

# The 5<sup>th</sup> European sCO<sub>2</sub> Conference for Energy Systems – March 14<sup>th</sup> to 16<sup>th</sup>

Conference address: Vienna House Diplomat Prague | Evropská 15 | 160 41 Prague | Czech Republic



Tuesday - March 14 <sup>th</sup>							
	<b>Room: Loft</b>						
19:00 – 20:00	<b>Reception &amp; Evening Event</b> <i>Buffet: open bar with soft drinks, wine, beer, snacks</i>						
Wednesday - March 15 <sup>th</sup>							
	<b>Room: Belvedere I</b>						
09:00 – 09:15	<b>Welcome and Introduction</b> <i>Dieter Brillert<sup>1</sup> and Václav Dostál<sup>2</sup></i> 1: University of Duisburg - Essen / UDE 2: Czech Technical University in Prague / CTU						
09:15 – 09:45	<b>Keynote Speech</b>						
09:45 – 10:15	Coffee break						
	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"><b>Heat Exchanger and Transfer (Session 01)</b></td> <td style="width: 50%;"><b>sCO<sub>2</sub> Applications and Energy Systems (Session 02)</b></td> </tr> <tr> <td><b>Room: Belvedere I</b></td> <td><b>Room: Belvedere IV</b></td> </tr> <tr> <td><b>Chairman: Jörg Starflinger, University Stuttgart</b></td> <td><b>Chairman: Václav Dostál, TU Prague</b></td> </tr> </table>	<b>Heat Exchanger and Transfer (Session 01)</b>	<b>sCO<sub>2</sub> Applications and Energy Systems (Session 02)</b>	<b>Room: Belvedere I</b>	<b>Room: Belvedere IV</b>	<b>Chairman: Jörg Starflinger, University Stuttgart</b>	<b>Chairman: Václav Dostál, TU Prague</b>
<b>Heat Exchanger and Transfer (Session 01)</b>	<b>sCO<sub>2</sub> Applications and Energy Systems (Session 02)</b>						
<b>Room: Belvedere I</b>	<b>Room: Belvedere IV</b>						
<b>Chairman: Jörg Starflinger, University Stuttgart</b>	<b>Chairman: Václav Dostál, TU Prague</b>						
10:15 – 10:45	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"> <b>128 - Optimization of the air channels on the Diverse Ultimate Heat Sink for sCO<sub>2</sub> power cycle</b>  <i>Filip, Radomír (1); Tioual-Demange, Sarah; Taiclet, Guillaume (2)</i>                      1: Research Centre Řež, Czech Republic                      2: Fives group, France                 </td> <td style="width: 50%;"> <b>125 - Part load analysis of a constant inventory supercritical CO<sub>2</sub> power plant for waste heat recovery in cement industry</b>  <i>Astolfi, Marco; Alfani, Dario; Binotti, Marco; Silva, Paolo; Persico, Giacomo</i>                      Politecnico di Milano, Italy                 </td> </tr> </table>	<b>128 - Optimization of the air channels on the Diverse Ultimate Heat Sink for sCO<sub>2</sub> power cycle</b> <i>Filip, Radomír (1); Tioual-Demange, Sarah; Taiclet, Guillaume (2)</i> 1: Research Centre Řež, Czech Republic 2: Fives group, France	<b>125 - Part load analysis of a constant inventory supercritical CO<sub>2</sub> power plant for waste heat recovery in cement industry</b> <i>Astolfi, Marco; Alfani, Dario; Binotti, Marco; Silva, Paolo; Persico, Giacomo</i> Politecnico di Milano, Italy				
<b>128 - Optimization of the air channels on the Diverse Ultimate Heat Sink for sCO<sub>2</sub> power cycle</b> <i>Filip, Radomír (1); Tioual-Demange, Sarah; Taiclet, Guillaume (2)</i> 1: Research Centre Řež, Czech Republic 2: Fives group, France	<b>125 - Part load analysis of a constant inventory supercritical CO<sub>2</sub> power plant for waste heat recovery in cement industry</b> <i>Astolfi, Marco; Alfani, Dario; Binotti, Marco; Silva, Paolo; Persico, Giacomo</i> Politecnico di Milano, Italy						
