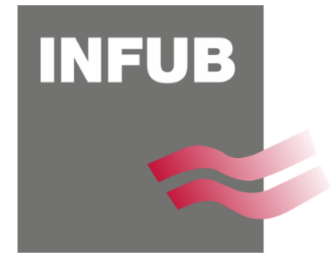

12th EUROPEAN CONFERENCE

ON INDUSTRIAL FURNACES AND BOILERS

10-11 November 2020 | Online/Live



INFUB-12 PROCEEDINGS

Keynote Lectures

A RENEWED AGENDA FOR RESEARCH AND INNOVATION IN EUROPE

Maria da Graça Carvalho
Member of the European Parliament, Portugal

CHALLENGES AND DEVELOPMENT NEEDS IN FLUIDIZED BED TECHNOLOGY

Edgardo Coda Zabetta
Sumitomo SHI FW, Finland

CHALLENGES AND DEVELOPMENTS IN THE CEMENT INDUSTRY - PROCESS DEVELOPMENTS FOR CO-PROCESSING OF WASTE AND CONTROL OF EMISSIONS

Lars Skaarup Jensen
FLSmidth, Denmark

USE OF HYDROGEN AS A FUEL IN INDUSTRIAL FURNACES

Joachim von Schéele
The Linde Group, Shanghai

PHOSPHORUS - A CRITICAL ELEMENT AND A CHALLENGE FOR THERMO-PROCESSING TECHNOLOGY

Harald Raupenstrauch
Montanuniversitaet Leoben, Austria

Combustion & Heat Transfer

- 006 Achieving Industrial Emissions Directive performance and increasing efficiency on least cost basis at a 160T/H refinery steam boiler**
G. Ridler, M. Kryjak, S. Billett, F. Gnyp & J. Goldring
RJM International (UK)
- 007 High performance Ultra-low NOx burner for industrial boilers**
L. Morandi, D. Maggiolini, G. Rossiello, M. Torresi, G.D. Rago, L. Fortunato & A. Saponaro
Macchi, ITEA SpA, Polytechnic University of Bari, Centro Combustione Ambiente SpA (Italy)
- 008 Numerical and experimental studies on the ignition of pulverized coal stream and spherical cloud**
W. Rybak & J. Wach (Poland)
Wroclaw University of Science and Technology (Poland)
- 009 Oxygen-enriched Combustion Technology using Self-induced Oscillation Phenomenon to Uniformly Heat a Wide Range in Industrial Furnaces**
M. Yamaguchi, T. Saito, Y. Yamamoto & Y. Hagihara
Taiyo Nippon Sanso Corporation (Japan)
- 010 Flameless Oxyfuel Solutions : Technologies and Results**
J. von Schéele
Linde plc, China
- 011 Combustion using an oxygen lancing in a reheating furnace**
C. Lee, Insu Kim, Junggoo Hong
Hyundai Steel & Kyungpook National University (Republic of Korea)
- 012 Influence of Hydrogen Admixtures and Swirl Intensity on Shape, Stability and Emissions of Premixed CH₄-H₂-air Flames**
M. Hefele, M. Blanas, H. Chaves, S. Eckart & H. Krause
TU Bergakademie Freiberg & University of Massachusetts (Germany/ USA)
- 013 Degassing and Stability Behavior of Oxide Heat Insulation Materials in Vacuum Furnaces**
R. Arnold, M. Gilbert, R. Behrend & H. Krause
Technische Universität Bergakademie Freiberg (Germany)
- 014 Energy Efficient Coil Coating Process - ECCO**
M. Schneider, P. Weinbrecht, C. Wieland, C. Weis & D. Trimis
Karlsruhe Institute of Technology (Germany)
- 015 Experimental Investigations on Plasma Assisted Solid Fuel Ignition and Combustion**
R. Youssefi, J. Maier, G. Scheffknecht
University of Stuttgart (Germany)
- 016 Tail biogas flame stabilization by assistance of thermal plasma reformer**
N. Striūgas, A. Tamošiūnas, L. Marcinauskas, R. Paulauskas, K. Zakarauskas & R. Skvorčinskienė
Lithuanian Energy Institute & Plasma Processing Laboratory (Lithuania)
- 017 Effects of microwaves on burning velocity and exhaust gas composition of laminar premixed propane flames**
S. Eckart, R. Behrend, E. Collins & H. Krause
TU Bergakademie Freiberg & Columbia University (Germany/ USA)

