresden Institut für Luft- und Kältetechnik
11:50	<a href="#">Concept of steam compressors in high temperature Heat Pump cascades and experiences of integrated Heat Pump solutions [30]</a> Rüdiger Rudischhauser   SRMTEC Group GmbH
12:15	Foyer Expo   Lunch break
13:20	<a href="#">Integration of high-temperature industrial Heat Pumps [31]</a> Dr. Stefan Henninger   Fraunhofer Institut for Solar Energy Systems
13:40	<a href="#">Turboden large-scale heat pumps beyond 200 °C to play a crucial role in the path for decarbonization of heating sector [32]</a> Emanuele Pingaro   Turboden S.p.A.
14:00	<a href="#">Developing, testing and demonstrating a high-temperature Heat Pump portfolio [33]</a> Tage Petersen   Danish Technological Institute (DTI)
Industrial High Capacity Heat Pumps and Applications	
14:20	<a href="#">How to achieve high seasonal efficiency in balanced thermal grids [34]</a> Caroline Haglung Stignor   RISE Research Institutes of Sweden
14:40	<a href="#">Revolutionizing manufacturing: The plus project's sustainable transformation with R-290 HPs [35]</a> Kaven Nourrice   Frascold S.p.A.
15:10	Foyer Expo   Coffee break
15:30	<a href="#">Journey towards high-capacity Heat Pumps [36]</a> Arul Mike Prakash John   Johnson Controls
15:50	<a href="#">SPIRIT – Full-scale demonstration of industrial Heat Pumps [37]</a> Miguel Ramirez   TNO
Heat Pump Certification	
16:10	<a href="#">Unlocking Energy Efficiency: Certified Heat Pumps and Chiller Technology for a Sustainable Future [38]</a> Tim Kröger   Eurovent Certita Certification
16:30	<a href="#">Summary of the 2nd day [39]</a> Dr.-Ing. Rainer M. Jakobs   Information Centre on Heat Pumps and Refrigeration IZW e.V.
16:50	End

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All presentations will be held in English.



# THE HEAT PUMP WORLD MEETS IN NUREMBERG



Dr.-Ing. Rainer M. Jakobs

Coordinator European Heat Pump Summit  
Information Centre on Heat Pumps and Refrigeration IZW e. V.  
German Society of Refrigeration and Air Conditioning DKV e. V.

This year we can execute the eighth Summit with a high-calibre congress programme and more than 35 prominent national and international speakers and a Foyer Expo with 30 exhibitors.

For more than a decade, Chillventa has been one of the most important events for everyone in the refrigeration, AC & ventilation and Heat Pump Technology industry around the world. When 2008 at Chillventa the Heat Pump Symposium started the day before Chillventa, the highly successful Industrial Heat Pump Village and the forum during Chillventa 2008 were the causes for NürnbergMesse to develop this topical issue a stage further. NürnbergMesse offers in 2009 for the first time the **European Heat Pump Summit** to the international Heat Pump industry and all those involved with technologies for effective energy utilization a special B-to-B dialogue platform with Congress and Foyer Expo.

Every two years, it brings together renowned speakers and international decision-makers from industry, commerce, associations, organisations, and the R&D community to enjoy high-level professional dialogue and networking. "Connecting Heat Pump Experts" is the task of the Summit.

The German 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. In particular, we should be pleased that politicians in Germany have now after many lost years caught on the idea of Heat Pumps.

Heat Pumps have also a key role to play in decarbonising heating across the UK that is why UK aims to increase the number of heat pump installations from 55,000 a year in 2021 to 600,000 a year by 2028. By the end of the decade, the UK will be one of the largest markets in Europe for Heat Pumps. See presentations [3-4].