10:45 – 11:15	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"> <b>132 - Thermodynamic Analysis of a Reactive Particle-to-sCO<sub>2</sub> Heat Exchanger for Recovering Stored Thermochemical Energy</b>  <i>Siefering, Bryan; Umer, Muhammad (1); Stechel, Ellen (2); Fronk, Brian (1)</i>                      1: The Pennsylvania State University                      2: Arizona State University                 </td> <td style="width: 50%;"> <b>116 - Performance and Cost Potential for Direct-Fired Supercritical CO<sub>2</sub> Natural Gas Power Plants</b>  <i>Pidaparti, Sandeep; White, Charles (1); Liese, Eric; Weiland, Nathan (2)</i>                      1: National Energy Technology Laboratory/NETL Support Contractor                      2: National Energy Technology Laboratory                 </td> </tr> </table>	<b>132 - Thermodynamic Analysis of a Reactive Particle-to-sCO<sub>2</sub> Heat Exchanger for Recovering Stored Thermochemical Energy</b> <i>Siefering, Bryan; Umer, Muhammad (1); Stechel, Ellen (2); Fronk, Brian (1)</i> 1: The Pennsylvania State University 2: Arizona State University	<b>116 - Performance and Cost Potential for Direct-Fired Supercritical CO<sub>2</sub> Natural Gas Power Plants</b> <i>Pidaparti, Sandeep; White, Charles (1); Liese, Eric; Weiland, Nathan (2)</i> 1: National Energy Technology Laboratory/NETL Support Contractor 2: National Energy Technology Laboratory				
<b>132 - Thermodynamic Analysis of a Reactive Particle-to-sCO<sub>2</sub> Heat Exchanger for Recovering Stored Thermochemical Energy</b> <i>Siefering, Bryan; Umer, Muhammad (1); Stechel, Ellen (2); Fronk, Brian (1)</i> 1: The Pennsylvania State University 2: Arizona State University	<b>116 - Performance and Cost Potential for Direct-Fired Supercritical CO<sub>2</sub> Natural Gas Power Plants</b> <i>Pidaparti, Sandeep; White, Charles (1); Liese, Eric; Weiland, Nathan (2)</i> 1: National Energy Technology Laboratory/NETL Support Contractor 2: National Energy Technology Laboratory						
11:15 – 11:45	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"> <b>147 - A methodology to design air-cooled condensers for supercritical power cycles using carbon dioxide and carbon dioxide mixtures</b>  <i>Rodríguez-de Arriba, Pablo; Crespi, Francesco; Sánchez, David; Muñoz, Antonio</i>                      Department of Energy Engineering, University of Seville, Spain                 </td> <td style="width: 50%;"> <b>139 - Influence of variations of flue gas and ambient temperature on the dynamics and performance of a MW scale supercritical CO<sub>2</sub> waste heat to power unit</b>  <i>Olumayegun, Olumide; Marchionni, Matteo; Usman, Muhammad; Tassou, Savvas</i>                      Brunel University London, United Kingdom                 </td> </tr> </table>	<b>147 - A methodology to design air-cooled condensers for supercritical power cycles using carbon dioxide and carbon dioxide mixtures</b> <i>Rodríguez-de Arriba, Pablo; Crespi, Francesco; Sánchez, David; Muñoz, Antonio</i> Department of Energy Engineering, University of Seville, Spain	<b>139 - Influence of variations of flue gas and ambient temperature on the dynamics and performance of a MW scale supercritical CO<sub>2</sub> waste heat to power unit</b> <i>Olumayegun, Olumide; Marchionni, Matteo; Usman, Muhammad; Tassou, Savvas</i> Brunel University London, United Kingdom				
<b>147 - A methodology to design air-cooled condensers for supercritical power cycles using carbon dioxide and carbon dioxide mixtures</b> <i>Rodríguez-de Arriba, Pablo; Crespi, Francesco; Sánchez, David; Muñoz, Antonio</i> Department of Energy Engineering, University of Seville, Spain	<b>139 - Influence of variations of flue gas and ambient temperature on the dynamics and performance of a MW scale supercritical CO<sub>2</sub> waste heat to power unit</b> <i>Olumayegun, Olumide; Marchionni, Matteo; Usman, Muhammad; Tassou, Savvas</i> Brunel University London, United Kingdom						
11:45 – 12:00	Group photo						
12:00 – 13:15	Lunch						

