EUROPEAN HEAT PUMP SUMMIT

POWERED BY CHILLVENTA

NUREMBERG, 26–27.10.2021
CONGRESS + EXPO

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

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NÜRNBERG MESSE

PROGRAMME | PROGRAMM

TUESDAY, 26.10.2021 – Hall Brüssel
DIENSTAG, 26.10.2021 – Saal Brüssel

Challenges and Opportunities for Heat Pumps

09:15 Introduction [1]
Dr.-Ing. Rainer M. Jakobs | Information Centre on Heat Pumps and Refrigeration IZW e. V.

09:25 A heat pump strategy for the next decade [2]
Thomas Nowak | European Heat Pump Association

09:50 Transformative UK Heat Pump Commitment: Opportunities and Expectations for the Global Supply Chain [3]
James Beal | UK Department For International Trade (DIT)

10:15 Foyer expo | Coffee break

Research & Development, Refrigerants

10:40 Energy Efficiency, Safety and Sustainability of Heat Pump Applications with low GWP HFO Refrigerants [4]
Hans-Dieter Küpper | Chemours Deutschland GmbH

11:05 Heat Pump Systems with Low GWP Refrigerants [5]
Prof. Yunho Hwang | University of Maryland

11:30 Ground source heat pump with HC: Frascold HC case study for residential application [6]
Kaven Nourrice | Frascold S.p.A.

11:50 Ground source heat pumps with new generation refrigerants – high efficiency solutions developed for the premium market [7]
Stefano Bissoli | Alfa Laval

12:15 Lunch break

Air Conditioning & Heating, District Heating, Refrigeration

13:20 "Blue House", a virtuous example of the main trends of the European HVAC market [8]
Dr. Eng. Allesandro Pinato | Swegon

13:45 The future of renewable heating in apartment buildings [9]
Bart Aspeslagh | Daikin Europe

14:10 Fraunhofer IEG – Applied research for reshaping the heat sector [10]
Arianna Passamonti | Fraunhofer IEG

14:30 Efficiency gains of refrigeration systems by usage of heat pumps [11]
Rüdiger Rudischhauser | SRMTec Group GmbH

14:55 Foyer expo | Coffee break

Research & Development, Components Systems

15:25 Saginomiya components for heat pumps [12]
Marcin Michalak | Saginomiya Europe

15:45 Can you hear it? Reducing the sound power of heat pumps to ambient noise level [13]
Michael Kraus | Ziehl-Abegg SE

16:10 Importance of Acoustic Simulation to Evaluate the Impact of Design Modifications of Scroll Compressor [14]
Enrico Fraccari | Emerson Climate Technology GmbH

16:35 Challenges in the development of positive displacement compressors for high temperature heat pumps [15]
M.Sc. Dirk Schlehuber | Bitzer Kühlmaschinenbau GmbH

16:53 Bitzer HP Eco system [16]
Thomas Rasmussen | Bitzer Electronics A/S

17:10 Natural refrigerants AlfaGreen® heat collectors optimized for district heating large scale installations [17]
Roberto Mistrorigo | LU-VE Group

17:30 Optimized multi-chamber test bench for various testing options for heat pumps and air conditioning units [18]
Kerstin Bauerreiß | EP Ehrler Prüftechnik Engineering GmbH

17:50 Summary of the 1st day [19]
Dr.-Ing. Rainer M. Jakobs | Information Centre of Heat Pumps and Refrigeration IZW e. V.

18:10 Get-together

WEDNESDAY, 27.10.2021 – Hall Brüssel
MITTWOCH, 27.10.2021 – Saal Brüssel

IoT and Heat Pumps

08:30 IoT and heat pumps: opportunities and challenges [20]
Dr. Veronika Wilk | AIT Austrian Institute of Technology

08:55 Controlling Platforms with IoT use for Heat Pumps [21]
Stig Petersen | LS Control A/S

Heat Pump Application

09:20 Heat pumps in multi-family buildings. Possible solutions and examples of implementation [22]
Dr.-Ing. Marek Miara | Fraunhofer Institute for Solar Energy Systems ISE