2022 was a record breaking year for Heat Pump sales in Europe, which rose 38 % on the previous year, with 3 million units sold. There are now around 20 million Heat Pumps installed in Europe. The European Commission is planning a Heat Pump Action Plan, to be published by the end of 2023. To support this Action Plan EHPA and other 22 organisations worked together to build a 'Heat Pump Accelerator' document which identifies the barriers and solutions to faster heat pump roll-out. [2]

Green Heating is about low CO<sub>2</sub> emitting heating installations. It is important to consider the right environmental metrics; this is not only about "natural" (as opposed to F-gas) refrigerants or GWP (Global Warming Potential) but rather about TEWI (Total Equivalent Warming Impact) and even better LCCP (Life Cycle Climate Performance). [20]

Throughout the last few decades, there has been a significant effort to improve the environmental impact of refrigerants. This plays also an important role in this Summit. Due to the amendments to the F-gas Regulation and discussions about PFAS, refrigerants represent

another ongoing challenge that affects all sectors. The dialogues talks on the F-Gas Regulation were supposed to end in July 2023 and were then postponed until after the summer holidays. What does the F-gas Regulation mean for the ramp up of the EU Heat Pump market? See the presentations [5-10 and 34].

Large-scale field trial: Heat Pumps in old single family houses are used for space heating and domestic hot water heating and are installed in buildings built between 1826 and 2001. The condition of the buildings ranges from un-renovated to nearly fully renovate and different types of heat transfer systems are installed. The measurement concept includes minute-by-minute logging of the measurement data. The contribution includes interim results of an efficiency analysis for around 40 to 50 Heat Pumps. [24]

The refrigeration segment must also cover a constantly rising demand in the market, whereby hybrid systems that can provide both cooling and heating 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. [30]

More than 40 case studies of various IoT enabled Heat Pump products and services were analysed in seven participating countries. The contribution gives insights into the relevance of interconnected Heat Pumps, state-of-the-art use cases, market availability and selected technology trends. [26]

Industry is responsible for over 25 % of EU greenhouse gas emissions, and decarbonising it is the key to achieving Europe's climate goals. Industrial heating is a particular challenge due to the high temperatures needed by many industries. The need and interest in Industrial Heat Pumps (IHP) for process heat generation to decarbonize the industrial environment increased significantly in recent years. Using renewable electricity and high-temperature Heat Pumps (HTHP) can mitigate these risks and associated challenges. HTHP see Presentations [29-32 and 33] and IHP [34-37]

More short description of the presentations you will find on the following pages.

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 question of the direction that refrigerants will take in the future needs to be clarified.

I thank all speakers for their contributions and all companies, associations, and societies for their support and wish the participating Heat Pump community a successful Summit, animated discussions and excellent networking.

## TUESDAY, 24.10.2023 – HALL BRÜSSEL

### Challenges and Opportunities for Heat Pumps

- [1] **Introduction**  
Dr.-Ing. Rainer M. Jakobs | Information Centre of Heat Pumps and Refrigeration, IZW e. V.

A short review:

- Highlights from the past Heat Pump Summits
- The current situation and an outlook
- The focus areas of the Summit

- [2] **Europe's Heat Pump market – The numbers, the context, the EU policy**  
Thomas Nowak | European Heat Pump Association

2022 was a record breaking year for Heat Pump sales in Europe, which rose 38% on the previous year, with 3 million units sold. There are now around 20 million Heat Pumps installed in Europe!

Heat Pumps are now avoiding around 54 Mt of CO<sub>2</sub> in Europe – roughly equivalent to the annual emissions of Greece. Thomas Nowak will dive deep into European Heat Pump sales data for 2022, and give his views on recent developments in the market. He will also present his views on the European Commission's forthcoming Heat Pump action plan.

EHPA and a group of organisations are building a 'heat pump accelerator' which identifies the barriers and solutions to a faster heat pump roll-out in line with the REPowerEU targets, and will feed into this action plan.

