14th EUROPEAN CONFERENCE

ON INDUSTRIAL FURNACES AND BOILERS

2 - 5 April 2024 - Algarve, Portugal

INFUB

Programme

Tuesday, April 2nd 2024

15:00 - 18:00	**Conference Registration** Location: **Sala Salgados**
18:00 - 18:30	**Opening Session** Location: **Sala Salgados**
18:40 - 19:30	**Keynote 1: Cecilia Sebastiani - Babcock Wanson, Italy** **Environment and Innovation: Obstacles, Challenges, Opportunities for Industrial Thermal Engineering** Location: **Sala Salgados**
20:00	**Welcome Dinner** Location: **Le Palmeraie**

Wednesday, Apr 3rd 2024

08:30 - 09:20

Keynote 2: Toshiro Fujimori - IHI Corporation, Japan
Power generation for decarbonization using ammonia fuel
Location: **Sala Salgados**

09:25 - 10:45

01-MONI: Condition Monitoring and Pollution
Location: **Sala Salgados**
Chair: **Joachim Wuenning**

Online corrosion monitoring in a waste co-fired fluidized bed power plant
Dennis Hülsbruch[1], Adrian Marx[1], Alexander Kuhn[1], Jochen Ströhle[1], Bernd Epple[1], Marcin Kost[2]
1: Technical University Darmstadt, Germany; 2: Fortum Power and Heat Polska Sp. z o.o.

3D Analysis of the Flight Behavior of Refuse-Derived Fuel Particles: Plenoptic Camera vs. Stereo Camera System
Markus Vogelbacher[1], Miao Zhang[1], Robin Streier[2], Siegmar Wirtz[2], Viktor Scherer[2], Jörg Matthes[1]
1: Karlsruhe Institute of Technology, Institute for Automation und Applied Informatics, Germany; 2: Ruhr-University Bochum, Department of Energy Plant Technology, Germany

Creep bending tests of alloys during superimposed thermal cycling
Siri Harboe-Minwegen
OWI Science For Fuels, Germany

An Inverse Solution Methodology for the Optimization of Heater Powers in a Vacuum Batch Furnace
Ersin Yıldız[1], Altuğ M. Başol[1], M. Pınar Mengüç[1,2]
1: Özyeğin University, Türkiye; 2: Center for Energy, Environment and Economy (CEEE/EÇEM), Özyeğin University, Türkiye

02-BURN: Burners and Modelling
Location: **Sala Galé I**
Chair: **Hao Wu**

Decarbonization in the lime industry
Marlena Wissel, Frank Ohnemueller
German Lime Association, Germany

Heat transfer enhancement of a thermal plasma in a rotary kiln for cement production
Alice Fakt[1], Adrian Gunnarsson[1], Klas Andersson[1], Bodil Wilhelmsson[2], Arvid Stjernberg[2]
1: Chalmers University of Technology, Sweden; 2: Heidelberg Materials Cement Sverige AB, Sweden

Influence of flights and cross fixtures on the heat transfer surfaces in rotary kilns
Claudia Meitzner[1], Fabian Herz[2], Eckehard Specht[1], Alina Lange[3], Harald Kruggel-Emden[3]
1: Otto von Guericke University Magdeburg, Institute of Fluid Dynamics and Thermodynamics, Universitätsplatz 2, 39106 Magdeburg Germany; 2: Anhalt University of Applied Sciences, Applied Biosciences and Process Engineering, Bernburger Str. 55, 06366 Köthen Germany; 3: Technische Universität Berlin, Chair of Mechanical Process Engineering and Solids Processing, Ernst-Reuter-Platz 1, 10587 Berlin Germany

The influence of particle size on the quartz sand calcination in rotary kilns
Haozhi Jie, Fabian Herz
Anhalt University of Applied Sciences, Germany

03-ALT1: Alternative Fuels (bio-waste-iron)
Location: **São Galé II**
Chair: **Nidia Diaz Perez**

Characterization of the ignition and combustion behaviour of biogenic residues
Matteo Giesen, Daniel Bernhardt, Michael Beckmann
TU Dresden, Germany

Exploring Fluidized Bed Technology for Biocarbon Production with Alkali/Phosphorus Mitigation
Eduardo Arango Durango, Kentaro Umeki
Luleå University of Technology, Sweden

Investigation of the effect of pneumatic conveying on comminution of wood pellets: influence of silo truck parameters
Phil Spatz, Siegmar Wirtz, Viktor Scherer
Department of Energy Plant Technology, Ruhr-University Bochum, Germany

Sustainable process heat: Conditioning of biogenic synthesis gases from gasification for direct use in conventional burner systems
Christian Wondra, Peter Treiber, Jürgen Karl
Chair of Energy Process Enginieering, Friedrich-Alexander-University Erlangen-Nuremberg, Germany

10:45 - 11:15

Coffee Break
Location: **Le Palmeraie**

11:15 - 12:35

04-ALT2: Alternative Fuels (NH3, H2)

Location: **Sala Salgados**
Chair: **Agustin Valera**

An experimental study by laser diagnostics of the progressive decarbonization of a turbulent Bluff-Body flame with hydrogen

Kuppuraj Rajamanickam[1,2], Ariff Mahuthannan[3], Saïd Idlahcen[1], Bertrand Lecordier[1], Corine Lacour[1], Armelle Cessou[1], David Honoré[1]
1: CORIA - CNRS, UNIROUEN, INSA Rouen, Normandie Univ; 675 Avenue de l'université, 76801 Saint-Etienne-du-Rouvray, France; 2: Imperial College London, Department of Mechanical Engineering, SW72AZ, UK; 3: SINTEF Energy Research – NTNU, Trondheim, Norway

Renewable fuels for decarbonizing industrial furnaces: A techno-economic assessment of different Power-to-X concepts

Daniela Leibetseder[1], Philipp Moser[1], Christoph Zauner[1], Michael Schwaiger[2]
1: Austrian Institute of Technology, Austria; 2: voestalpine AG, Austria

Gas turbine operation with hydrogen blends

Mohsen Assadi[1], Reyhaneh Banihabib[1], Mohamed Pourkashanian[2], Karen Finney[2], Peter Kutne[3], Timo Lingstaedt[3]
1: University of Stavanger, Norway; 2: Sheffield University; 3: German Aerospace Research Center

New generation burner for 0 to 100 % hydrogen flexibility in reheating furnaces

John Brunelli-Brondex, Hassan Mohanna, Sébastien Caillat, Patrice Sedmak, Minh Duy Le
Fives Stein, France

05-BURN: Steel

Location: **Sala Galé I**
Chair: **Siri Harboe-Minwegen**

Electrification of reheating furnaces: state of the art and future research needs

Gustav Häggström, Joel Falk, Andreas Johnsson
Swerim AB, Sweden

Dissemination and future research road map on heating and burner technology in industrial heating in the European steel industry