09:45 The DLR High Temperature Heat Pumps Pilot plants [23]
Omar Abuh Khass, Stephan Finger | German Aerospace Center

10:10 Foyer expo | Coffee break

10:40 Steam generating heat pumps – Upcoming technology for heat recovery [24]
Franz Helminger | AIT Austrian Institute of Technology

11:00 High-temperature heat pumps – Developments and perspectives [25]
PhD Benjamin Zühlsdorf | DTI Danish Technological Institute

11:20 Heat Pumps for Drying [26]
Dr. Michael Lauermann | AIT Austrian Institute of Technology

11:40 Air source heat pump for district heating with HC: Case study by Frascold [27]
Kaven Nourrice | Frascold S.p.A.

12:00 Foyer expo | Lunch break

13:10 Heat pump, the heart in industrial saving energy projects [28]
PhD Gheorghe Mihalache | Atis Technologies, Canada

13:35 Performance of the IKEA Uppsala heat pump system measured within a IEA-HPT project [29]
Tommy Walfridson | RISE Research Institutes of Sweden

14:00 Refrigerant Lab 4.0: Integrated Optimization of Heat Pump Systems from Theory to Accessible Practice [30]
Christian Vering | RWTH Aachen University

14:25 Heat pump application in nZEB [31]
Prof. Carsten Wemhöner | OST – Eastern Switzerland University of Applied Sciences

14:50 Foyer expo | Coffee break

15:15 District networks and heat pumps – competitors or a winning team? [32]
Jörg Saar | Danfoss GmbH

15:40 Addressing the challenges of efficient non-polluting cooling and heating – the world's first storage heat pump [33]
Alexander Schechner | Envola GmbH

16:05 Vacuum ice slurry technology for harnessing water bodies as an efficient and powerful heat source for large heat pumps [34]
Dr.-Ing. Mathias Safarik | ILK Institute of Air Handling and Refrigeration

16:30 Comfort Climate Box, integrated heat pumps and storage solutions [35]
Peter Wagener | BDH b.v

16:45 Comfort and Climate Box from a Swedish perspective [36]
PhD Caroline Haglund Stignor | RISE Research Institutes of Sweden

Research & Development, Components Systems

17:00 Compressor Range for High Temperature Heat Pumps for Process Cooling and Heating [37]
Francesco Faralli | OFFICINE MARIO DORIN

17:20 Summary of the 2nd day [38]
Dr.-Ing. Rainer M. Jakobs | Information Centre on Heat Pumps and Refrigeration IZW e. V.

Subject to change as of 22.09.2021
All presentations will be held in English.

Änderungen vorbehalten. Stand 22.09.2021
Alle Vorträge werden in Englisch gehalten.

WELCOME TO THE EUROPEAN HEAT PUMP SUMMIT 2021!

WILLKOMMEN ZUM EUROPEAN HEAT PUMP SUMMIT 2021!

Dear participants,
There's no greater joy than the joy of a reunion. Following these challenging times, I am even more delighted to welcome you in person at the European Heat Pump Summit. At last, you'll again be able to make business contacts face-to-face, watch interesting presentations live instead of on a monitor, and look at products and innovations on site.

You'll hear a wealth of interesting presentations by renowned international speakers that will shed light on various market developments and technology and application trends for heat pumps. The spotlight will be on innovative technologies in component manufacture and the use of heat pumps in industrial and commercial applications, as well as on refrigerant issues and the use of hybrid systems and high-temperature heat pumps.

Professional knowledge-sharing will take centre-stage in both the congress and foyer expo. The dialogue with experts from all around the world and the associated opportunity to expand your personal network are the very essence of this event. This year, the congress will be complemented by digital features. For example, all presentations will be streamed online, making them available to participants who cannot attend the congress in person. Alternating with the European Heat Pump Summit, the leading international exhibition Chillventa is an equally important major gathering for the global heat pump community in the even-numbered years.

It is entirely thanks to all of you that the European Heat Pump Summit has become the No. 1 industry gathering by experts for experts. Please accept my sincere gratitude for your support and involvement!

I hope that you will enjoy two interesting days packed with new knowledge and exciting insights.