- [3] **The UK's Heat Pump Roadmap – Leading the way to net zero**  
James Beal | UK Department For International Trade (DIT)

The UK Government is committed to ambitious action to decarbonise the way homes and businesses are heated. Heating is responsible for over a third of UK carbon emissions. Net Zero by 2050 means to decarbonise the heating of over 30 million homes and businesses across the UK in a little over 25 years. Heat Pumps have a key role to play in decarbonising heating across the UK. To accelerate the Heat Pump roll-out, the UK Government is delivering a package of policies, including targeted regulation, a new market-based mechanism, and public investment through programmes such as the "Boiler Upgrade Scheme".

- [4] **UK Government's Heat Pump ready programme**  
Dr. George Bennett | UK Government - Department for Energy Security and Net Zero

The UK Government's Department for Business, Energy & Industrial Strategy is embarking on a 3-year innovation programme, 'Heat Pump Ready', part of its 'Net Zero Innovation Portfolio'. Heat Pump Ready is split into three complementary streams:

- Stream 1: Solutions for high-density Heat Pump deployment
- Stream 2: Developing tools and technology
- Stream 3: Trial support and learning

### Research & Development - Refrigerants

- [5] **F-gas and REACH regulations: A risk of the EU Heat Pump market rampup?**  
Alessia Del Vasto | European Heat Pump Association

EHPA has been focusing over the past year on representing the European Heat Pump sector.

The presentation will explore the consequences of the F-gas and REACH regulations on the European Heat Pump market, taking into account the REpower EU targets as announced by the European Commission in spring 2022. In particular, we will focus on the proposed bans on certain F-gases in Heat Pumps.

- [6] **HFO refrigerants in Heat Pumps and their role in cost-effectively reducing GHG emissions and reliance on natural gas**  
Dr. Bruno Yuji Kimura de Carvalho | Honeywell International

Presentation on market context of HFO refrigerants in Heat Pumps, optimization of residential Heat Pumps for HFO refrigerants (R-454C, R-455A and R-1234yf) to match or surpass R-410A performance. Furthermore a brief discussion on PFAS regulation and the importance of HFOs in overall CO<sub>2</sub> emission goals.





**[7] Residential Heat Pumps with Opteon™ XL20 / R-454C - System optimizations results**  
Dipl.-Ing. Hans-Dieter Kupper |  
Chemours Deutschland GmbH

A residential Heat Pump using R-454C refrigerant has been tested and optimized to get best efficiency and capacity out of the system in an independent laboratory in Germany. The thermodynamic properties of the Low GWP A2L refrigerant Opteon™ XL20 (R-454C) together with compressor envelope data showed promising opportunities for this application.

Finally, the main improvements in energy efficiency and system capacity are being discussed for a range of operating conditions.

**[8] New working fluid R-474A for BEV thermal management**  
Christian Macri | DAIKIN Chemical Europe GmbH

Battery electric vehicles (BEV) will have a significant share in future vehicle fleets. The acceptance of electrified vehicles by the market is essentially dependent on the achievable driving range of the vehicles. The use of Heat Pump systems in BEV is increasing to reduce the energy required by the thermal management.

A summary of current development programs and an outlook on the next steps concludes the presentation.

**[9] R-290 looks like the winning refrigerant for the upcoming packaged Heat Pumps: Can the winner take all?**  
Fabio Polo | Swegon

R-290 is going to be adopted as the main standard refrigerant for Monobloc Heat Pumps in residential and commercial comfort applications. The commercial comfort application is the main focus of this presentation. Current available compressor technologies to build R-290 Monobloc Heat Pumps are investigated, highlighting the pros and cons in terms of efficiency, optimization and working envelopes.

## Research & Development - Components, Systems

**[10] Sensing and safety solutions for Heat Pumps using R-290 and other refrigerants**  
Jan Klein Bluemink | Sensata Technologies //  
Wouter Oosterwijk | Sensata Technologies

Across a wide variety of engineering challenges facing companies right now, perhaps no piece of this transformation has gotten as much attention as the push to increase the use of Heat Pump technology across the entire European Union. The core of any Heat Pump is the careful balance between the temperature and pressure of the refrigerant which drives system efficiency and safety – particularly with the safety measures needed to manage R-290 refrigerant.