# The 5<sup>th</sup> European sCO<sub>2</sub> Conference for Energy Systems – March 14<sup>th</sup> to 16<sup>th</sup>

Conference address: Vienna House Diplomat Prague | Evropská 15 | 160 41 Prague | Czech Republic



Wednesday - March 15 <sup>th</sup>		
	<b>Panel Session</b> <b>Room: Belvedere I</b> <b>Chairman: Rene Pecnik, TU Delft</b> <b>Albannie Cagnac, Électricité de France / EDF</b>	
13:15 – 14:45	<b>Future outlook and challenges for implementing sCO<sub>2</sub> energy conversion systems</b> <i>David Sánchez<sup>1</sup>; Stefan Glos<sup>2</sup>; Leonhard Wolscht<sup>3</sup></i> 1: Universidad de Sevilla 2: Siemens Energy AG 3: MAN Energy Solution	
14:45 – 15:15	Coffee break	
	<b>Heat Exchanger and Transfer / sCO<sub>2</sub> Experiments and Loops (Session 03)</b> <b>Room: Belvedere I</b> <b>Chairman: Andreas Werner, TU Vienna</b>	<b>Fluid and Material Aspects (Session 04)</b> <b>Room: Belvedere IV</b> <b>Chairman: Andreas Jäger, TU Dresden</b>
15:15 – 15:45	<b>120 - Parametric analysis of heat exchanger design in a techno-economic optimization of a sCO<sub>2</sub> system</b> <i>Geoteliip C. V., Thiago; Gampe, Uwe; Rath, Sebastian; Jäger, Andreas (1); Glos, Stefan (2)</i> 1: Technische Universität Dresden, Germany 2: Siemens Energy AG Mülheim, Germany	<b>118 - Review of HAYNES(R) 282(R) alloy for supercritical CO<sub>2</sub> structural applications</b> <i>Tossey, Brett; Deodeshmukh, Vinay (1); Pint, Bruce (2)</i> 1: Haynes International Inc., United States of America 2: Oak Ridge National Laboratory, United States of America
15:45 – 16:15	<b>127 - Modeling of Autonomous Brayton Cycle (ABC) Loop with GAMMA+ code for Micro Modular Reactor Simulation Application</b> <i>Choi, Sungwook; Lee, Jeong Ik</i> KAIST, Republic of South Korea	<b>109 - Exergetic and Entropy Analysis of the PCRC and RCMCI Brayton Cycles Using s-CO<sub>2</sub> Mixtures. Case Study: Marine Applications</b> <i>Tafur-Escanta, Paul Michael (1); Valencia-Chapi, Robert (2); Muñoz-Antón, Javier (1)</i> 1: Universidad Politécnica de Madrid, Spain 2: Universidad Técnica del Norte, Ecuador
16:15 – 16:45	<b>151 - CO<sub>2</sub> purification for sCO<sub>2</sub> loop in Rez - summary of the test results</b> <i>Berka, Jan (1); Hlinčík, Tomáš; Purkarová, Eliška; Vagenknechtová, Alice; Ballek, Jakub-Vojtěch</i> 1: Centrum vyzkumu Rez s.r.o., Czech Republic 2: University of Chemistry and Technology Prague - Department of Gaseous and Solid Fuels and Air Protectio	<b>112 - Influence of the equation of state on the design of sCO<sub>2</sub>-power cycles</b> <i>Rath, Sebastian; Gampe, Uwe; Jäger, Andreas</i> TU Dresden, Germany
19:00	Dinner @ Vienna House Diplomat, Evropská 15, Prague	

# The 5<sup>th</sup> European sCO<sub>2</sub> Conference for Energy Systems – March 14<sup>th</sup> to 16<sup>th</sup>

Conference address: Vienna House Diplomat Prague | Evropská 15 | 160 41 Prague | Czech Republic