Yours sincerely,
Daniela Heinkel
Director European Heat Pump Summit,
NürnbergMesse

Liebe Teilnehmerinnen und Teilnehmer,
Wiedersehensfreude ist die schönste Freude. Nach einer herausfordernden Zeit freue ich mich in diesem Jahr umso mehr, Sie zum European Heat Pump Summit wieder persönlich begrüßen zu dürfen. Live Geschäftskontakte knüpfen, spannende Vorträge ohne Bildschirm sehen, Produkte und Innovationen vor Ort begutachten. All das ist nun wieder möglich.

Renommierte, internationale Referenten beleuchten in zahlreichen spannenden Vorträgen Marktentwicklungen, Technologie- und Anwendungstrends rund um das Thema Wärmepumpe. Im Fokus stehen innovative Technologien in der Komponentenherstellung, die Anwendung von Wärmepumpen in Industrie und Gewerbe sowie Fragen zu Kältemitteln und dem Einsatz von hybriden Anlagen und Hochtemperaturwärmepumpen.

Sowohl im Kongress als auch in der Foyer-Expo steht der fachliche Austausch im Vordergrund. Der Dialog mit Experten aus aller Welt und damit die Erweiterung des persönlichen Netzwerks machen die Veranstaltung erst zu dem was sie ist. Zusätzlich wird der Kongress dieses Jahr durch digitale Elemente ergänzt. Beispielsweise werden alle Vorträge online übertragen und somit auch Teilnehmern zugänglich gemacht, die den Kongress nicht vor Ort besuchen können. Im Wechsel mit dem European Heat Pump Summit ist die internationale Leitmesse Chillventa in den geraden Jahren ebenso ein zentraler und wichtiger Treffpunkt für die internationale Wärmepumpen-Community.

Nur durch Sie alle wird der European Heat Pump Summit zu DEM Branchentreffpunkt von Experten für Experten. Herzlichen Dank für Ihre Unterstützung und Teilnahme!

Ich wünsche Ihnen zwei interessante Tage voll mit neuem Wissen und spannenden Erkenntnissen.

Ihre Daniela Heinkel
Director European Heat Pump Summit,
NürnbergMesse

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 are holding the seventh Summit with a high-calibre congress programme and more than 35 prominent German and international speakers. The Summit in combination with the Foyer-Expo offers great opportunities and challenges for the industry. It is a unique B-to-B dialogue platform for exchanging information and experiences.

Securing a reliable, economic and sustainable energy supply as well as environmental and climate protection are important global challenges of the 21st century. Increasing the production and use of renewable energy and improving energy efficiency are the most important steps in order to achieve these goals of energy policy.

In the proposed EU strategy for Energy Systems Integration, the Commission foresees 40% of all residential and 65% of all commercial buildings being heated with electricity by 2030. Electric heat pumps will play a central role in the path towards decarbonising heating and cooling over the next 10 years and beyond.

The EU energy systems integration strategy quantified the necessary contribution at around 50 million heat pumps by 2030. Strong policy is needed to make these goals a reality [2].

The UK government's plan for a green industrial revolution aims to make the UK carbon neutral by 2050 and commits to making homes, schools and hospitals greener, with a target to install 600,000 heat pumps every year by 2028. There are great opportunities for heat pump manufacturers and the wider supply chain on the back of this policy. See the presentations [3].

While the residential heat pump market may be satisfied with standardised products and installations, most IHP (industrial heat pump) applications need to be adapted to unique conditions. In addition, a high level of expertise is crucial. The main goal is to overcome still-existing difficulties and barriers for the larger scale market in industrial applications. IHPs are active heat-recovery devices that increase the temperature of waste heat in an industrial process to a higher temperature to be used in the same process or another adjacent process or heat demand.