**[11] Design and selection of heat exchangers for commercial and industrial Heat Pumps**  
Gregor Schmidt | thermofin GmbH

There is enormous potential for the use of Heat Pumps in commercial and industrial applications. This presentation examines different heat exchanger designs and system concepts for air-source Heat Pumps, regarding ambient conditions and operating situations in commercial and industrial applications. This presentation is of interest to planners and operators of Heat Pumps on a commercial and industrial scale, from supermarkets to district heating.

**[12] Advantages of application of Saginomiya components in Heat Pump units**  
Marcin Michalak | Saginomiya Europe

The presentation will provide an overview of the line-up of Saginomiya components for Heat Pumps. It will start with a brief overview of the Heat Pump circuit with focus on its most important parts and their function in the system. The speaker will move on to describe each specific part with further explanation on its location and function in the system, and, most importantly, the advantages that use of Saginomiya components brings for design and performance of the final unit.

## Research & Development - Acoustic

**[13] Engineering a quiet future: Addressing noise pollution of Heat Pumps**  
Simon Waldner | Getzner Werkstoffe GmbH

As the number of Heat Pumps increases, so does the noise pollution for residents. The presentation will show how noise emissions can be reduced through effective internal decoupling of Heat Pump components and of the whole Heat Pump. Using PU dampers has huge advantages in comparison to conventional ones. The measurements show that, among other things, more efficient vibration isolation with polyurethane than with conventional rubber mounts is possible.



**[14] Sound localization techniques for the effective optimization of acoustic emissions from Heat Pumps**  
Dr. Thomas Rittenschober | Seven Bel GmbH

Modern Heat Pumps are designed for low sound emissions. Acoustic cameras can be effectively used to isolate the acoustic weaknesses of a construction or its sub-optimal installation in the field. The goal of the presentation is to give the audience a comprehensive overview of the capabilities and limitations of the technology with explicit reference to its use for both engineering and field service applications in the Heat Pump industry.

**[15] Noise assessment for Heat Pumps: Development of psychoacoustic metric incorporated in fan development**  
Marcel Rössler | ebm-papst Landshut GmbH

Today, using renewable energies is absolutely essential for climate protection. That is why air/water Heat Pumps enjoy a high level of acceptance in heating technology. Demand for them is rising and, with heat outputs from 3 to 30 kW, they are a useful solution for detached homes and apartment blocks. How does a component manufacturer like ebm-papst support the Heat Pump industry with regard to low-noise applications and high-efficiency systems as well as predictive maintenance topics and the use of new refrigerants?

## Research & Development - Components, Systems

**[16] Sustainable heat exchanger technology for commercial and industrial Heat Pumps using natural refrigerants**  
Tommy Angbäck, Stefano Bissoli | Alfa Laval

Going through the worst energy crisis in decades, society is struggling to break free from its dependence on gas, coal and oil and find alternative, reliable heat transfer sources. Heat Pumps represent an important piece in the new energy puzzle. In this presentation, we will describe how Alfa Laval heat exchanger development makes it possible to create efficient and sustainable fossil-free heating solutions using natural refrigerants.

**[17] Supporting system manufacturers deliver sustainable and efficient solutions in a hyper growing EU heating market**  
Andreea Closca | Copeland Europe GmbH

Copeland's mission to help decarbonize heating in Europe continues with the development of a complete range of fixed and variable speed compressors with R-290 up to 200 kW. With best-in-class efficiency and the lowest sound power level available, OEMs now have numerous options to improve their systems. In addition, Copeland acknowledges that local supply is more essential than ever by expanding its manufacturing capabilities and local customer support to sustain the high demand for Heat Pump technology in the years to come.