- 018 Experimental study of turbulent Bluff-Body flames stability by simultaneous high speed flame imaging and Particle Image Velocimetry**
N. Valdez, C. Lacour, B. Lecordier, A. Cessou, D. Honore
Normandie Univ (France)
- 019 Experimental analysis of the drying process in rotary kilns**
C. Meitzner, E. Specht & F. Herz
Otto von Guericke University Magdeburg & Anhalt University of Applied Sciences (Germany)
- 020 Influence of steam addition on biomass gasification in a drop tube furnace**
T. Rio, R. Ferreira & M. Costa
Instituto Superior Técnico, Universidade de Lisboa (Portugal)
- 021 Numerical and experimental investigation of the spheroidization process of non-spherical particles in a semi-industrial furnace**
H. Gerhardtter, M. Knoll, R. Prieler, C. Hochenauer & P. Tomazic
Graz University of Technology & M. Swarovski Gesellschaft m.b.H. (Austria)

Alternative Fuels

- 022 Experimental and numerical investigations of a high-power density sulphur burner**
M. Fedoryk, F. Zhang, H. Heidarifatasmi, N. Sebbar, S. Harth, D. Trimis & H. Bockhorn
Karlsruhe Institute of Technology (Germany)
- 023 Valorisation of plastic wastes by pyrolysis for energy production**
J.-B. Michel & M. Simeoni
Race for Water Foundation & ETIA S.A.S. Carrefour Jean Monnet (Switzerland/ France)
- 024 Microwave heated pyrolysis of CFRP - Characteristics of Gas and Oil products**
R. Behrend, T. Krampitz, C. Pätzold, P. Fröhlich, M. Bertau, H. Lieberwirth & H. Krause
TU Bergakademie Freiberg (Germany)
- 025 Energy Recovery Assessment of Brazilian Municipal Solid Waste by Combustion System**
A. C. Gutierrez-Gomez, A. Garrido Gallego, R. Palacios-Bereche, J. Tófan de Campos Leite, A. M. Pereira Neto
Federal University of ABC (Brazil)
- 026 Unresolved issues in modelling thermochemical conversion of biomass**
K. Umeki, A. D. Garcia, Thamali R. Jayawickrama, A. Phounglamcheik, A. Bach-Oller & R. Gebart
Luleå University of Technology (Sweden)
- 027 Carbonization of grape pomace**
A. F. Ferreira & M. Costa
Instituto Superior Técnico, Universidade de Lisboa, (Portugal)
- 028 Drying and Decomposition Analysis of Hydrochars**
E. Kleiber, F. Weigler & F. Herz
Anhalt University of Applied Sciences (Germany)
- 029 Pressurized steam pyrolysis of grape residues for production of valuable liquid hydrocarbons**
F. Miccio, A. Natali Murri, E. Papa, E. Landi & M. Minelli
University of Bologna (Italy)
- 030 Modern concepts for sensor-based process optimization of waste-fired power plants**
F. Graube-Kühne, T. Kehr, S. Grahl & M. Beckmann
Technische Universität Dresden (Germany)

- 031 Thermal performance of a domestic boiler burning briquettes made with agricultural wastes**
B. Braga, V. Ferreira, A. Sanches & C. Pinho
DEMEC-FEUP, INEGI & CEFT-FEUP (Portugal)
- 032 Design and Application of Low-NOx Pulverized Biomass Burner over Biomass Grate Furnace**
S. Hamel, K. Zając, P. Kuczmierczyk & A. Santhirasegaran
Steinmüller Engineering GmbH (Germany)
- 033 Single droplet ignition and combustion of jet-A1, hydroprocessed vegetable oil and their blends in a drop tube furnace**
G. Pacheco, A. Silva & M. Costa
Instituto Superior Técnico, Universidade de Lisboa & Aerog-LAETA, Universidade da Beira Interior (Portugal)
- 034 Influence of fuel characteristics of alternative residual biomass and ash chemistry on fluidized bed combustion and gasification**
T. Karel, K. Fürsatz, J. Priscak, M. Kuba, N. Skoglund & H. Hofbauer
BEST – Bioenergy and Sustainable Technologies GmbH, TU Wien & Umeå University (Austria/ Sweden)
- 035 Raw Biogas as a Potential Substitute for Natural Gas in Metallurgical Thermal Processes – Impact on Combustion and Pollutant Emissions**
M. Röder, T. Schneider, P. Pietsch, A. Giese, R. Erler & K. Görner
Gas- und Wärme-Institut Essen e.V. & DBI - Gastechnologisches Institut gGmbH Freiberg (Germany)
- 036 Material concepts for heat exchangers in the field of high temperature conversion: Results of long-term exposures in corrosive pyrolysis gases**
M. Gilbert, L. Schmies, C. Knosalla, W. Lippmann & H. Krause
TU Bergakademie Freiberg & TU Dresden (Germany)
- 037 Numerical Simulation of Radiant Burner Performance Burning Syngas Fuels**
G. Scribano & Manh-Vu Tran
University of Nottingham Malaysia & Monash University Malaysia (Malaysia)
- 038 Multi-fuel Combustion System for Gaseous and Liquid Biofuels with Low NOx Emissions**
M. Röder, D. Möntmann, M. Grote, A. Giese, D. Diarra & K. Görner
Gas- und Wärme-Institut Essen e.V. & OWI Oel-Waerme-Institut gGmbH, Herzogenrath (Germany)
- 039 Thermochemical Behavior of the Ashes of Municipal Solid Waste and its Impact on Combustion Systems for Mass Burning**
A. C. Gutierrez-Gomez, A. Garrido Gallego, S. A. Nebra & A. M. Pereira Neto
Federal University of ABC (Brazil)

