

Program of the 3rd HTHP Symposium



High-Temperature
Heat Pump Symposium
Copenhagen 29.-30.3.2022

Tuesday, 29.03.2022

Time	Track 1	Track 2
09:00 – 10:30	Welcome Session 1-1	
10:30 – 11:00	Coffee Break	
11:00 – 12:30	Technology Developments and Perspectives 1-2	
12:30 – 13:30	Lunch	
13:30 – 14:30	Regulatory Frameworks and Business Models 1-3A	HTHP Technologies 1-3B
14:30 – 15:00	Coffee Break	
15:00 – 16:20	HTHP Technologies 1-4A	Process Integration 1-4B
16:20 – 17:30	Poster Session and Networking 1-5	
19:00	Dinner at FoodClub København	

Wednesday, 30.03.2022

Time	Track 1	Track 2
09:00 – 10:20	Technology Developments 2-1A	System & Sector Integration 2-1B
10:20 – 10:50	Coffee Break	
10:50 – 12:10	Heat Pump-based Steam Systems 2-2A	Technology Development 2-2B
12:10 – 13:10	Lunch	
13:10 – 14:00	Plenary Discussion: Fulfilling the Potential - How many Industrial Heat Pumps are realistic and how do we get there?	
14:00	Site Visits	

Program of the 3rd HTHP Symposium

Tuesday, 29.03.2022



High-Temperature
Heat Pump Symposium
Copenhagen 29.-30.3.2022

Time	Presentation	Speaker	Duration
Welcome Session 1-1			
09:00 - 10:30	Welcome and Introduction	<u>Benjamin Zühlsdorf</u> , (DTI)	15 min
	Need of Electrification and Decarbonization – now more than ever!	<u>Nils Røkke</u> , SINTEF and Chair of EERA (European Energy Research Alliance)	15 min
	Towards energy transformation in chemical industry by large-scale energy recovery using heat pumps	<u>Julian Meyer-Kirschner</u> & Martin Dorn, (BASF)	30 min
	High-Temperature Heat Pumps – How large is the potential and how can we exploit it?	<u>Brian Elmegaard</u> , (DTU), <u>Benjamin Zühlsdorf</u> , (DTI), <u>Michael Bantle</u> , (SINTEF)	30 min
10:30– 11:00	Coffee Break		
Technology Developments and Perspectives 1-2 – Chair: Michael Bantle (SINTEF)			
11:00 - 12:30	IEA HPT Annex 58 about High-Temperature Heat Pumps - State of the art review, demonstration cases and development perspectives	<u>Benjamin Zühlsdorf</u> , (DTI) <u>Jonas Lundsted Poulsen</u> , (DTI) <u>Florian Schlosser</u> , (University of Paderborn)	50 min
	DryFiciency closed loop heat pumps: Operation experience and outlook	<u>Veronika Wilk</u> , et al., (AIT)	20 min
	An industry response to more ambition in energy regulation	<u>Annita Westenbroek</u> , (Cepi - Confederation of European Paper Industries)	20 min
12:30 – 13:30	Lunch		