**[18] High temperature Heat Pump with 150 °C condensing temperature**  
Mauro Bonfanti | Officine Mario Dorin;  
Miguel Ramirez | TNO; Xabier Peña | Tecnalia

Dorin started developing R-744 transcritical compressors in 1991 with the first transcritical application in late '90s. In 2012 Dorin developed the ATEX range with dedicated technology for hydrocarbon solutions. Dorin expands its product offering by introducing an innovative range of compressors for R-744 and hydrocarbons specially designed for high efficiency. A study on high temperature Heat Pumps reaching 150 °C condensing temperature and recent improvements together with TNO will be presented in the lecture.

**[19] Large scale Heat Pumps for district heating with R-744**  
Tobias Fuhrer | BITZER Kühlmaschinenbau GmbH

The presentation focus is on the basic system design and large-scale R-744 compressors for Heat Pump district heating applications. Local district heating networks are available in different designs and temperature levels. The third- and fourth-generation of local district heating networks are particularly suitable for retrofitting Heat Pump systems due to their supply and return temperatures. System capacities of 1 MW up to 16 MW are typically realized.

**[20] Green Heating with Danfoss**  
Matthieu Stoll | Danfoss A/S

Danfoss is committed to the reduction of CO<sub>2</sub> emissions in the heating sector and supports OEMs & installers with energy efficient components, solutions & services both on the Heat Pump & hydronic side. In addition Heat Pump components are qualified & optimized with the greenest of suitable refrigerants. We will focus specifically on the key components that have an impact on energy efficiency or are impacted by the refrigerant selection: compressors, heat exchangers, expansion valves, electronic radiator thermostat, dynamic balancing valves, control logics/optimization service.

**[21] Summary of the 1st day**  
Dr.-Ing. Rainer M. Jakobs | Informationszentrum  
Wärmepumpen und Kältetechnik e.V.

A review of the first day with a short report on each presentation.







## Heat Pump Application - Residential

- [22] **Modular low-capacity R-290 Heat Pump water heaters enhanced with compact PCM thermal storage**  
Fabrizia Giordano | AIT Austrian Institute of Technology GmbH

At the AIT Austrian Institute of Technology GmbH, innovative Heat Pump solutions are developed in collaboration with industrial partners across Europe to replace gas boilers in large multi-family houses, combining ease of installation, modularity, ecological refrigerants, thermal storage and acoustic optimisation.

The solution of the project replacement of gas boilers is currently under development and will be demonstrated in a multi-family house. The Heat Pump water heater is enhanced by a compact storage module with a refrigerant-PCM-water heat exchanger and a storage capacity of 6-9 kWh.

- [23] **Towards optimal design and operation of Heat Pumps in residential application**  
Jonas Klingebiel | RWTH Aachen University, Institute for Energy Efficient Buildings and Indoor Climate

To exploit to potential of Heat Pump systems in residential application, there is a need for optimal design and operation. While numerous theoretical studies exist, there are few experimental studies that demonstrate the potential. We validate optimal design and operation in our VCLab. The results evaluate the potential of Heat Pump systems for residential applications and recommend perspectives for further investigation.

There is a huge potential for optimal design and operation to be shifted from academia to practice to pave the way toward low-emission heating supply in buildings.

- [24] **Heat Pump efficiency in old single-family houses: Interim results of large-scale field trial**  
Danny Günther | Fraunhofer Institut for Solar Energy Systems

Within the „WP-QS im Bestand“ research project, up to 75 air-source and ground-source Heat Pumps in single-family houses built between 1826 and 2001 are being detailed measured under real conditions. The presentation includes interim results of an efficiency analysis for around 40 to 50 Heat Pumps. The research questions can be divided into the following three categories:

- Energy performance and environmental impacts
- Sector coupling
- Quality assurance in the retrofitting process

- [25] **Full electric buildings with Heat Pumps. indoor air quality, health, energy: The comfort becomes smart**  
Yannic Kleinschmidt | Clivet GmbH

According to the European Commission, around 80 % of the final energy consumption in residential buildings is used for space and water heating. Heat Pumps are a mature technology able to fully exploit renewable sources, ambient energy and waste heat. The Heat Pump (HP) technology allows users to operate their home while storing and transferring the energy captured from the sun, through PV systems, in the most effective form, either thermal or electric.