Oliver Hatzfeld[1], Andreas Johnsson[2], Gustav Haeggstroem[2], Joel Falk[2], Nico Schmitz[3], Elsa Busson[3]
1: VDEh-Betriebsforschungsinstitut GmbH, Germany; 2: Swerim AB, Sweden; 3: IOB, RWTH Aachen University, Germany

Investigations of radiant tube arrangements and their effect on radiation exchange in horizontal furnaces

Dominik Büschgens, Herbert Pfeifer
Department for Industrial Furnaces and Heat Engineering, RWTH Aachen University, Aachen, Germany

Simulation model of a strip annealing line to improve product quality in precision strip production

Nico Rademacher[1], Christian Kühnert[2], Dominik Büschgens[1], Moritz Eickhoff[1], Herbert Pfeifer[1], Thomas Bernard[2]
1: RWTH Aachen University, Department for Industrial Furnaces and Heat Engineering, Germany; 2: Fraunhofer Institute of Optronics, System Technologies and Image Exploration IOSB, Germany

06-PLAS: Thermochemical Recycling of Plastics

Location: **São Galé II**
Chair: **Osvalda Senneca**

Plastic pyrolysis: an experimental study on the circularity of organic-rich fraction from mechanical recycling of refrigerators

Jonas Vogt[1], Salar Tavakkol[1], Frank Richter[1], Grazyna Straczewski[1], Axel Renno[2], Simone Raatz[2], Dieter Stapf[1]
1: Karlsruhe Institute of Technology, Institute for Technical Chemistry, Germany; 2: Helmholtz Institute Freiberg of Resource Technology, Freiberg, Germany

Technical and market challenges in the chemical recycling of plastic wastes

Jean-Bernard MICHEL
Humana Sàrl, Switzerland

Multi-material injection system to foster circularity: valorization of recycled polymers from waste plastics in Electric Arc Furnace

Mattia Bissoli[1], Enrico Malfa[1], Mauro Gizzi[1], Lorenzo Angeli[2], Piero Frittella[2], Andrea Landini[2], Gianpaolo Foglio[2], Francesco Fredi[2], Cosmo Di Cecca[2], Mattia Tellaroli[2], Ercole Tolettini[2], Carolina Busseni[2], Elisa Marchesan[3], Elia Gosparini[3], Luz Salas[4], Antoine Claveau[4], Loredana Di Sante[5], Marcello Casa[5]
1: Tenova S.p.A., Castellanza (VA), Italy; 2: Feralpi Siderurgica, Lonato (BS), Italy; 3: IBLU, Pasian di Prato (UD), Italy; 4: Strane, France; 5: RINA-Centro Sviluppo Materiali (RM), Italy

Ex-situ catalytic pyrolysis of electronic plastic waste using combined CaO, HZSM-5 and Fe/HZSM-5 catalysts for improving hydrocarbons yield

Samina Gulshan[1], Hoda Shafaghat[2], Panagiotis Evangelopoulos[3], Weihong Yang[1]
1: KTH Royal Institute of Technology, Department of Material Sciences and Engineering; 2: Division of Bioeconomy and Health, Department of Biorefinery and Energy, RISE Research Institutes of Sweden AB; 3: Department of System Transition and Service Innovation, Unit of Resources from Waste, RISE Research Institutes of Sweden AB

12:35 - 13:50

LUNCH
Location: **Ocean Buffet**

13:50 - 14:40

Keynote 3: Henrik Saxén - Åbo Akademi University, Finland
A computational study on energy efficiency of hydrogen reduction of iron ore in a direct reduction furnace
Location: **Sala Salgados**

14:45 - 16:05

07-ALT2: Alternative Fuels (NH3, H2)

Location: **Sala Salgados**
Chair: **Sven Eckart**

Large-eddy simulation and experimental study of a partially premixed hydrogen / air swirled burner: impact of the injection system

Karine Truffin[1], Paul-Georgian Luca[1], Tran Ngoc Duc Ho[1], Justin Bertsch[1], Giampaolo Maio[1], Cédric Mehl[1], Victor Coquin[2,3], Gilles Cabot[2], Bruno Renou[2], Lucio Taddeo[3]
1: IFP Energies Nouvelles, 1-4 Av. du Bois Préau, 92852 Rueil-Malmaison, France; 2: UNIROUEN, INSA Rouen, CNRS, CORIA, Normandie University, 76000 Rouen, France; 3: CETIAT, 25 Avenue des Arts, 69100 Villeurbanne

Green hydrogen application in the hard-to-abate industry: a feasibility study

Marco Pellegrini[1], Alessandro Guzzini[1], Cesare Saccani[1], Barbara Lodi[2], Jessica Rosati[2], Daniele Tocco[3]
1: University of Bologna, Italy; 2: CPL Concordia Soc. Coop., Italy; 3: Fluorsid S.p.A., Italy

Quantifying the effect of swirl number on the radiative heat transfer from hydrogen-methane blended flames by use of a diffusion swirl burner

Benjamin Rhys White[1], Steven Morris[1], Burak Goktepe[1], Richard Marsh[1], Andrew Price[2]
1: Cardiff University, United Kingdom; 2: CR PLUS

Utilisation of Virtual Chemistry for the combustion of CH4 − H2 mixture

Malo Hustache[1,2], TAN-PHONG LUU[1], NICOLAS MEYNET[2], NASSER DARABIHA[1], BENOIT FIORINA[1]
1: Laboratoire EM2C, CentraleSupelec, France; 2: Engie Lab Crigen, France

08-BURN: Burners and Modelling

Location: **Sala Galé I**
Chair: **Zaaquib Yunus Ahmed**

Design aspects of microwave heating and plasma burners for high temperature processes: An Overview

Ralph Behrend, Sven Eckart, Valerie Grimm, Muralimohan Juttu-Vidyasagar, Hartmut Krause
TU Bergakademie Freiberg, Institute of Thermal Engineering, Professorship of Gas and Heat Technology Germany

Single particle RDF conversion models for oxy-fuel conditions: simulation and experiments

Robin Alexander Streier[1], Rafael Solana Gómez[2], Reinhold Kneer[2], Ines Veckenstedt[3], Anica Vogel[3], Thomas Deck[3], Karl Lampe[3], Viktor Scherer[1]
1: Department of Energy Plant Technology, Ruhr-University Bochum, Germany; 2: Institute of Heat and Mass Transfer, RWTH Aachen University, Germany; 3: Cement Process Technology, thyssenkrupp Polysius GmbH, Germany

Electrification of continuous steel-strip annealing furnaces

Jaejin Yu[1,2], Jaewon Chung[2], Hookyung Lee[1]
1: Korea Institute of Energy Research, Korea, Republic of (South Korea); 2: Korea University, Korea, Republic of (South Korea)

3D Tomographic Reconstruction of Industrial High-Temperature Combustion Processes