Modelling

- 040 CFD modelling of flameless oxy-lancing combustion technology to boost burner capacity**
Phuc Danh Nguyen, G. Ghazal & V. Cuervo Piñera
ArcelorMittal Global R&D (France/ Spain)
- 041 Numerical Analysis of the Transient Heating Characteristics of a Slab in a Re-Heat Furnace**
Z. Ahmedab, I. T’Jollynab, S. Lecompteab, T. De Raadc & M. De Paepeab
Ghent University, ArcelorMittal Gent & FlandersMake@UGent (Belgium)
- 042 Modelling radiative heat transfer in an industrial furnace using the lattice Boltzmann method**
R. Prieler, P. Burian, M. Landl, C. Schluckner, C. Hochenauer
Graz University of Technology (Austria)
- 043 Large Eddy Simulation of Reactive Flow on the Fire Side of a Steam Cracking Furnace**
S. Nadakkal Appukuttan, E. Riber, B. Cuenot, T. Gilles
CERFACS & John Zink Hamworthy Combustion (France/ Luxembourg)

- 044 Effects of surrounding radiation on the lifetime of radiant tubes in a vertical strip galvanizing line**
D. Büschgens, N. K. Karthik, C. Schubert, N. Schmitz, W. Lenz & H. Pfeifer
RWTH Aachen University, (Germany)
- 045 Simulation of a turbulent combustion and structural mechanics in radiant tube burner using OpenFOAM**
Z. Raonic, D. Nikolaenko, C. Spijker, H. Raupenstrauch
Montanuniversitaet Leoben (Austria)
- 046 CFD modeling: a powerful tool for high efficiency burner design**
A. Saponaro, O. Senneca, F. Cerciello, D.J. Brand, M. Torresi, F. Cesareo, M. Valenzano, S. Siena, G. Rago, G. Rossiello, G. Volpi, M. Penati, R. Dadduzio, T. Gianì, M. Rogora, L. Fortunato & V. Panebianco
Centro Combustione Ambiente S.p.A, ITEA S.p.A, Istituto di Ricerche sulla Combustione (IRC), University, Politecnico di Bari, AC BOILERS S.p.A (Italy/ South Africa)
- 047 Large Eddy Simulation of pulverized coal combustion under oxy atmospheres using tabulated chemistry**
H. Nicolai, A. Samim Doost, F. di Mare, C. Hasse & J. Janicka
Technische Universität Darmstadt & Ruhr-Universität Bochum (Germany)
- 048 Impact of the charging strategy, the cohesive zone and a varying blast volume flow on the conditions in the hearth: Transient DEM-CFD simulations of an industrial blast furnace**
H. Merten, F. Bambauer, S. Wirtz, V. Scherer, H. Bartusch & R. Lin
Ruhr-University Bochum, Bochum, VDEh-Betriebsforschungsinstitut, Department Process Optimisation Iron and Steel Making & AG der Dillinger Hüttenwerke (Germany)
- 049 A two-dimensional pyrolysis model for thermally thick particles**
Q. N. Hoang, M. Vanierschot, T. Croymans, R. Pittoors & J. Van Caneghem
Group T Leuven campus, KU Leuven & Keppel Seghers Belgium NV (Belgium)
- 050 Studies on the Waste Feeding Process in large-scale Waste Incineration Plants**
M. H. Zwiellehner, R. Warnecke & F. Grafmans
SAR Elektronik GmbH & GKS Gemeinschaftskraftwerk Schweinfurt GmbH (Germany)
- 051 Thermal process for energy recovery from Waste Electronic and Electrical Equipment under the premise of bromine recycling**
M. Dunker, A. Hiller & M. Beckmann
Technische Universität Dresden (Germany)
- 052 Combustion Behavior of Lumpy Coke in Mixed Feed Lime Shaft Kilns**
B. Hallak & E. Specht
Otto von Guericke University Magdeburg (Germany)
- 053 Novel heat recovery system for ceramic furnaces using high-temperature phase change materials and integration based on multicriteria analysis development**
P. Royo, L. Acevedo, A. J. Arnal, M. Diaz-Ramírez, T. García-Armingol, V. J. Ferreira, G. Ferreira & A. M. López-Sabirón
Research Centre for Energy Resources and Consumption (CIRCE) & CIRCE Institute (Spain)
- 054 Towards Digital Twin of an Industrial Furnace Operating with Natural Gas/ Hydrogen Mixtures**
N. Meynet & G.-A. Grandin
Engie Lab Crigen (France)
- 055 Exergy analysis of a large CFB boiler furnace**
A. Mankonen, E. Vakkilainen, J. Kaikko & V. Sergeev
Lappeenranta-Lahti University of Technology LUT & Peter the Great St.Petersburg Polytechnic University, (Finland/ Russian Federation)

