INTERNATIONAL FLAME RESEARCH FOUNDATION

IFRF Conference 2025

Sustainable and safe combustion

17-19 June, Sheffield UK

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DIRECTOR'S WELCOME

Dear delegate,

Welcome to the IFRF Conference 2025, the first to be held in seven years!

The venue for the conference is the historic town hall in the city of Sheffield, known as the 'Steel City' due to the city's role as a major hub for steel production in the 19th and 20th centuries. Sheffield's steel heritage remains a significant part of its identity and continues to shape the city's culture and economy.

IFRF is also headquartered at the University of Sheffield's Energy Innovation Centre (EIC), a strategic merger of the Translational Energy Research Centre (TERC) and the Sustainable Aviation Fuels Innovation Centre (SAF-IC). The importance of heavy industry in the region coupled with exciting new technological developments in energy and fuels at the EIC makes Sheffield the ideal venue for our conference.

With the theme of 'sustainable and safe industrial combustion', we've curated an engaging programme of interest to delegates from industry and academia around the world.

You'll hear from five renowned keynote speakers, dive deep into critical topics across our parallel sessions and explore

the latest combustion innovations at our poster sessions and exhibition. We also invite you to our Gala Dinner on Wednesday 18th June after an afternoon tour of the EIC's state-of-the-art facilties.

The final day offers a unique look at leading EU demonstrator projects and a lively panel, with dedicated time for your own strategic discussions.

Thank you for taking the time to attend the IFRF Conference 2025. We appreciate your support of the IFRF and hope you enjoy the activities over the next three days.

Greg Kelsall
IFRF Executive Director

SCHEDULE
DAY 1

Time	Session	*Authors/Affiliation
08:30	**Arrival, registration and refreshments**	
09:00	**Welcome:** Sauro Pasini, IFRF President	
09:15	**Opening keynote:** The role of combustion (and fuels) in a decarbonising world - **Jörg Leicher,** Gas- und Wärme-Institut Essen e.V.	
10:00	**Session A1: Rapid poster presentation** (1 minute per poster)	
	P01: Impact of hydrogen combustion on NOx emissions – physical and regulatory considerations	**J. Leicher,** A. Giese, Gas- und Wärme-Institut Essen e.V.
	P02: Pyrolysis of a single wood pellet between 600 and 1000°C under high heating rates in a drop tube furnace: Experiments and modeling	A. Wittmann, C. Schönnenbeck, G. Gerandi, A. Brillard, **J.-F. Brilhac**, V. Tschamber, Université de Haute-Alsace
	P03: Development of a numerical simulation model for the investigation of a fuel-flexible ladle preheating system	**H. Kaiser**, J. Losacker, N. Schmitz, C. Wuppermann, A. Volkert, F. Firsach, D. Schreiber & R. Schweikle, RWTH Aachen University, Badische Stahlwerke GmbH, Badische Stahl-Engineering GmbH
	P04: Decarbonization by Improving Fired Heater Efficiency to ≥95 %	**C. Riley**, Sulzer Chemtech US Inc.
	P05: Impact of dimethyl ether and other fuels on a test rig fired by a Swirl-Stabilized Cold Flow Burner	**M. Diewald**, N. Schmitz & C. Wuppermann, RWTH Aachen University
	P06: The Suntec Hydrogen and Natural Gas Mixer Solution	**D. Morin**, Suntec Industries

*Presenter in bold.

Time	Session	*Authors/Affiliation
	P07: Correlation between pollutant emissions and chemiluminescence measurements for the monitoring of MILD Combustion systems	V. Castro, **G.B. Ariemma**, P. Sabia, G. Sorrentino, R. Ragucci & M. de Joanno STEMS, DICMaPI, University of Naples Federico II
	P08: Monte-Carlo approach for resolving transient heat transfer in annealing furnace	**A. Sayed Kassem**, V. Forest, V. Eymet, C. Coustet, S. Blanco, R. Fournier, P.-D. Nguyen, G. Ghazal & J.-L. Borean, ArcelorMittal Global R&D, Méso-Star, Laboratoire Laplace
	P09: Lean Premixed Combustion of producer gas: CFD Simulation and experimental tests of flame temperature and emissions	**M. Renzi**, M. Zubair Qureshi & M. Fatehi, Free University of Bolzano
	P10: New lateral burner for 0 to 100% hydrogen flexibility in steel reheating furnaces	H. Mohanna, J. Lumbreras, J. Losacker, **S. Caillat**, D. Mira & N. Schmitz, Fives Stein, BSC Spain, RWTH Aachen University
	P11: Feature selection and mode analysis for Sparse Sensing applied to MILD systems	V. Rosati, G.B. Ariemma, **G. Sorrentino**, R. Ragucci & M. de Joannon, Istituto di Scienze e Tecnologie per l'Energia e la Mobilità sostenibili −Università degli studi di Napoli Federico II
	P12: A Research and Collaboration Platform for Decarbonising Glass and other Foundation Industries	**R. Ireson**, Glass Futures
10:20	**Refreshments and poster session**	