Markus Röder[1], Philipp Pietsch[2], Andreas Unterberger[3], Fabio Martins[3], Anne Giese[1], Khadijeh Mohri[3,4,5]
1: Gas- und Wärme-Institut Essen e.V. – GWI, Essen, Germany; 2: Gastechnologisches Institut Freiberg gGmbH – DBI, Freiberg, Germany; 3: Tomography, Institute for Energy and Materials Processes – EMPI, University of Duisburg-Essen, Duisburg, Germany; 4: Fluid Dynamics, EMPI, University of Duisburg-Essen, Duisburg, Germany; 5: Center for Nanointegration Duisburg-Essen – CENIDE, University of Duisburg-Essen, Duisburg, Germany

09-ALT1: Alternative Fuels (bio-waste-iron)

Location: **São Galé II**
Chair: **Maarten Vanierschot**

Digital twin of a 154MWth biomass spout-firing boiler

Margherita Dotti[1], Emil Zacho Rath[2], Henrik Hofgren[2], Matthias Mandø[1], Chungen Yin[1]
1: Department of Energy Technology, Aalborg University, Denmark; 2: Babcock & Wilcox Renewable, Denmark

A Study of the Phosphorus Release Potential of Sewage Sludge in Entrained Flow Gasification

Johannes Scherer[1], Andreas Richter[1], Tobias Ginsberg[2], Christian Wolfersdorf[2]
1: TU Bergakademie Freiberg, Germany; 2: RWE Power AG, Forschung und Entwicklung

On the combustion of terpenes biofuels

Philippe Dagaut
Centre National de la Recherche Scientifique, France

Operational determination of the fraction composition during waste incineration

Antje David[1], Daniel Bernhardt[1], Michael Beckmann[1], Anna Krein[2], Stefan Vodegel[2]
1: Dresden University of Technology, Germany; 2: Clausthal Research Center for Environmental Technologies, Germany

16:05 - 16:35

Coffee Break
Location: **Le Palmeraie**

16:35 - 17:55

10-ALT2: Alternative Fuels (NH3, H2)

Location: **Sala Salgados**
Chair: **David Honoré**

Experimental study on a H2/Natural Gas fired prototype self-recuperative burner – fundamental performance, combustion efficiency, NOx emissions

Lukas Sankowski, Hannah Kaiser, Christopher Wünning, Nico Schmitz, Herbert Pfeifer
RWTH Aachen University, Germany

Heat transfer and NOx emissions from hydrogen / natural gas flames in thin-walled furnaces

Peijun Guo, Neil L. Smith, Doug B. Proud, Paul R. Medwell, Peter Ashman
University of Adelaide, Australia

Comparison of the NOx emissions for a 70kW dual fuel hydrogen/natural gas industrial burner

Gordon Andrews[1,2], Ramon Quinonez[2], Ray Massey[2], Richard Wakeman[2], Jason Poon[1], Herodotus Phylaktou[1], Steve Smith[2]
1: University of Leeds, UK; 2: Clean Burner Systems Ltd., UK

Experimental study on a new developed hydrogen condensing boiler with single digit NOx Emissions

Michael Dölz[1], Joachim G. Wünning[2], Tobias Plessing[1]
1: Institute for Hydrogen and Energy Technology; 2: WS Wärmeprozesstechnik GmbH

11-BURN: Solid Fuels

Location: **Sala Galé I**
Chair: **Stefan Pielsticker**

Towards Using Large Eddy Simulation for Analysis of Combustion Characteristics in a 1 MW Biomass Burner

Leon Loni Berkel, Pascal Steffens, Hendrik Nicolai, Christian Hasse
Institut for Simulation of reactive Thermo-Fluid Systems, Technische Universität Darmstadt, Otto-Berndt-Strasse 2, 64287 Darmstadt

Modelling and prediction of self-heating and self-ignition in 3D storage pile of solid fuels

Yonghao Wang, Matthias Mandø, Chungen Yin
Aalborg University, Denmark

Optimisation and digitalisation strategies for the "Furnace of the Future" - especially for plants operated with heterogeneous solid fuels

Martin Hannes Zwiellehner[1], Franz Dannerbeck[1], Mike Sinnreich[2], Ragnar Warnecke[3], Theo Steininger[4], Maksim Greiner[4]
1: SAR Group GmbH, Process- and Environmental Technology, Germany; 2: Thermische Verwertungsanlage Schwarza, Germany; 3: GKS Gemeinschaftskraftwerk Schweinfurt, Germany; 4: Erium GmbH, Germany

CFD Based Solutions to Resolve Combustion and Emissions Issues of Waste-to-Energy Plants

Anura Perera, Thomas Ball, John Goldring, Gerry Riley
RJM International, United Kingdom

12-ALT1: Alternative Fuels (bio-waste-iron)

Location: **São Galé II**
Chair: **Christoph Spijker**

Experimental investigation of high temperature conversion of sewage sludge in an entrained flow reactor

Christian Schmidberger[1], Benjamin Ortner[2], Simon Grathwohl[1], Jörg Maier[1], Günter Scheffknecht[1]
1: University of Stuttgart, Germany; 2: Graz University of Technology

Impact of chemical treatments of particle boards on the fate of nitrogen during their combustion

Thomas Bertus[1,2], Jérôme Lemonon[2], F. Javier Escudero Sanz[2], Sylvain Salvador[2]
1: COMPTE.R, France; 2: Centre RAPSODEE, UMR CNRS 5302, IMT Mines Albi, France

Experimental Investigation of Combustion Characteristics During Co-Combustion of Solid Recovered Fuel and Coal in a 1 MWth Circulating Fluidized Bed Reactor

Alexander Kuhn[1], Eric Langner[1], Dennis Hülsbruch[1], Emmi Kallio[2], Alex Soderholm[2], Vesna Barisic[2], Jochen Ströhle[1], Bernd Epple[1]
1: Institute for Energy Systems and Technology, TU Darmstadt, Germany; 2: Sumitomo SHI FW Energia Oy, Finland

Energy storage using direct iron oxide reduction and energy utilization with high temperature metal combustion

Luis M. Romeo[1], Carmen Mayoral[2], Santiago Jiménez[2], Begoña Rubio[2], José M. Andrés[2]
1: Universidad de Zaragoza. EINA-Mechanical Engineering Department.; 2: Instituto de Carboquímica (CSIC).