Program of the 3rd HTHP Symposium

Tuesday, 29.03.2022



High-Temperature
Heat Pump Symposium
Copenhagen 29.-30.3.2022

Time	Presentation	Speaker	Duration	Presentation	Speaker	Duration
13:30 – 14:30	Regulatory Frameworks and Business Models 1-3A, Chair: Thomas Nowak (EHPA)			HTHP Technologies 1-3B – Chair: Jonas Kjær Jensen (DTU)		
	EU Policy affecting the development and application of high-temperature heat pumps	<u>Thomas Nowak</u> , (EHPA)	5 min	HighLift – a very high temperature heat pump for industrial use – key results from a Horizon2020 Fast Track to Innovation Project	<u>Tor-Martin Tveit</u> & <u>Stefano Vittor</u> , (Olvondo Technology), <u>Ron Zevenhoven</u> , (Åbo Akademi University)	20 min
	Industrial heat pump opportunities in the Irish market	<u>David Connolly</u> , (Astatine)	15 min	Smart implementation of a Rotation Heat Pump	<u>Andreas Längauer</u> & <u>Bernhard Adler</u> , (ecop Technologies)	20 min
	Large Scale High Temperature Heat Pumps: Lessons learned and near future technologies	<u>Lars Reinholdt</u> & <u>Pernille Hartmund Jørgensen</u> , (Plan Energi)	15 min	Futraheat's TurboClaw high-temperature heat pump technology	<u>Tom Taylor</u> , (Futraheat)	20 min
	Panel discussion with presenters			25 min		
14:30 – 15:00	Coffee Break					
15:00 – 16:20	HTHP Technologies 1-4A – Chair: Claus Schøn Poulsen (DTI)			Process Integration 1-4B – Chair: Veronika Wilk (AIT)		
	Decarbonize the high-temperature heat demand with innovative large heat pumps	<u>Andrea Barbon</u> , Turboden	20 min	Supply temperature levels in Danish industry: a necessary discussion before High Temperature Heat Pump integration	<u>Martin Pihl Andersen</u> , <u>Jierong Liang</u> & <u>Roger Padullés Solé</u> , (DTU)	20 min
	Oilon ChillHeat high temperature heat pumps – up to 120 °C with full power	<u>Martti Kukkola</u> , Oilon	20 min	Feasibility of HTHPs – Experiences from selected case studies	<u>Fridolin Müller Holm</u> , (Viegand Maagøe)	20 min
	Challenges in the development of positive displacement compressors for high temperature heat pumps	<u>David Holder</u> , Bitzer	20 min	Optimal Temperature matching in high-temperature heat pumps	<u>Elias Vieren</u> , et al.	20 min
	Energy efficient integration of high temperature CO ₂ heat pumps and conventional heaters for spray dryers	<u>Lorenzo Bellemo</u> & <u>Riccardo Bergamini</u> , GEA	20 min	Large Scale Industrial Waste Heat Recovery: application in the food and pulp industry and heat storage using HTHPs	<u>Jose L. Corrales Ciganda</u> , <u>Maidier Epelde Agirre</u> & <u>Felipe Trebilcock Kelly</u> , Tecnalia	20 min

Program of the 3rd HTHP Symposium

Tuesday, 29.03.2022



High-Temperature
Heat Pump Symposium
Copenhagen 29.-30.3.2022

Time	Presentation	Speaker	Duration
Poster Session and Networking 1-5, Chair: Michael Bantle (SINTEF) All posters will be pitched in 1 min by the presenters in front of their posters, before all participants have the possibility to check out all posters and discuss with the presenters.			
	Welcome and Introduction	All poster presenters	20 min
16:20 – 17:30	Multi-Stage Water Vapor Reversed Rankine Cycle for Industrial High Temperature Heat Pump	<u>Seon Tae Kim</u> , Robert Hegner, Göksel Özüylasi, Panagiotis Stathopoulos, Eberhard Nicke, (DLR)	60 min
	Upgraded High-Temperature Heat Integration in Energy-Intensive Sectors	<u>Chiara Magni</u> , Hamed Abedini, Alessia Arteconi & Sylvain Quoilin (KU Leuven), Toon Demeester, Elias Vieren, Wim Beyne, Michel De Paepe & Steven Lecompte, (Ghent University)	
	The Applications of Ammonia-Water Absorption-Compression High-Temperature Heat Pumps in European Food Industry	<u>Shuai Ren</u> , Marcel Ulrich Ahrens, Armin Hafner, (NTNU)	
	Potential Impact of Industrial High-Temperature Heat Pumps on the European Market	<u>Cordin Arpagaus</u> & Stefan S. Bertsch, (OST), Jorge Payá, UPV, Abdelrahman H. Hassan, (UPV & Zagazig University)	
	Demonstrating high-temperature heat pumps at different integration levels	<u>Tage Petersen</u> , Benjamin Zühlsdorf, (DTI)	
	Annex 59 - Heat Pumps for Drying	<u>Michael Lauermann</u> , Veronika Wilk, Thomas Fleckl, (AIT)	
	Proofing the Replacement of Low GWP Synthetic Refrigerants in High-Temperature Heat Pump Applications	<u>Bassam Edmond Badran</u> , Ghanbarpourgeravi, M., Khodabandeh, R., (KTH)	
	Experimental wet compression using hydraulics	A. M. Berman, C. H. Bork Jansen, J. J. Krogh, J. Østergaard Pedersen, J. Sønder Nielsen, N. Arjomand Kermani, B. Elmegaard, (DTU)	
	Performance optimization of supercritical CO ₂ chiller system	A. M. Berman, J. Sønder Nielsen, B. Elmegaard, (DTU)	
	19:00	Dinner at FoodClub København (Sortedam dossering 7C, 2200 København N)	