## IoT, AI and Integral Planning Tools

- [26] **IoT enabled Heat Pumps – Case studies and market opportunities**  
Dr. Veronika Wilk | AIT Austrian Institute of Technology GmbH

Ambitious climate, energy and environmental goals require the conversion into an efficient and renewable energy system with low CO<sub>2</sub> emissions. Digitalisation is one of the important factors in the transformation of the energy systems. The presentation gives an overview on the findings of IEA HPT TCP Annex 56 that analysed opportunities and challenges of IoT and digitalisation for Heat Pumps in more than 40 case studies of various IoT products and services.

- [27] **How AI and data optimize Heat Pumps energy consumption**  
Ran Roth | Sensibo

We will discuss the recent and expected growth in Heat Pump adoption and how smart controllers make Heat Pumps even more efficient. Real case studies and how Heat Pumps are lowering energy bills. By continuously analyzing environmental data, AI algorithms learn and adapt to individual users' preferences, fine-tuning heating and cooling operations to achieve the perfect indoor climate while minimizing energy consumption.

- [28] **Integral planning tool for thermal renovation and Heat Pump application in multi-apartment buildings**  
Assoz. Prof. Dr.-Ing. Fabian Ochs | University of Innsbruck

The thermal renovation of the building stock represents an important contribution to the achievement of climate protection goals. Heat Pumps will undoubtedly dominate the heating of buildings in the future, at least in places where district heating or biomass is not possible. This contribution presents the development of a spreadsheet-based approach as an extension for existing spreadsheet tools to support the targeted planning of thermal renovations and the switch to Heat Pump-based heating systems. The user-friendly presentation of the results (e.g. energy flow diagrams) should also allow optimization of the systems and simple communication.

## High Temperature Industrial Heat Pumps

- [29] **Development of a high-temperature Heat Pump in the KETEC research project**  
Markus Müller | Institut für Luft- und Kältetechnik

Currently, a high-temperature Heat Pump for temperatures up to 140 °C in the range of 250 kW heating capacity is being developed at the ILK Dresden. The lecture presents partial results of the development of a high-temperature Heat Pump within the framework of the large joint project KETEC (Research Platform for Refrigeration and Energy Technology) between University of Chemnitz, Fraunhofer ISE Freiburg and the ILK Dresden.

- [30] **Concept of steam compressors in high temperature HP cascades and experiences of integrated HP solutions**  
Rüdiger Rudischhauser | SRMTec Group GmbH

The demand for high temperature fluids in industrial processes is currently covered by fossil fuelled boilers and/or combustion systems. In the quest for decarbonisation Heat Pumps driven by electricity are a great tool if that electricity is generated by green processes. In cascade systems the lift of temperature is split into two steps which make it possible to utilise two different refrigerants at their best properties.

The integrated application of Heat Pumps in refrigeration cycles is a concept of using otherwise wasted energy (emitted to atmosphere by air-cooled condensers) as heat source for a Heat Pump.

- [31] **Integration of high-temperature industrial Heat Pumps**  
Dr. Stefan Henninger | Fraunhofer Institut for Solar Energy Systems

The need and interest in Heat Pumps for process heat generation to decarbonize the industrial environment increased significantly in recent years. In addition to rising costs, the high geopolitical dependence on countries that supply fossil fuels also poses an economic risk. Using renewable electricity and high-temperature Heat Pumps (HTHP) can mitigate these risks and associated challenges. This presentation provides insights and examples of HTHP integration analysis, possible market and available suppliers. Guidelines for future projects and identification of promising processes are derived.





### [32] Turboden large-scale HPs beyond 200 °C to play a crucial role in the path for decarbonization of heating sector

Emanuele Pingaro | Turboden S.p.A.

Turboden have developed large-scale Heat Pumps capable of reaching temperatures up to 200 °C. These Heat Pumps offer high efficiency and can produce thermal power ranging from 3 to 30+ MWth per unit. Heat Pumps' features will be presented together with potential innovative implementations. In addition, some reference cases for both district heating and industrial applications will be described.