Thursday, April 4th 2024

08:30 - 09:20

Keynote 4: Henrik Thunman - Chalmers University of Technology, Sweden
Waste as a feed stock for chemicals: Steam cracking of waste for virgin plastic production with negative CO2 emissions
Location: **Sala Salgados**

09:25 - 10:45

13-SFB: SFB 287: Packed and moving beds

Location: **Sala Salgados**
Chair: **Viktor Scherer**

XDEM Technology Supporting the Transition from Blast to Direct Reduction Iron (DRI) Furnaces

Bernhard Josef Peters
University of Luxembourg, Luxembourg

How CFD-DEM Simulations benefit from Machine Learning

Stefan Radl[1], Hadie Benabchiasli[1], Gregor Fasching[1], Michael Mitterlindner[1], Mohammadsadegh Salehi[1,2]
1: Graz University of Technology, Austria; 2: Virtual Vehicle Research GmbH, 8010 Graz

Flame-particle interaction inside a packed bed of particles: experiments to validate DEM/CFD simulations

Mohammadhassan Khodsiani[1], Enric Illana Mahiques[2], Frank Beyrau[1], Viktor Scherer[2], Benoît Fond[1,3]
1: Otto-von-Guericke University of Magdeburg, Germany; 2: Institute of Energy Plant Technology, Ruhr-University Bochum, Bochum, Germany; 3: ONERA, the French Aerospace Lab, Department of Aerodynamics, Aeroelasticity and Aeroacoustics (DAAA), Paris-Saclay University, F-92190 Meudon

A numerical study on the gas phase combustion downstream of a packed particle bed: differences in prediction by VLES and RANS turbulence models

Max Brömmer, Enric Illana Mahiques, Siegmar Wirtz, Viktor Scherer
Ruhr University Bochum, Germany

14-BURN: Waste/Sewage

Location: **Sala Galé I**
Chair: **Luis M. Romeo**

Characterization of Packed Bed Reactors Using X-Ray Microtomography: Effect of Particle Irregularity and Particle Size Distribution on the Bed Morphology

Zahra Ghasemi Monfared[1], Gunnar Hellström[1], Ryan Robinson[2], Kentaro Umeki[1]
1: Lulea University of Technology, Sweden; 2: Höganäs AB,

Application of computationally inexpensive CFD approach for the combustion of sewage sludge powder in entrained flow furnaces

Benjamin Ortner[1], Christian Schmidberger[2], Hannes Gerhardter[1], René Prieler[1], Christoph Hochenauer[1]
1: Graz University of Technology, Austria; 2: University of Stuttgart, Germany

Impact of combustion control on HCl and SO2 production in an industrial Waste-to-Energy furnace

Wouter Meynendonckx[1], Mariya Ishteva[2], Mathias Verbeke[3], Johan De Greef[1]
1: ChEMaRTS, Department of Materials Engineering, Leuven Group T Campus, KU Leuven, Belgium; 2: NUMA-ADVISE, Department of Computer Science, Campus Geel, KU Leuven, Belgium; 3: DTAI, Department of Computer Science, Bruges Campus, KU Leuven, Belgium

CFD modelling of an 850 kW injection furnace to investigate NOx emissions

Johannes Haimerl, Gabriel J Roeder, Christoph Daschner, Sebastian Fendt, Hartmut Spliethoff
Chair of Energy Systems, Technical University of Munich, Germany

15-ALT2: Alternative Fuels (NH3, H2)

Location: **São Galé II**
Chair: **Nico Schmitz**

Effect of NH3 addition on a Natural Gas Fueled Industrial Radiant Tube Burner

Namsu Kim, Young Tae Guahk, Changbog Ko, Seunggon Kim
Korea Institue of Energy Research, Korea, Republic of (South Korea)

Use of cracked ammonia for the replacement of propane in industrial boilers

Agustin Valera-Medina[1], Syed Mashruk[1], Marsh Richard[1], James Rudman[2], Joanna Jojka[3], Phil Bowen[1]
1: Cardiff University, United Kingdom; 2: FloGas; 3: Poznan University of Technology, Poland

Combustion of ammonia as a carbon-free fuel for heat generation - Comparative Studies on Economic Efficiency

Janine Wiebe[1], Hans-Joachim Gehrmann[1], Krasimir Aleksandrov[1], Dieter Stapf[1], Christian Reichert[2]
1: Karlsruhe Institute of Technology (KIT), Institute for Technical Chemistry (ITC), Karlsruhe, Germany; 2: Bingen Technical University of Applied Sciences (TH-Bingen), Bingen, Germany

Effect of ammonia substitution on combustion characteristics of swirling non-premixed methane-air flame

Toufik Boushaki[1], Zhiyong GUO[2]
1: University of Orleans - ICARE CNRS; 2: University of Orleans - ICARE CNRS

10:45 - 11:15

Coffee Break
Location: **Le Palmeraie**

11:15 - 12:35

16-MONI: Condition Monitoring and Pollution

Location: **Sala Salgados**
Chair: **Jörg Matthes**

High temperature dielectric properties measurement for refractories

Ralph Behrend, Valerie Grimm, Hartmut Krause
TU Bergakademie Freiberg, Institute of Thermal Engineering, Professorship of Gas and Heat Technology Germany

Combustion characteristics on periodic fuel-flow control in an industrial furnace

Hookyung Lee[1], Dong Myung Seo[1], Jonghyun Kim[2], Kangmin Ju[2], Jungsoo Park[2]
1: Korea Institute of Energy Research, Korea, Republic of (South Korea); 2: Chosun University, Korea, Republic of (South Korea)

Overall plant optimization by automatic controlling with acoustic gas temperature measurement – Improvement of efficiency, emissions, and plant availability

Martin Brodeck, Maximilian von Campenhausen
Bonnenberg & Drescher GmbH, Germany

The Influence of Sulfur Recirculation Technology on Deposit Formation in a Waste-to-Energy Plant

Wenhan Cao[1], Yifan Du[1], Sven Andersson[2], Peter Arendt Jensen[1], Peter Glarborg[1], Thomas Norman[3], Niels Peder Hansen[4], Hao Wu[1]
1: Technical University Of Denmark, Denmark; 2: Babcock & Wilcox GMAB™ Environmental Technologies, Sweden; 3: Babcock & Wilcox Renewable, Denmark; 4: MEC - Bioheat&Power, Maabjerg Energy Center, Denmark

17-BURN: Oxy and Ammonia

Location: **Sala Galé I**
Chair: **Cecilia Sebastiani**

Experimental investigation towards emission minimization via oxygen lancing in oxy-fuel combustion of natural gas and hydrogen

Stefan Schwarz[1], Georg Daurer[1], Christian Gaber[2], Martin Demuth[2], Christoph Hochenauer[1]
1: Graz University of Technology, Institute of Thermal Engineering, Austria; 2: Messer Austria GmbH, Austria

Oxy-Fuel Combustion in an Entrained Flow Test Rig for Regeneration of spent Calcium Looping Sorbents

Nico Mader, Jörg Maier, Günter Scheffknecht
University of Stuttgart, Institute of Combustion and Power Plant Technology, Germany

Experimental study on coal/ammonia co-firing in a 80kW th single burner scale and 1MW th mulit burner scale furnace

Taeyoung Chae[1], Jaewook Lee[1], Woohyeun Sim[1], Won Yang[1], Kyoungil Park[2], Sehyun Baek[2]
1: Korea institute of industrial technology, Korea, Republic of (South Korea); 2: Korea electric power corporation, Korea, Republic of (South Korea)

Experimental investigations of the combustion of ammonia for decarbonized process heat