High-temperature heat pumps (HTHPs) are HPs with heat sink temperatures in the range of 100 to 160°C. They may become increasingly commercialised during the coming years. Major applications have been identified, particularly in the food, paper, metal and chemical industries. See the presentations [23, 24, 25, 37]

Drying processes are widely used in industry and commerce (food industry, paper industry, chemical industry, ceramics industry, laundries, etc.) as well as in household applications (white goods, tumble dryers, dishwashers) in various forms and contribute significantly to energy consumption. 10–25% of industrial energy consumption is used for drying processes. See the presentation HPs for Drying [26]

As digitalisation progresses, heat pumps are becoming part of the Internet of Things (IoT). Heat pumps will play an important role in the energy system of the future. They are a versatile technology for the provision of space and process heat, for water heating and for cooling buildings and processes. They are increasingly becoming connected devices that participate in the Internet of Things. See the presentations [20, 21]

Throughout the last few decades, there has been a significant effort to improve the environmental impact of refrigerants. This also plays an important role in this Summit. See the presentations [4, 5, 6, 7, 15, 17, 37]

Complex heat pump systems require more complex testing equipment and innovative research infrastructure for the optimisation. See the presentations [18, 30]

The use of heat pumps in multi-family buildings, district networks, commercial buildings and industrial processes is covered by further presentations. See the presentations [22, 27, 28, 29, 32, 33, 34, 35, 36]

You will find more short descriptions of the presentations on the following pages.

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.

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:

– More than 40 years of heat pump and refrigerant development.
– The current situation and an outlook.
– The focus areas of the Summit.

[2] A heat pump strategy for the next decade

Thomas Nowak | European Heat Pump Association

The EU energy system integration strategy and the IEA net zero by 2050 are only the most obvious examples of an increasing number of studies pointing to a most prominent role for heat pump technologies in a decarbonised society. Beyond political goals, heat pump technologies made an inroad into the modelling of the EU commission. The EU energy systems integration strategy quantified the necessary contribution at around 50 million heat pumps by 2030. Strong policy is needed to make these goals reality.

[3] Transformative UK Heat Pump Commitment: Opportunities and Expectations for the Global Supply Chain

James Beal | UK Department For International Trade (DIT)

The UK government's ten point plan for a green industrial revolution, published in November 2020, aims to make the UK carbon neutral by 2050 and commits to making homes, schools and hospitals greener, with a target to install 600,000 heat pumps every year by 2028.

Following a brief outline of the wider policy environment and the UK government's clean growth ambitions, the session will centre on the current state of the heat pump industry and supply chain in the UK and discuss the significant growth and investment opportunity linked to the aim of scaling up the heat pump market by 2028.

Research & Development, Refrigerants

[4] Energy Efficiency, Safety and Sustainability of Heat Pump Applications with low GWP HFO Refrigerants

Hans-Dieter Küpper | Chemours Deutschland GmbH

Low-GWP refrigerants like R-454B and R-454C allow for high energy efficiency at higher flow temperatures in residential and commercial heat pump applications. Classified as A2L refrigerants, they provide higher safety and lead to overall sustainable solutions.

Low-GWP refrigerants need to be implemented in new heat pump developments in order to fulfil F-gas requirements in the first step. Moreover, A2L refrigerants with low-GWP can enable achieving higher system energy efficiency, and they allow for higher sink temperatures than HFC refrigerants. This makes heat pumps fit for use in building renovations and also for operation with existing hydronic radiator systems at a high energy efficiency rate, despite operating at higher flow temperatures.

[5] Heat Pump Systems with Low GWP Refrigerants

Prof. Yunho Hwang | University of Maryland

To accelerate the promotion of low-GWP refrigerant applications, in 2019 the Internal Energy Agency's Heat Pumping Technology (IEA-HPT) initiated Annex 54: Heat Pump Systems with low-GWP Refrigerants. This annex aims to develop design guidelines for otpimised heat pump components and systems for low-GWP refrigerants.

This work provides 2020 activities of IEA-HPT's Annex 54. A comprehensive review was conducted for the R&D progress on components using low-GWP refrigerants for residential applications. The review particularly focused on heat exchangers and compressors. In addition, it presents a study on circuitry optimisation of tube-fin heat exchangers.

[6] Ground source heat pump with HC: Frascold HC case study for residential application

Kaven Nourrice | Frascold S.p.A

Frascold's presentation concerns the case study that was carried out in collaboration with an Italian company that produces and markets innovative solutions for heating and cooling buildings or entire neighbourhoods. The case study was carried out in a residential ground source application with HC.