### [33] Developing, testing and demonstrating a high-temperature Heat Pump portfolio

Tage Petersen | Danish Technological Institute

High-temperature Heat Pumps with supply temperatures above 100 °C are a key-technology for decarbonizing industrial process heat demands through efficient electrification. This presentation will introduce the development of various high-temperature Heat Pump technologies using water, HC's, and R-744 as working fluids. 6 different demo-systems will be presented, and a status from on the latest testing activities in the HTHP laboratory at DTI will be given.

## Industrial High Capacity Heat Pumps and Applications

### [34] How to achieve high seasonal efficiency in balanced thermal grids

Caroline Haglund Stignor | RISE Research Institutes of Sweden

Balanced thermal networks (BTN) aim to recover low temperature heat and high temperature cooling within a district via a thermal network.

An operational challenge specific to BTN occurs when there is a low heating demand at a relatively low temperature level (e.g. 35 °C) on the condenser side that coincides with a relatively high temperature (e.g. 25 °C) on the evaporator side, resulting in a high thermal capacity of the Heat Pumps system during times with limited heating demand from the building.

### [35] Revolutionizing manufacturing: The plus project's sustainable transformation with R-290 HPs

Kaven Nourrice | Frascold S.p.A.

The Plus project in Magnor, Norway, aims to transform the Plus factory into the world's most environmentally friendly furniture manufacturing facility. The core of this project is based of Enrad Heat Pumps equipped with Frascold compressors, specifically designed for R-290. The project exceeds emission reduction goals.

### [36] Journey towards high-capacity Heat Pumps

Arul Mike Prakash John | Johnson Controls

Johnson Controls Europe comes with a legacy of +300 installations and +700 MW of Heat Pumps in the last decade, both as a product supplier and as turnkey system integrator. The presentation will focus on the following: 3 case studies from across Europe and the upcoming new product introductions from Johnson controls in the high-capacity space will be presented.

The new product introduction details will focus on technology, its adaption, and the journey beyond 100 °C. Latest innovations in the digital & sustainable infrastructure space complement the outlook.

### [37] SPIRIT – Full-scale demonstration of industrial Heat Pumps

Miguel Ramirez | TNO

Industry is responsible for over 25 % of EU greenhouse gas emissions, and decarbonising it is the key to achieving Europe's climate goals. Industrial heating is a particular challenge due to the high temperatures needed by many industries.

The EU-funded SPIRIT project will address this challenge. The presentation will cover the objectives and status of the project that will demonstrate three full-scale (> 0.7 MWth) industrial Heat Pump systems upgrading waste heat to valuable temperatures (135-160 °C) in the paper & pulp and food & beverage industry.

The ultimate goal of the project, which will run for 3.5 years, is to enable industrial Heat Pumps to become the reference technology for covering industrial heat demand for temperatures up to 160 °C by 2030.

## Heat Pump Certification

### [38] Unlocking Energy Efficiency: Certified Heat Pumps and Chiller Technology for a Sustainable Future

Tim Kröger | Eurovent Certita Certification

Eurovent Certita Certification is widely recognized as a global leader in third-party certification for product performance in the fields of heating, ventilation, air conditioning, and refrigeration. Our focus is on driving sustainability and energy efficiency through certified solutions. We showcase the pivotal role of certified Heat Pumps and chillers in achieving a sustainable future. Discover the benefits of certification and how it leads to reduced energy consumption and lower emissions.

Join us in unlocking the energy efficiency potential for a greener future. Let's pave the way to a more sustainable world together.

### [39] Summary of the 2nd day

Dr.-Ing. Rainer M. Jakobs | Information Centre on Heat Pumps and Refrigeration IZW e. V.

A review of the second day with a short report on each presentation.

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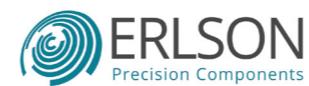
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