Marcel Biebl, Jörg Leicher, Anne Giese, Klaus Görner
Gas- und Wärme-Institut Essen e.V., Germany

18-PLAS: Thermochemical Recycling of Plastic

Location: **São Galé II**
Chair: **Salar Tavakkol**

RiPlaiD concept for valorization of waste plastics into gasoline: from laboratory to pre-industrial scale

Maurizio Azzolini[1], Giovanni Curia[1], Fabio Moratti[1], Alessandro Bozzoli[2], Luigi Crema[2], Michele Bolognese[2], Matteo Testi[2], Farhad Farajimoghadam[3], Paesano Laura[3], Davide Imperiale[3], Luca Pagano[3], Urbana Bonas[3], Marta Marmiroli[3], Nelson Marmiroli[3], Barbara Apicella[4], Francesca Cerciello[5], Renata Migliaccio[4], Maria Maddalena Oliano[4], Giovanna Ruoppolo[4], Fernando Stanzione[4], Massimo Urciuolo[4], Osvalda Senneca[4]
1: Lifenergy Italia; 2: Fondazione Bruno Kessler; 3: CINSA; 4: STEMS-CNR; 5: RUB

Thermochemical recycling of mixed plastic wastes through pyrolysis and steam cracking – assessment of centralized vs. decentralized approaches.

Ivan Gogolev[1], Nidia Diaz Perez[1], Chahat Mandviwala[1], Renesteban Forero Franco[1], Ann-Christine Johansson[2], Andre Selander[2], Martin Seemann[1]
1: Chalmers University of Technology, Sweden; 2: Research Institutes of Sweden (RISE)

Direct Numerical Simulation of gasification of a polypropylene plastic particle in supercritical water: impact of flow conditions

Abouelmagd Abdelsamie[1,2], Cheng Chi[1], Zhisong Ou[3], Dominique Thevenin[1]
1: Lab. of Fluid Dynamics and Technical Flows, Magdeburg University, Germany; 2: Lab. of Fluid Mechanics, Mechanical Power Engineering Department, Faculty of Engineering (El-Mattaria), Helwan University; 3: State Key Laboratory of Geomechanics and Geotechnical Engineering, Institute of Rock and Soil Mechanics, Chinese Academy of Sciences

A comprehensive approach for sampling and analyzing product mixtures from a semi-industrial scale fluidized bed steam cracker

Chahat Mandviwala, Renesteban Forero Franco, Ivan Gogolev, Teresa Berdugo Vilches, Martin Seemann, Henrik Thunman
Department of Space, Earth and Environment (SEE), Division of Energy Technology, Chalmers University of Technology, Gothenburg, Sweden 41296

12:35 - 13:50 **Lunch**
Location: **Ocean Buffet**

13:50 - 14:40

Poster Session 1 - Short Presentations
Location: **Sala Galé I**
Chair: **Viktor Scherer**

P1 Influence of hydrogen combustion on high-temperature materials in thermoprocessing technology
Chris Fritsche[1], Katrin Markuske[2], Tarik Boyraz[3], Sven Eckart[1], Matthias Steinbacher[3], Hartmut Krause[1]
1: TU Bergakademie Freiberg, Chair of Gas and Heat Technology, Germany; 2: TU Bergakademie Freiberg, Chair of Technical Thermodynamics, Germany; 3: Leibniz-Institut für Werkstofforientierte Technologien Bremen, Germany

P2 Reactivity Assessment and influence on industrial heating systems of Methane, Hydrogen, and Ammonia mixtures
Sven Eckart[1], Ernesto Salzano[2], Andreas Richter[3], Hartmut Krause[1], Gianmaria Pio[2]
1: GWA, TU Bergakademie Freiberg, Germany; 2: Alma Mater Studiorum - University of Bologna; 3: MTK, TU Bergakademie Freiberg, Germany

P3 A method for the compensation of thermal reflections in radiation based temperature measurements in combustion chambers
Jörg Matthes[1], Patrick Waibel[1,2], Lutz Gröll[1], Markus Vogelbacher[1]
1: Karlsruhe Institute of Technology, Germany; 2: Heidelberg Materials AG

P4 A Solution for Decarbonisation: Hydrogen Fired Oxyfuel Burners
Martin William Adendorff[1], Esin Iplik[2], Joachim von Scheele[1]
1: Linde GmbH, Germany; 2: Linde Sverige AB, Sweden

P5 Spectral resolved radiative heat flux measurements in a combustion chamber
Lukas Pörtner[1], Burak Özer[2], Marcel Richter[3], Dominik König[3], Martin Schiemann[1], Anna Maßmeyer[2], Jochen Ströhle[3], Bernd Epple[3]
1: Ruhr-University Bochum, Germany; 2: RWTH Aachen University; 3: TU Darmstadt

P6 Comparative studies on the operation of two industrial burners with natural gas and hydrogen
Antonia Nikoletta Sikotakopoulou[1], Daniel Bernhardt[1], Ronald Wilhelm[2], Michael Beckmann[1]
1: Chair of Energy Process Engineering, TU Dresden; 2: Saacke GmbH

Poster Session 2 - Short Presentations
Location: **São Galé II**
Chair: **Sébastien Caillat**

P18 Thermochemical valorization of lignocellulosic wastes into sustainable biomaterials and biofuels
Assia Maaoui[1,2], Raouia Chagtmi[1,2], Francesca Cerciello[3], Aida Ben Hassen Trabelsi[1], Fernando Stanzione[4], Maria Maddalena Olino[4], Osvalda Senneca[4], Barbara Apicella[4]
1: Laboratory of Wind Energy Control and Waste Energy Recovery, LMEEVED, Research and Technology Centre of Energy, CRTEn, B.P. 95, 2050 Hammam-Lif, Tunisia; 2: Department of Geology, Faculty of Sciences of Tunis, University of Tunis El Manar, 2092, El Manar II, Tunis, Tunisia; 3: Laboratory of Industrial Chemistry, Ruhr University Bochum, 44801 Bochum, Germany; 4: Istituto di Scienze e Tecnologia per l'Energia e la Mobilità Sostenibili (STEMS)-CNR, 80125 Napoli, Italy

P19 Measurements of NOx emissions from biomass combustion in medium to large-scale power plants.
Gabriel J Roeder[1], Johannes Haimerl[1], Yusheng Chen[2], Matthias Gaderer[2], Sebastian Fendt[1], Hartmut Spliethoff[1]
1: Chair of Energy Systems, Techninal University of Munich, Germany; 2: Professorship of Renewable Energy Systems, Techninal University of Munich, Germany

P20 Integration of Molten Carbonate Fuel Cells (MCFCs) in the glassmaking process to allow decarbonisation and supporting electrification
Letizia Cretarola[1], Roberto Scaccabarozzi[2], Maurizio Spinelli[2], Federico Vigano'[1,2]
1: Department of Energy - Politecnico di Milano, Milan, Italy; 2: LEAP Scarl (Laboratory for Energy and the Environment - Piacenza), Italy