Thursday - March 16 <sup>th</sup>		
	<b>sCO<sub>2</sub> Applications and Energy Systems / Heat Exchanger (Session 05)</b> Room: Belvedere I                      Chairman: Paolo Silva, <i>Politecnico di Milano</i>	<b>Turbomachines and Cycles (Session 06)</b> Room: Belvedere IV                      Chairman: Teemu Turunen-Saaresti, <i>LUT University</i>
09:00 – 09:30	<b>119 - Techno-economic analysis and optimization of sCO<sub>2</sub> power cycle</b> <i>Son, In Woo; Lee, Jeong Ik; Jeong, Yongju</i> <i>The Korea Advanced Institute of Science and Technology (KAIST), Republic of South Korea</i>	<b>111 - Further development of a through-flow program by considering real gas equations of state</b> <i>Ren, Haikun; Schuster, Sebastian; Brillert, Dieter</i> <i>University of Duisburg-Essen, Chair of Turbomachinery, Germany</i>
09:30 – 10:00	<b>130 - Performance analysis of PTES layouts evolving sCO<sub>2</sub> for industrial WHR integration</b> <i>Maccarini, Simone; Barberis, Stefano; Mehdi, Shamsi Syed Safeer; Gini, Lorenzo; Traverso, Alberto</i> <i>Thermochemical Power Group, Department of Mechanical Engineering, University of Genova, Italy</i>	<b>155 - Design and Computational Assessment of a Supercritical CO<sub>2</sub> Compressor for Waste Heat Recovery Applications</b> <i>Romei, A.; Persico, G.; Gaetani, P. (1); Bellobuono, E. F.; Toni, L.; Valente, R. (2)</i> <i>1: Laboratory of Fluid Machines, Energy Dept., Politecnico di Milano, Italy</i> <i>2: Centrifugal Compressor and Expanders, NPD Baker Hughes, Nuovo Pignone, Italy</i>
10:00 – 10:30	<b>134 - Experimental and Numerical Study on Thermal Hydraulic Performance of Trapezoidal Printed Circuit Heat Exchanger for Supercritical CO<sub>2</sub> Brayton Cycle</b> <i>Ji, Yuxuan; Wang, Zheng; Wang, Mingxuan; Liu, Yafei; Xu, Haoran; Zhu, Peiwan; Xiao, Gang</i> <i>Zhejiang University, People's Republic of China</i>	<b>145 - Design and Evaluation of Low Specific Speed Expander for Geothermal Energy Application</b> <i>Patil, Abhay; Nielson, Jordan; Smith, Natalie (1); Weiss, Nathan (2)</i> <i>1: Southwest Research Institute, United States of America</i> <i>2: Sage Geosystems Inc, United States of America</i>
10:30 – 11:00	Coffee break	
	<b>sCO<sub>2</sub> Experiments and Loops (Session 07)</b> Room: Belvedere I                      Chairman: Otakar Frýbort, <i>Research Centre Řež</i>	<b>Turbomachines and Cycles (Session 08)</b> Room: Belvedere IV                      Chairman: Uwe Gampe, <i>TU Dresden</i>
11:00 – 11:30	<b>114 - System analysis of experimental sCO<sub>2</sub> cycle Sofia</b> <i>Kriz, Daniel; Vlcek, Petr; Frybort, Otakar</i> <i>Research Centre Rez, Czech Republic</i>	<b>106 - Transient simulation and analysis of a supercritical CO<sub>2</sub> heat removal system under different abnormal operation conditions</b> <i>Hofer, Markus (1); Hecker, Frieder (2); Buck, Michael; Starflinger, Jörg (1)</i> <i>1: University Stuttgart, Germany</i> <i>2: Simulator Centre of KSG/GfS</i>
11:30 – 12:00	<b>113 - Design and setup of the suCOO-Lab sCO<sub>2</sub> test facility at TU Dresden</b> <i>Rath, Sebastian; Gampe, Uwe; Breitskopf, Cornelia; Jäger, Andreas</i> <i>TU Dresden, Germany</i>	<b>115 - Dynamic Simulation and Experimental Validation of a 35 MW Heat Pump Based on a Transcritical CO<sub>2</sub> Cycle</b> <i>Wolscht, Leonhard (1); Knobloch, Kai (2); Jacquemoud, Emmanuel; Jenny, Philipp (1)</i> <i>1: MAN Energy Solutions, Switzerland</i> <i>2: Department of Energy Conversion and Storage, Technical University of Denmark</i>