The strengths of a ground source application with HC are many and touch on different aspects: sustainability, efficiency and innovation. In the reversible mode, by inverting the cycle, it is also able to provide summer cooling. Finally, the possibility of heating the water even at high temperatures allows integration into the residential sector without substantial changes to the existing heat distribution systems.

[7] Ground source heat pumps with new generation refrigerants – high efficiency solutions developed for the premium market

Stefano Bissoli | Alfa Laval

Electric power availability from the grid will represent a limiting factor in the booming heat pump market, and only high-COP devices will be supported in the future. Alfa Laval's innovative solutions represent a unique and cost competitive offering to reach the maximum COP.

Alfa Laval will share and show innovations in ground source heat pumps with new generation refrigerants. High-efficiency COP levels are becoming a reality in the ground source market in Northern and Middle Europe, and we see rapid development of this application in southern regions where it traditionally hasn't been used.

Air Conditioning & Heating, District Heating, Refrigeration

[8] "Blue House", a virtuous example of the main trends of the European HVAC market

Dr. Eng. Allesandro Pinato | Swegon

Blue House is a new HVAC plant in Malmö (Sweden), with a high-efficiency, low-GWP inverter HP that works in synergy with the AHUs and the room terminals to ensure the best indoor environmental quality (IEQ) and minimise the energy consumption. Digitalisation of the system allows for local and remote connectivity. The recent COVID pandemic has highlighted the importance of the IEQ as a key parameter both for renovation and for new buildings. The plant is highly optimised in terms of total efficiency thanks to the deep synergy of the cooling/heating production, distribution network and loads. The heat pump system communicates in real time with the AHU and room terminals, ensuring the best IEQ and continuously minimising the energy consumption.

[9] The future of renewable heating in apartment buildings

Bart Aspeslagh | Daikin Europe

More and more people across Europe live in an urban area. Numbers by Eurostat show that in 2018, 46% of the EU-27 population lived in flats in those areas. Apartment buildings are amongst the most relevant contributors of energy consumption and CO_2 emission. Decarbonisation is a hot topic in the collective building market: there is a higher demand for living space in cities and the cities of the future should be environmentally friendly. Daikin takes the challenge in multi-family apartment building to apply full renewable solutions based on in-house heat pump technology. Compared with the high distribution losses that occur in typical communal heating systems – which lead to overheated buildings and wasted energy – the low ambient loop means that heat losses are reduced by more than 90%.

[10] Fraunhofer IEG – Applied research for reshaping the heat sector

Arianna Passamonti | Fraunhofer Research Institution for Energy Infrastructures and Geothermal Systems IEG

The Fraunhofer IEG carries out research in the fields of integrated energy infrastructures, geothermal energy and sector coupling for a successful energy transition. One of those key technological components is heat pumps, and they are therefore a key research field. IEG aims to develop in close cooperation with manufactures the next generation of heat pumps and their integration into green district heating and cooling networks.

[11] Efficiency gains of refrigeration systems by usage of heat pumps

Rüdiger Rudischhauser | SRMTec Group GmbH

Heating and cooling are the two sides of the equation. Instead of dissipating the condensing heat of refrigeration systems to the atmosphere, its usage as heat source for a heat pump is not only the environmentally right choice but can also greatly improve the efficiency, thus reducing operating cost.

Research & Development, Components Systems

[12] Saginomiya components for heat pumps

Marcin Michalak | Saginomiya Europe

The presentation will provide an overview of the line-up of Saginomiya components for hydrocarbon heat pumps. The components will include 4-way reversing valves, electronic expansion valves, pressure transducers and pressure switches.