P21 Experimental determination of quantitative flash pyrolysis yields of polymethyl methacrylate (PMMA) in a fluidized bed reactor
Stefan Pielsticker, Katja Hendricks, Reinhold Kneer
RWTH Aachen University, Institute of Heat and Mass Transfer

P7 Effects of varying wall conditions and air staging on temperatures and exhaust gas in natural gas-hydrogen flames

Sven Eckart, Lars Raschke, Moritz Junge, Hartmut Krause
TU Bergakademie Freiberg, Germany

P8 Weighted Sum of Grey Gases Radiation Model for Air and Oxyfuel Combustion of Hydrogen-Methane Mixtures at Atmospheric Pressure

Johannes Losacker, Alex M Garcia, Franziska Ott, Nico Schmitz, Herbert Pfeifer
RWTH Aachen University, Department for Industrial Furnaces and Heat Engineering, Kopernikusstr. 10, 52074 Aachen, Germany

P9 Comparative Analysis Of Hydrogen-Enriched Natural Gas And Diverse Process Control Strategies For Copper Melting Furnace Operation: A Simulation-Based Study

Lars Felkl[1], Chris Fritsche[2], Sven Eckhardt[2], Hartmut Krause[2], Olaf Schwedler[3], Alexandros Charitos[1]
1: Institute for Nonferrous Metallurgy and Purest Materials, TU Bergakademie Freiberg, Germany; 2: Institute of Thermal Engineering, TU Bergakademie Freiberg, Germany; 3: KME Mansfeld GmbH, Germany

P10 A 2-zone mathematical model for thermal design and NOx forecasting on high temperature industrial furnaces

Robert Tucker, Neil Fricker
Global Combustion Systems, Livingstone, United Kingdom

P11 Transient thermo-mechanical modelling of real-scale metallurgical converter preheating

Zlatko Raonic, Harald Raupenstrauch
Montanuniversitaet Leoben, Austria

P12 Numerical investigation on the influence of the skid coolant temperature on the reheating furnace performance

Zaaquib Yunus Ahmed[1,2], Toon Demeester[1,2], Ilya T'Jollyn[3,2], Wim Beyne[1,2], Teun De Raad[4], Steven Lecompte[1,2], Michel De Paepe[1,2]
1: Department of Electromechanical, Systems and Metal Engineering, Ghent University; 2: FlandersMake@UGent Corelab EEDT MP Flanders Make, Leuven, Belgium; 3: Department of Electromechanical Engineering, University of Antwerp, Belgium; 4: ArcelorMittal Gent, Belgium

P22 Towards Sustainable Textile Waste Management: Exploring Valuable Chemicals Production through Steam cracking in a Dual Fluidized Bed

Renesteban Forero Franco, Isabel Cañete-Vela, Chahat Mandviwala, Teresa Berdugo-Vilches, Nidia Diaz Perez, Ivan Gogolev, Henrik Thunman, Martin Seemann
Chalmers University of Technology, Sweden

P23 Chemical characterization of condensed phases from waste plastics pyrolysis

Barbara Apicella[1], Maurizio Azzolini[2], Francesca Cerciello[3], Giovanni Curia[2], Renata Migliaccio[1], Fabio Moratti[1], Maria Maddalena Oliano[1], Giovanna Ruoppolo[1], Carmela Russo[1], Fernando Stanzione[1], Massimo Urciuolo[1], Osvalda Senneca[1]
1: STEMS-CNR; 2: Lifenergy Italia; 3: RUB

P24 Is a two-step thermochemical conversion an alternative route to maximize waste tire circularity?

Nidia Diaz Perez, Chahat Mandviwala, Ivan Gogolev, Renesteban Forero-Franco, Teresa Berdugo Vilches, Henrik Thunman, Martin Seemann
Chalmers University of Technology, Sweden

P25 Cow Bone Waste uses as a catalyst for pyrolysis of lignocellulosic biomasses

Raouia Chagtmi[1,2], Assia Maaoui[1,2], Francesca Cerciello[3], Osvalda Senneca[4], Fernando Stanzione[4], Renata Migliaccio[4], Barbara Apicella[4], Aida Ben Hassen Trabelsi[1]
1: Laboratory of Wind Energy Control and Waste Energy Recovery, LMEEVED, Research and Technology Centre of Energy, CRTEn, B.P. 95, 2050 Hammam-Lif, Tunisia; 2: Department of Geology, Faculty of Sciences of Tunis, University of Tunis El Manar, 2092, El Manar II, Tunis, Tunisia; 3: Laboratory of Industrial Chemistry, Ruhr University Bochum, 44801 Bochum, Germany; 4: Istituto di Scienze e Tecnologia per l'Energia e la Mobilità Sostenibili (STEMS)-CNR, 80125 Napoli, Italy

P26 Hydrogen from biomass: effect of oxygen enrichment on steam gasification

Santhosh P[1], Muthu Kumar K[1], Jaganathan V M[2], Rahul Sharma[3], Varunkumar S[1]
1: Indian Institute of Technology, Madras, India; 2: National Institute of Technology Trichy, India; 3: Corporate R&D Department, Gas Authority of India Limited, Noida, India

P13 Numerical study on influences of nitrogen contents in fuel and oxidizer on nitrogen oxide emissions during oxy-fuel combustion of natural gas
Yonmo Sung, Wontak Choi, Seunggi Choi
Gyeongsang National University, Korea, Republic of (South Korea)

P14 Hydrogen combustion burner for non-oxidizing furnaces in steel processing lines
Hassan Mohanna[1], Yannick Mourlot[1], Sébastien Caillat[1], Patrice Sedmak[1], Rémy Chitsaz[2], Laurent Lesne[2]
1: Fives Stein, France; 2: Fives Keods

P15 Heat Losses in Metal Heat Treatment Furnaces: Experimental Characterization and Optimization
José Vasco Mota
University of Coimbra, Portugal

P16 Chemical recycling of plastic waste compared to a conventional valorisation pathway
Federico Vigano'[1,2], Antonio Conversano[1,2], Davide Sogni[2], Daniele Di Bona[2], Stefano Consonni[1,2]
1: Department of Energy - Politecnico di Milano, Milan, Italy; 2: LEAP Scarl (Laboratory for Energy and the Environment - Piacenza), Italy

P17 Callidus® Ultra Blue® Burner System
Kurt Kraus[1], Yong Wang[2], Huynh Pham[2], Marc Cremer[3]
[1]Honeywell UOP Callidus, United States of America; [2]Technip Energies USA, Inc.; [3]Reaction Engineering International

P27 Influence of Hydrogen-Natural Gas Blend on Co-Combustion Process
Bernardo Afonso Martins Dias de Almeida
University of Coimbra, Portugal

P28 A novel partially aerated swirl burner design for biomass thermochemical applications
Vignesh B, Muthu Kumar K, Varunkumar S
Thermodynamics and Combustion Engineering Laboratory, IIT Madras, Chennai, India