Program of the 3rd HTHP Symposium

Wednesday, 30.03.2022



High-Temperature
Heat Pump Symposium

Copenhagen 29.-30.3.2022

Time	Presentation	Speaker	Duration	Presentation	Speaker	Duration
	Technology Developments 2-1A, Chair: Claus Schøn Poulsen (DTI)			System and Sector Integration 2-1B – Chair: Brian Elmegaard (DTU)		
09:00 - 10:20	Development of a hydrocarbon cascade heat pump for high temperature applications	<u>Jonas Lundsted Poulsen</u> & B. Zühlsdorf (DTI), M. Fröschle (Bock), P. Laulund & C. Gade (S&T), L. Vigild & D. Ebert (Fuchs)	20 min	Steam from waste heat – costs of ways for steam generation	<u>Franz Helminger</u> , Johannes Riedl & Alexander Steurer (AIT)	20 min
	Industrial high temperature heat pump for simultaneous process cooling and heating	<u>Christian Schlemminger</u> & Michael Bantle (SINTEF), Sigmund Jenssen (Cadio)	20 min	A hybrid system of steam generating heat pump and solar parabolic trough collectors for process heating: Techno-economic analysis for a brewery	<u>Puneet Saini</u> & Andrew Hedstrom (Absolicon), Cordin Arpagaus, Frédéric Bless & S. Bertsch (OST)	20 min
	TransCrit: R600 high-temperature heat pump in sub- and trans-critical operation	<u>Manuel Verdnik</u> & René Rieberer, (Graz University of Technology)	20 min	Optimal operation of a conceptional industrial energy system including a high temperature heat pump, thermal energy storage and wind power	<u>Jasper Walden</u> , Anselm Glade, Jens Gollasch, Phong A. Tran, Martin Bähr & Tom Lorenz (DLR)	20 min
	Development and experimental analysis of two new types of steam compressors	<u>Hans Madsbøll</u> , Jonas Lundsted Poulsen & B. Zühlsdorf, (DTI), D. Rook (Hamburg Vacuum), C. Sørensen (CS TechCom)	20 min	Performance analysis of high temperature heat pumps and thermal energy storages for a dairy	<u>August Brækken</u> & Michael Bantle SINTEF, Marcel Ahrens, NTNU	20 min
10:20 - 10:50	Coffee Break					
	Heat Pump-based Steam Systems 2-2A – Chair: Wiebke Brix Markussen (DTU)			Technology Development 2-2B – Chair: Christian Schlemminger (SINTEF)		
10:50 - 12:10	Steam producing heat pumps for the electrification of the pulp and paper industry	<u>Michael Bantle</u> , Christian Schlemminger, Ole Marius Moen & Elisa Magnanelli, (SINTEF)	20 min	Development perspectives for HTHPs by Johnson Controls – Theoretical considerations, technical perspectives and project examples	<u>Alexander Cohr Pachai</u> , Per Skov (Johnson Controls)	20 min
	Efficient integration of steam generating heat pumps by adapting to industrial process needs	<u>Sabrina Dusek</u> , Franz Helminger & Veronika Wilk, (AIT), Alexander Arnitz, (Lenzig AG)	20 min	Reverse Brayton Cycle High Temperature Heat Pump for Heat Delivery Temperatures up to 350 °C	<u>Leander Schleuss</u> , Enrico Jende, Nancy Kabat, Nico Setzepfand & Panagiotis Stathopoulos, (DLR)	20 min
	Techno-Economic Analysis of Steam-Generating Heat Pumps in Distillation Processes	<u>Cordin Arpagaus</u> , Frédéric Bless & Stefan S. Bertsch, (OST)	20 min	Ongoing research for the utilization of NH ₃ -H ₂ O absorption-compression heat pumps at high temperature operation	<u>Marcel Ahrens</u> , Khalid Hamid, Ignat Tolstorebrov, Armin Hafner & Trygve Magne Eikevik, (NTNU)	20 min
	Heat Pump Development based on Mechanical Vapour Recompression Technology	Carl Ivar Gotaas, <u>Kjetil Evenmo</u> & Jan Haraldsen, (EPCON)	20 min	Thermoacoustic heat pumps for high temperature and industrial applications	<u>Jan-Aiso Lycklama a Nijeholt</u> , Hassan Tijani, Simon Spoelstra & Anshuman Pandey, (TNO)	20 min
12:10 - 13:10	Lunch					