[13] Can you hear it? Reducing the sound power of heat pumps to ambient noise level

Michael Kraus | Ziehl-Abegg SE

Despite the advantages heat pumps provide in terms of CO_2 emission reduction, with increasing numbers of installed and operated heat pumps increasingly more sources of noise are deployed. As noise is one of the most underestimated sources of illnesses, there is a chance that the acceptance of heat pumps suffers, or strict legislation to protect people from noise are enacted. Therefore, for example, a major share of heat pumps must be operated at part load overnight to be within the given limits. The presentation will introduce the latest development in axial fan technology, which can provide a solution to both issues. It will show the potential of axial fans applied in heat pumps specifically developed to achieve the lowest possible noise level, including lowest tonality in that application to avoid part load operation overnight or reduce the related power loss.

[14] Importance of Acoustic Simulation to Evaluate the Impact of Design Modifications of Scroll Compressor

Enrico Fraccari | Emerson Climate Technology GmbH

Heat pump is one of the main technologies that will allow reaching the complete decarbonisation of the heating sector. The adoption of these systems is growing at a high pace and this technology becomes more and more common. While this is extremely important for the industry, the widespread adoption of these heating systems is requiring more attention to features like sound emission. The reduction of heat pump noise is becoming of critical importance for the acceptance of this heating technology.

One of the main sound sources of such units is the compressor which delivers the refrigerant flow necessary for its operation. Due to restricting regulations and the introduction of variable speed compressors, it becomes more challenging to meet targets required by customers.

[15] Challenges in the development of positive displacement compressors for high temperature heat pumps

M.Sc. Dirk Schlehuber | Bitzer Kühlmaschinenbau GmbH

The presentation gives an overview of the compressor technologies used at BITZER and the state of the art of these compressor technologies for use in high-temperature heat pumps. In addition, an overview will be presented of currently available refrigerants and oils with their properties for use with positive displacement compressors in high-temperature heat pumps at different temperature levels, as well as their advantages and disadvantages.

[16] Bitzer HP Eco system

Thomas Rasmussen | Bitzer Electronics A/S

BITZER Electronics has provided control solutions for heat pumps since the 1980s and has built up and continually developed an extensive knowledge of both domestic and commercial heat pump systems. Over the years Bitzer Electronics continued the journey and has been adding more functions to all components, such as introducing the BDN (Bitzer Digital Network). The journey Bitzer has been on has been part of an overall master plan, and it is now ready to take the next big step by integrating all elements into a BITZER ECO-system available for heat pump.

[17] Natural refrigerants AlfaGreen® heat collectors optimized for district heating large scale installations

Roberto Mistrorigo | LU-VE Group

District heating systems are expected to play an important role in future renewable energy systems. District heating systems contribute to substantially reducing primary energy supplies, carbon dioxide emissions and cost. Heat pumps are a key component in this green application. Heat pumps permit using the latent heat of various accessible heat sources such as: ambient air, seawater, groundwater or waste heat from the industry.

AlfaGreen® is designed for exterior installation, with easy integration into any environment thanks to its elegant casing, and it is optimised for ammonia, glycol and CO_2. The system is customised to fit the district heating plant's specific energy needs with a high efficiency.

[18] Optimized multi-chamber test bench for various testing options for heat pumps and air conditioning units

Kerstin Bauerreiß |
EP Ehrler Prüftechnik Engineering GmbH

Complex heat pump systems with combined air conditioning and/or air heating units require more complex testing equipment. Introducing a 3-chamber test bench, which represents the outside, installation room and living room. By individually conditioning each of the three chambers and monitoring the respective interactions, very complex systems can be tested in this set-up.

[19] Summary of the 1st day

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

A flashback on the first day with a short view of every presentation.

WEDNESDAY, 27.10.2021 – HALL BRÜSSEL
MITTWOCH, 27.10.2021 – SAAL BRÜSSEL

IoT and Heat Pumps

[20] IoT and heat pumps: opportunities and challenges

Dr. Veronika Wilk | AIT Austrian Institute of Technology

As digitalisation progresses, heat pumps are becoming part of the Internet of Things (IoT). Heat pumps will play an important role in the energy system of the future. They are a versatile technology for the provision of space and process heat, for water heating and for cooling buildings and processes. They increasingly become connected devices that participate in the Internet of Things. They can be designed to intelligently meet demand, enabling real-time energy efficiency, flexible use of electricity, optimised load profiles and an optimised compromise in terms of comfort and operating costs. The work belongs to the IEA HPT TCP Annex 56.