P29 Design and operating parameters of a two-stage biomass combustion plant
Valerie Grimm, Tommy Flößner, Reinhild Arnold, Ralph Behrend, Hartmut Krause
TU Bergakademie Freiberg, Germany

P30 Characterization of pulverized biomass blends in a drop tube furnace
Abdou Suso, Piotr Plaza, Eva Miller, Jörg Maier, Günter Scheffknecht
Institute of combustion and Power Plant Technology (IFK),University of Stuttgart, Germany

P31 Oxygen separation with MIEC membranes on a lab scale Oxy-fuel furnace
Fabian Scheck[1], Nico Schmitz[1], Herbert Pfeifer[1], Ralf Kriegel[2], Martin Demuth[3], Wolfgang Bender[4]
1: RWTH Aachen University, Germany; 2: Fraunhofer Institute for Ceramic Technologies and Systems IKTS, Germany; 3: Messer Austria GmbH, Austria; 4: Hülsenbusch Apparatebau GmbH & Co. KG, Germany

P32 A multiscale Reactor Network Model for grate-fired waste combustion furnaces
Raf Vandevelde[1], Maarten Vanierschot[2,3], Johan De Greef[1]
1: ChEMaRTS, Department of Materials Engineering - Leuven Group T Campus KU Leuven, Leuven, Belgium; 2: AFAA, Department of Mechanical Engineering - Leuven Group T Campus KU Leuven, Leuven, Belgium; 3: MaSIM, Material Science, Innovation and Modelling - North-West University, Mmabatho, South Africa

14:40 - 16:00 **Poster Session**
Location: **Sala Salgados**

16:30 - 20:00 **Wine Tasting and visit to Quinta do Canhoto in Albufeira** (15 minutes bus drive from Vidamar Hotel)

Friday, April 5th 2024

08:30 - 09:20

Keynote 5: Lorella Palluotto - ENTSOG, Belgium
Gas quality challenges in the decarbonization process of the gas grid
Location: **Sala Salgados**

09:25 - 10:45

19-PLAS: Thermochemical Recycling of Plastic
Location: **Sala Salgados**
Chair: **Osvalda Senneca**

Chemical recycling of plastic waste via fluidized bed gasification at pilot scale
Fabiola Panitz, Jens Kaltenmorgen, Marc Siodlaczek, Jochen Ströhle, Bernd Epple
EST, Technical University of Darmstadt, Germany

Behaviour of different oxygen carriers in the chemical looping combustion of plastic residues
Teresa Mendiara, Maria Teresa Izquierdo, Óscar Condori, Lidia García
Instituto de Carboquímica (ICB-CSIC). Miguel Luesma Castán, 4 50018. Zaragoza. Spain.

Influence of Power, Temperature and Residence time in Microwave-Assisted Pyrolysis of CFRP Composites
Muralimohan Juttu Vidyasagar[1], Ralph Behrend[1], Mareen Zöllner[2], Thomas Krampitz[2], Holger Lieberwirth[2], Hartmut Krause[1]
1: TU Bergakademie Freiberg, Institute of Thermal Engineering (IWTT), Chair of Gas and Heat Technology, Freiberg; 2: TU Bergakademie Freiberg, Institute of Processing Machines and Recycling Systems Technology (IART), Freiberg

Particle-resolved numerical simulation of pyrolysis process of a non-ideal plastic particle
Feichi Zhang[1], Salar Tavakkol[1], Akshay Somvanshi[1], Flavio Galeazzo[2], Dieter Stapf[1]
1: Karlsruhe Institute of Technology, Germany; 2: High Performance Computing Center Stuttgart, Germany

20-BURN: Burners and Modelling
Location: **Sala Galé I**
Chair: **Eva Gutheil**

Optimization of the plasma-assisted gasification process in a vertical entrained-flow gasifier through the CFD simulations
Robert Lewtak, Jonas Brandstetter, Sebastian Bastek, Johannes Waßmuth, Kentaro Umeki, Andrius Tamosiunas, Sebastian Fendt, Harmut Spliethoff
Technical University of Munich, Germany

Spectral analysis of alternative low-carbon fuel combustion in plasma-assisted burner
Adolfas Jančauskas, Ernest Bykov, Rolandas Paulauskas, Kęstutis Zakarauskas, Lina Vorotinskienė
Lithuanian Energy Institute, Lithuania

Experimental Investigation of Flow Velocity in a Pulsation Reactor
Chunliang Zhang, Stefan Günther, Stefan Odenbach
TU Dresden, Germany

Liquid Fuel Evaporation under Entrained Flow Gasification Conditions – Insights for Burner Development
Manuel Haas[1], Sabine Fleck[1], Tobias Jakobs[1], Thomas Kolb[1,2]
1: Institut für Technische Chemie, Karlsruher Institut für Technologie; 2: Engler-Bunte-Institut, Chemische Energieträger - Brennstofftechnologie, Karlsruher Institut für Technologie

21-ALT2: Glass Melting
Location: **São Galé II**
Chair: **Jörg Leicher**

Numerical investigation of thermal radiation in the combustion zone of a glass melting furnace
Berkay Halvaşi, Tolga Altınoluk, Altuğ M. Başol, M. Pınar Mengüç
Özyeğin University, Turkiye

Tests of an in-furnace NOx reduction technique on pilot scale glass melters and steel reheating furnaces firing natural gas, hydrogen and simulated coke oven gas.
Neil Fricker, Richard Pont, Iain Shoveller
Global Combustion Systems, Livingstone, United Kingdom

Hydrogen admixture on a natural gas-oxygen burner for glass-melting process
Anna Hasche, Hartmut Krause, Sven Eckart
TU Bergakademie Freiberg, Germany

Hydrogen as an alternative fuel in oxy-fuel glass melting furnaces: A numerical study of the fuel substitution effects based on coupled CFD simulations
Georg Daurer[1], Stefan Schwarz[1], Martin Demuth[2], Christian Gaber[2], Christoph Hochenauer[1]
1: Graz University of Technology, Institute of Thermal Engineering, Austria; 2: Messer Austria GmbH, Austria

10:45 - 11:15

Coffee Break
Location: **Le Palmeraie**

11:15 - 12:35

22-ALT1: Alternative Fuels (bio-waste-iron)

Location: **Sala Salgados**
Chair: **Adrian Gunnarsson**

Towards general reactor network modeling for metal fuel combustion

Sören Dübal[1], Daniel Braig[2], Pascal Steffens[2], Leon Loni Berkel[2], Arne Scholtissek[2], Christian Hasse[2], Hendrik Nicolai[2], Sandra Hartl[1]
1: Optical Diagnostics and Renewable Energies (ODEE), University of Applied Sciences Darmstadt, Germany; 2: Simulation of reactive Thermo-Fluid Systems (STFS), Technical University of Darmstadt, Germany