- 056 Comparison of the Dynamic Behaviour between Bubbling and Circulating Fluidized Bed Combustors**
G. Martinez Castilla, R. M. Montañés, D. Pallarès & F. Johnsson
Chalmers University of Technology (Sweden)
- 057 Development of Process Model for the Manufacturing of Sanitary Ware in Tunnel Kiln**
D. M. Alex, T. Redemann & E. Specht,
Otto von Guericke University Magdeburg (Germany)
- 058 Coupled Computational Fluid Dynamics and Discrete Element Method modelling of shaft furnace, including nitrogen emissions,**
C. Spijker, R. W. Pollhammer & H. Raupenstrauch
Montanuniversitaet Leoben & K1-MET GmbH (Austria)
- 059 Impact of flow maldistribution on performance of shell-and-tube heat exchangers**
T. Dorau, R. Schab, S. Unz, R. Malayeri & M. Beckmann
Technische Universität Dresden (Germany)

Green Challenges and Renewable Future

- 060 Challenges for the Future Combustion of Green Fuels**
J.G. Wüning
WS Wärmeprozestechnik GmbH (Germany)
- 061 Thermodynamic and lifecycle analysis of a CO₂-based methanol synthesis**
M. Dierks, F. Möllenbruck, G. Oeljeklaus & K. Görner
University of Duisburg-Essen (Germany)
- 062 Negative CO₂ Emission Technologies – A New Trend in Energy Research?**
T. Pröll
University of Natural Resources and Life Sciences (Austria)
- 063 Bioefficiency: The Challenging Way Towards the Next Generation of Biomass-fired Combined Heat and Power Plants**
H. Spliethoff, T. de Riese, L. Hansen, R. Nowak Delgado, S. Fendt
Technische Universität München & Bayerisches Zentrum für Angewandte Energieforschung e. V (Germany)
- 064 Design of an energy efficient heating system for integrated oxygen production using ceramic membranes**
F. Scheck, N. Schmitz, H. Pfeifer & R. Kriegel
RWTH Aachen University & Fraunhofer Institute for Ceramic Technologies and Systems IKTS (Germany)

Monitoring

- 065 In-furnace thermal imaging for process optimisation and NO_x reduction**
Christopher Leonard and Neil Simpson
Ametek Land & Simpson Combustion
- 066 Temperature Measurements by Means of SO₂ Spectra and Differential Optical Absorption Spectroscopy in Two Full-Scale Boilers**
T. Leffler, S. Badieli & P. Kallner
Vattenfall AB (Sweden)

Pollutant Emissions

- 067 Reduction of thermal and fuel NO-formation with Multi-Stage Flameless Oxidation**
N. Schmitz, L. Giesler, E. Cresci, J.G. Wuenning & H.Pfeifer
RWTH Aachen University & WS Waermeprozessstechnik GmbH (Germany)
- 068 Issues relating to the Combustion of High Asphaltene Heavy Fuel Oils.**
A.R. Lea-Langton, K.D. Bartle, F.A. Atiku, J.M. Jones & A. Williams
University of Manchester & University of Leeds (UK)
- 069 Influence of operation mode of a drop-feed-pellet domestic boiler on gaseous and particulate emissions**
A. Martinez, C. Lacour, J. Yon & A. Coppalle
Normandie University (France)
- 070 Development of new concepts for an energy efficient firing of ceramics by 2050**
T. Redemann & E. Specht
Otto von Guericke University Magdeburg (Germany)
- 071 Effects of CO₂-H₂O dilution on non-premixed turbulent oxygen enriched flames in a swirl burner**
T. Boushaki, H. Zaidaoui, J.C. Sautet, C. Chauveau
University of Orleans & Normandie University (France)