[21] Controlling Platforms with IoT use for Heat Pumps

Stig Petersen | LS Control A/S

Presenting a controlling platform with IoT use for updating software of different parts of the control platform without ever leaving the office. A secure and easy-to-use solution, from the controlling platform hardware and software, to maximise the efficiency of the heat pump to the IoT software for servicing and updating the heat pump.

Heat Pump Application

[22] Heat pumps in multi-family buildings. Possible solutions and examples of implementation

Dr.-Ing. Marek Miara | Fraunhofer Institute for Solar Energy Systems ISE

The use of heat pump systems in apartment buildings is possible and already practiced. Many examples from several countries underline this. The building sector plays a significant role in energy consumption in every country. Next to electricity generation and the transport, it is the most important sector in terms of greenhouse gas emissions. The massive reduction of CO_2eq emissions from buildings and the long-term achievement of a climate-neutral building sector should therefore be considered inseparable. The work belongs to the IEA HPT TCP Annex 50.

[23] The DLR High Temperature Heat Pumps Pilot plants

Omar Abuh Khass, Stephan Finger | German Aerospace Center

The new German Aerospace Center's (DLR) Institute of Low-Carbon Industrial Processes is currently developing new prototypes of high-temperature heat pumps (HTHP). Those are needed to process streams in industrially relevant high temperature ranges that cannot be achieved with state-of-the-art heat pumps.

[24] Steam generating heat pumps – Upcoming technology for heat recovery

Franz Helminger | AIT Austrian Institute of Technology

Heat pumps will make an important contribution to increasing the energy efficiency of industrial processes. They enable electrification and make a significant contribution to reducing CO_2 emissions. Developments in heat pumps with heat utilisation temperatures above 100°C were significantly expanding the range of applications for heat pumps in industry in the last years.

[25] High-temperature heat pumps – Developments and perspectives

PhD Benjamin Zühlsdorf | DTI Danish Technological Institute

This talk gives an overview of currently ongoing developments and perspectives of high-temperature heat pumps (HTHP) with supply temperatures above 100°C. HTHP are a key technology for decarbonising industrial process heat supply and are expected to cover a considerable share of industrial process heat supply. The work belongs to the IEA HPT TCP Annex 58.

[26] Heat Pumps for Drying

Dr. Michael Lauermann | AIT Austrian Institute of Technology

Drying processes are widely used in industry and commerce (food industry, paper industry, chemical industry, ceramics industry, laundries, etc.) as well as in household applications (white goods, tumble dryers, dishwashers) in various forms and contribute significantly to energy consumption. 10–25 % of industrial energy consumption is used for drying processes. The work belongs to the IEA HPT TCP Annex proposal.

[27] Air source heat pump for district heating with HC: Case study by Frascold

Kaven Nourrice | Frascold S.p.A.

Frascold´s presentation concerns the case study that was carried out in collaboration with a Danish company specialising in heat pumps, which, using the energy of the air, heats entire neighbourhoods. The CX screw compressor optimised the system and guarantees its efficiency. The benefits of district heating are many: high energy efficiency, low maintenance costs and greater safety.

[28] Heat pump, the heart in industrial saving energy projects

PhD Gheorghe Mihalache | Atis Technologies, Canada

The possibility of realising projects using heat pumps determined by the ratio of the price of electricity and that of natural gas. Most of industry is supplied by natural gas, and using other types of heat pumps than electrical compression is not economical. The only regions in North America where it is possible to use electric heat pumps in industrial applications are in Canada: Quebec, Manitoba and eventually British Columbia.

The presentation presents two projects done in Quebec, one in a factory and another in a pork slaughterhouse.

[29] Performance of the IKEA Uppsala heat pump system measured within a IEA-HPT project

Tommy Walfridson | RISE Research Institutes of Sweden

Within the project several larger heat pump systems have been performance analysed. The IKEA warehouse site in Uppsala, Sweden, is one of those analysed by RISE. The 2 MW Carrier heat pump system has two heat pumps with six screw compressors. The slider capacity control gives 16 stages, more than enough for good capacity control. It has a poor performing control system giving significant fluctuation in both heating and cooling mode. This also means much lower than possible performance and a performance that is degrading each year. The work belongs to the IEA HPT TCP Annex 52.