Program of the 3rd HTHP Symposium

Wednesday, 30.03.2022



High-Temperature
Heat Pump Symposium
Copenhagen 29.-30.3.2022

Time	Presentation	Speaker	Duration
	Plenary Discussion: Fulfilling the Potential - How many Industrial Heat Pumps are realistic and how do we get there? 2-3 – Moderator: Benjamin Zühlsdorf (DTI)		
13.10 - 14.00	<ul style="list-style-type: none"> • What is missing for process industries for committing to heat pump-based process heat supply? • Assuming that we can reach optimal regulatory frameworks, how much heat pumps can the HP industry provide? • How can we accelerate the transition? 	<ul style="list-style-type: none"> • Jan Boes, Owner, SD&E • Nuria Navarrete, Utilities Engineering Lead, Heineken • Veronika Wilk, Thematic Coordinator, AIT 	45 min
	Closing		5 min
	Site Visits 2-4		
	As part of the symposium, several site visits are organized to sites with various systems (not necessarily HTHP systems). We will organize the transport to the sites and after the tour, you will be dropped at a place with easy access to public transport and connection to the main train station and the airport. The site visits require registration, which will be opened shortly before the event (see homepage).		
	<u>Steam Compressor Test Rig at Weel & Sandvig</u> This site visit will be organized by Weel & Sandvig (https://weel-sandvig.com/) to present their test rig for their two-stage steam compression system based on turbocompressors. The test rig is located at DTU in Kgs. Lyngby and there is space for 30 people in two groups.		30 min + transport
14.00 - 16.00	<u>FlexHeat Heat Pump in Nordhavn</u> The Flexheat Heat Pump is operated by HOFOR and has been developed as a system with high flexibility to be able for fast regulation and provision of frequency reserves to the electricity grid. There is space for 25 persons.		45 min + transport
	<u>16 MW Air-Source Heat Pump for District Heating in Farum</u> This site visit will bring you to the 16 MW air-source heat pump that is installed at Farum district heating. The heat pump has been started in the beginning of 2021 and is located in Farum/Farremosen (https://www.farum-fjernvarme.dk/aktuelt/vassingerod-energipark-varmepumpen/fakta-om-varmepumpen/). There is space for 40 persons.		45 min + transport
	<u>Tårnby Forsyning</u> Tårnby Forsyning's new energy central is an innovative heat pump system combining heating and cooling with wastewater and groundwater. The system has won EHPA's price for the heat pump project of the year in 2020 in the category DecarbIndustry. There is space for 30 persons in two groups.		45 min + transport