Kinetics of Iron Reduction upon Reduction/Oxidation Cycles

Francesca Cerciello[1], Antonio Fabozzi[2], Christoph Yannakis[1], Luciano Cortese[2], Sebastian Schmitt[3], Oguzhan Narin[3], Viktor Sherer[2], Osvalda Senneca[1]
1: RUB, DE; 2: CNR, IT; 3: Doosanlentjes, DE

An experimental and CFD study of the iron ore fixed bed structure and its influence on the direct reduction process

Mohammed Liaket Ali, Sven Mehlhose, Quentin Fradet, Uwe Riedel
German Aerospace Center (DLR), Institute of Low-Carbon Industrial Processes

LES of a 47 kWth swirled-stabilized methane-assisted iron flame with tabulated chemistry

Daniel Braig[1], Pascal Steffens[1], Janik Hebel[2], Leon Loni Berkel[1], Hendrik Nicolai[1], Arne Scholtissek[1], Andreas Dreizler[2], Christian Hasse[1]
1: Technical University of Darmstadt, Institute of Simulation of Reactive Thermo-Fluid Systems, Otto-Berndt-Straße 2, 64287 Darmstadt, Germany; 2: Technical University of Darmstadt, Institute of Reactive Flows and Diagnostics, Otto-Berndt-Straße 3, 64287 Darmstadt, Germany

23-MONI: NOX and Fuel

Location: **Sala Galé I**
Chair: **Lorella Palluotto**

Combustion in a coke oven battery: numerical modelling and testing with focus on NOx emission

Gianluca Rossiello[1], Tiziana Vela[1], Alberto Campodonico[2], Alberto Vicentini[2], Silvia Nazzarri[2], Daniele Ettorre[3], Seyed Behzad Ahmadpanah[3], Andrea Puzo[3], Marco Torresi[3]
1: SEAMTHESIS Srl, Via IV Novembre, 156 – 29122 Piacenza, ITALY; 2: PAUL WURTH Italia SpA (SMS group), Via Balleydier 7 – 16149 Genova, ITALY; 3: DMMM, Department of Mechanics, Mathematics and Management, Polytechnic University of Bari, Via Re David, 200 – 70125 Bari, ITALY

Evaluation of the Combustion Characteristics of Polyfluorinated Organic Substances

Hans-Joachim Gehrmann, Krasimir Aleksandrov, Andrei Bologa, Philipp Bergdolt, Vanessa Nuredin, Dieter Stapf
Karlsruhe Institute of Technology (KIT), Germany

Investigation of NOx emission in hydrogen, natural gas and propane in an oxyfuel fired pilot scale furnace

Nidhin Thekkedath Madhu[1], Martin Adendorff[1], Esin Iplik[2], Sven Eckart[3], Hartmut Krause[3]
1: Linde GmbH, Carl-von-Linde-Straße 25, 85716 Unterschleißheim, Germany; 2: Linde Sverige AB, 2-10 Varuvägen, 125 30 Älvsjö, Sweden; 3: Institute of Thermal Engineering, Technische Universität Bergakademie Freiberg, Gustav Zeuner Straße 7, 09599 Freiberg, Germany

Cutting NOX Emissions When Executing Facility-Wide Energy Transitions to 100% Hydrogen and Renewable Fuels with the Callidus® Ultra Blue® Burner System

Kurt Kraus[1], Yong Wang[2], Huynh Pham[2], Marc Cremer[3]
1: Honeywell UOP Callidus, United States of America; 2: Technip Energies USA, Inc.; 3: Reaction Engineering International

12:35 - 13:50

Lunch
Location: **Ocean Buffet**

13:50 - 14:40

Keynote 6: Joerg Leicher - Gas- und Wärme-Institut Essen e.V., Germany
Going all-electric? – Alternative fuels for decarbonized (high-temperature) process heat
Location: **Sala Salgados**

14:45 - 16:05

24-ALT2: Alternative Fuels (NH3, H2)
Location: **Sala Salgados**
Chair: **Jean-Bernard MICHEL**

Investigation of heat transfer characteristics of oxyfuel combustion in a semi-industrial furnace using natural gas/hydrogen blends

Kristina Mabic[1,2], Martin Adendorff[1], Esin Iplik[1,2], Ioanna Aslanidou[2], Konstantions Kyprianidis[2]
1: Linde GmbH, Carl-von-Linde-Straße 25, 85716 Unterschleißheim, Germany; 2: Mälardalen University, Box 883, 72123 Västerås, Sweden

A Comparison of Reheating Metals in Combustion Processes Using Natural Gas and Hydrogen Fuels

Mark Hannum, Justin Dzik, Alexis Omilion
Fives North American Combustion, Inc.

Rehabilitation of an existing Natural Gas Boiler to co-combustion of Hydrogen Rich Gas

Sven Löwen, Bernhard Zimmermann, Samir Nasri
Mitsubishi Power Europe GmbH, Germany

Development of a Low-Emission Combustion Concept for Hydrogen in Multi-Fuel-Burners

Marius Philipp[1], Nico Schmitz[1], Herbert Pfeifer[1], Albert Kowert[2]
1: RWTH Aachen University, Germany; 2: CombuTec GmbH & Co. KG

25-BURN: Numerical Modelling
Location: **Sala Galé I**
Chair: **Viktor Scherer**

Numerical study on the influence of devolatilisation kinetics on pulverised solid fuel turbulent swirling flames under oxyfuel conditions

Hossein Askarizadeh[1], Stefan Pielsticker[1], Hendrik Nicolai[2], Reinhold Kneer[1], Christian Hasse[2], Burak Özer[1], Anna Maßmeyer[1]
1: Institute of Heat and Mass Transfer, RWTH Aachen University, Augustinerbach 6, 52056 Aachen, Germany; 2: Department of Mechanical Engineering, Simulation of Reactive Thermo-Fluid Systems (STFS), Tech-nical University of Darmstadt, Otto-Berndt-Straße 2, Darmstadt 64287, Germany

Experimental and numerical investigation of a mild combustor for gas turbine applications

Gonçalo Pacheco, Afonso Santoalha, Bruno M. Pinto, Miguel A. A. Mendes, Pedro J. Coelho
IDMEC- Instituto de Engenharia Mecânica, Portugal

Numerical NOX analysis of a Premixed Methane-Air Swirl Burner (TECFLAM)

USMAN GHAFOOR, ZLATKO RAONIC, CHRISTOPH SPIJKER, HARALD RAUPENSTRAUCH
Thermoprozesstechnik, Montanuniversität Leoben

A NOX postprocessing method for non-premixed and premixed flames

Christoph Spijker[1], Senthilathiban Swaminathan[2], Zlatko Raonic[1], Harald Raupenstrauch[1]
1: Montanuniversitaet Leoben, Austria; 2: K1-Met GmbH

16:10 - 16:30

Closing Address
Location: **Sala Salgados**

19:00

Farewell Dinner
Location: **Le Palmeraie**