[30] Refrigerant Lab 4.0: Integrated Optimization of Heat Pump Systems from Theory to Accessible Practice

Christian Vering | RWTH Aachen University

The Refrigerant Lab 4.0 is an innovative research infrastructure for the optimisation of heat pump systems in theory and practice. It is designed as a living lab for participation of stakeholder, supporting interactions during research processes. In addition to an innovative, highly interconnected infrastructure, this set-up requires simulation and optimisation models specially adapted to the laboratory in order to maximise the knowledge gain.

[31] **Heat pump application in nZEB**
Prof. Carsten Wemhöner | OST – Eastern Switzerland University of Applied Sciences

Since Jan. 1, 2021, nearly zero energy buildings are the requirement for new buildings in the EU.

Thus, cost-effective system solutions to comply with nZEB requirements are of high interest. Heat pumps are already well established in nZEB application. The project has investigated heat pump integration and design for the application in nZEB by simulation and field monitoring. The work belongs to the IEA HPT TCP Annex 49.

[32] **District networks and heat pumps – competitors or a winning team?**
Jörg Saar | Danfoss GmbH

District heating networks and heat pump compete to supply heat to buildings. Is this still true? This presentation shows possibilities and challenges how the team of new district heating networks and heat pumps can offer cost-attractive and convenient heating and often even cooling for buildings with impressive efficiencies. The team of heat pumps and district network allows a radical reduction of temperatures in the district network even down to ambient conditions.

[33] **Addressing the challenges of efficient non-polluting cooling and heating – the world's first storage heat pump**
Alexander Schechner | Envola GmbH

There is a need to see technology from a different angle to offer best efficiencies in order to protect our climate. Therefore, Envola gave the heat pump an integrated storage. The Envola storage heat pump offers previously unknown economic efficiency and eco-friendliness.

[34] **Vacuum ice slurry technology for harnessing water bodies as an efficient and powerful heat source for large heat pumps**
Dr.-Ing. Mathias Safarik | ILK Institute of Air Handling and Refrigeration

Low water temperatures close to the freezing point in winter as well as the fouling of heat exchangers hinder the use of water bodies as heat sources for large-scale heat pumps. Heat extraction by direct evaporation of water with the possibility of partial icing overcomes these obstacles. Vacuum ice technology offers the potential to increasingly tap water bodies as a powerful, efficient and monovalent heat source in the future, with significantly reduced extraction and discharge quantities.

[35] Comfort Climate Box, integrated heat pumps and storage solutions

Peter Wagener | BDH b.v

Integrated systems consisting of heat pumps and storage are an important technological option to accelerate the use of renewable energy for heating and cooling by combining heat pumps and storage under one control strategy. A progress overview on the topic of this project will be presented. The work belongs to the IEA HPT TCP Annex 55.

[36] Comfort and Climate Box from a Swedish perspective

PhD Caroline Haglund Stignor | RISE Research Institutes of Sweden

A Comfort and Climate Box (CCB) includes a heat pump in combination with storage and integrated smart control. The Swedish research project has developed concept solutions for three types of CCBs and will present results and learnings from simulations and laboratory testing of a CCB prototype. The work belongs to the IEA HPT TCP Annex 55.

Research & Development, Components Systems

[37] Compressor Range for High Temperature Heat Pumps for Process Cooling and Heating

Francesco Faralli | OFFICINE MARIO DORIN

DORIN has successfully designed and supplied compressors for a cascade cycle working with two different hydrocarbons. The low-temperature cycle works with R290 (propane) and the high-temperature cycle (HT) works with R600 (butane). Due to the high values of discharge temperature for the HT cycle, a customised compressor has been designed for R600. The special design comes from DORIN's vast experience in R744 (CO_2) compressors, where the severe working conditions in terms of pressures and temperatures demand unique technical features.

[38] Summary of the 2nd day

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

A flashback on the second day with a short view of every presentation.

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