# The 5<sup>th</sup> European sCO<sub>2</sub> Conference for Energy Systems – March 14<sup>th</sup> to 16<sup>th</sup>

Conference address: Vienna House Diplomat Prague | Evropská 15 | 160 41 Prague | Czech Republic



Thursday - March 16 <sup>th</sup>		
12:00 – 12:30	<b>110 - Study of PID-based S-CO<sub>2</sub> System Control Method</b> <i>Kim, Gi Hyeon; Lee, Jeong Ik</i> <i>Korea Advanced Institute of Science and Technology, Republic of South Korea</i>	<b>124 - Analysis of the potential of CO<sub>2</sub> based mixtures to improve the efficiency of cogenerative waste heat recovery power plants</b> <i>Morosini, Ettore (1); Donielli, Michele (2); Alfani, Dario; Astolfi, Marco (1); Marcoberardino, Gioele Di (2); Manzolini, Giampaolo (1)</i> 1: Politecnico di Milano, Italy 2: Università degli studi di Brescia, Italy
12:30 – 13:30	Lunch	
	<b>sCO<sub>2</sub> Experiments and Loops (Session 09)</b> <b>Room: Belvedere I</b> <b>Chairman: Marco , Astolfi Politecnico di Milano</b>	<b>Turbomachines and Cycles (Session 10)</b> <b>Room: Belvedere IV</b> <b>Chairman: Rene Pecnik, TU Delft</b>
13:30 – 14:00	<b>131 - The steady behavior of the supercritical carbon dioxide natural convection loop</b> <i>Draskic, Marko; Bugeat, Benjamin; Pecnik, Rene</i> <i>TU Delft, The Netherlands</i>	<b>146 - Design of Compact Radial Turboexpanders for sCO<sub>2</sub> Power Systems</b> <i>Romei, Alessandro; Persico Giacomo (1); Biliotti, Davide, Minani, Alberto (2); Lottini, Fabrizio; Marconcini, Michele (3)</i> 1: Politecnico di Milano 2: Baker Hughes, Nuovo Pignone 3: Università degli Studi di Firenze
14:00 – 14:30	<b>121 - Performance comparison of temperature sensors for closed cycles operating with supercritical CO<sub>2</sub></b> <i>Belleoud, Pierre; Anselmi, Eduardo (1); Chetwynd-Chatwin, Jason (2); Roumeliotis, Ioannis (1)</i> 1: Cranfield University, Bedfordshire, United Kingdom 2: Rolls-Royce plc, Bristol, United Kingdom	<b>122 - Design of an axial sCO<sub>2</sub> turbine for a demo plant in an industrial environment</b> <i>Glos, Stefan; Musch, Christian; Stueer, Carmen; Wechsung, Michael</i> <i>Siemens-Energy, Germany</i>
14:30 – 15:00	<b>108 - sCO<sub>2</sub> Test Facility at TU Wien: Design, Operation and Results</b> <i>Illyés, Viktoria; Thanheiser, Stefan; Schwarzmayr, Paul (1); David, Pierre-Luc; Guerif, Xavier (2); Werner, Andreas; Haider, Markus (1)</i> 1: TU Wien, Austria 2: Kelvion Thermal Solutions	<b>136 - Design and testing of a supercritical CO<sub>2</sub> compander for 2 MW</b> <i>Schmitz, Ulrich; Sauerborn, Markus; Bohn, Juergen; Enneking, Martin; Brenner, Jens</i> <i>Atlas Copco Energas GmbH/Atlas Copco Gas and Process</i>
	<b>Room: Belvedere I</b>	
15:00 – 15:15	<b>Closing Session</b> <ul style="list-style-type: none"> <li>- Best paper award</li> <li>- Announcement of the conference location and date for 2025</li> </ul>	