SCHEDULE
DAY 1

Time	Session	*Authors/Affiliation
11:00	**Parallel sessions**	
	Session B1: Hydrogen	
	Oxygen Enrichment Studies in Fuel Flexible Low Temperature Oxyfuel Burner	**N. Thekkedath Madhu**, M. Adendorff, K. Mabic, E. Iplik, S. Eckart, H. Krause, Linde GmbH, Institute of Thermal Engineering, TU Bergakademie Freiberg, Linde Sverige AB
	Production of Hot Hydrogen-Rich Syngas in Integrated Plants for Efficient Injection in the Blast Furnace and CO2 Mitigation	E. Faraci, D. Garot, A. Oblanca Gutiérrez, C. Morelli, L. Micheletti, Rina Consulting, CRM Group, ArcelorMittal Global R&D Paul Wurth SMS Group (**Presented by Davide Ressegotti, Rina Consulting S.p.A.)**
	H_2 Firing Challenges from Industry Perspective	**S. Mania,** Shell Global Solutions international B.V.
	Session C1: Process Heating	
	Reducing carbon intensity of industrial heating processes using hydrogen cofiring	**A. Heeley**, K.N. Finney, J. Szuhanzski, A. Gheit & M. Pourkashanian, Energy Innovation Centre - University of Sheffield
	Experimental Assessment of Nitrogen Oxide Emissions in Hydrogen-Based Coal Substitution for Iron Ore Induration in Rotary Kilns	**S. Colin**, F. Normann, C. Fredriksson, K. Andersson, Division of Energy Technology, Chalmers University of Technology, LKAB
	Development of an innovative “foreheart” regenerative furnace for molten glass	**I. Luzzo**, F. Cirilli, M. Marchegiani, L. Tosini, Rina Centro Sviluppo Materiali Dalmine Italy, Rina Centro Sviluppo Materiali Roma Italy, Bormioli Luigi Italy
12:00	**Lunch**	

Time	Session	*Authors/Affiliation
13:00	**Keynote speech:** Heating GreenSteel: A Crossroad of Hydrogen, Ammonia, Biofuels, Electricity, Heat Recovery, and CCS – **Anna Domènech Abella**, Head of Innovation and Industrial Engineer at CELSA	
13:45	**Parallel sessions**	
	Session D1: Measurement Technology	
	Application of digital cameras to increase our knowledge of hydrogen combustion in rotary kilns	**F.J. Triana de las Heras,** F. Normann, K. Andersson, A. Gunnarsson, Division of Energy Technology, Chalmers University of Technology
	3D Tomographic Imaging of Flame Emission in Industrial Thermal Processes	C.T. Foo, M. Röder, F.J.W.A. Martins, P. Pietsch, A. Giese & **K. Mohri**, EMPI - Tomography, EMPI – Fluid Dynamics, CENIDE - University of Duisburg-Essen, Gas- und Wärme-Institut Essen e.V., Gastechnologisches Institut
	Measurement of mass flow rate of pneumatically conveyed pulverised biomass through acoustic emission detection and electrostatic sensing	X. Zeng, **Y. Yan**, School of Control and Computer Engineering - North China Electric Power University, Hangzhou International Innovation Institute - Beihang University
	Session E1: Emerging technologies	
	The effect of coating layer formation on heat transfer conditions in a thermal plasma heated rotary kiln	**A. Fakt**, I. Qasim, A. Gunnarsson F. Normann, B. Wilhelmsson & K. Andersson, Department of Space, Earth and Environment - Chalmers University of Technology, Heidelberg Materials Cement Sverige AB

*Presenter in bold.

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Time	Session	*Authors/Affiliation
	Cement Production Using A 300 kWel Plasma System – An Experimental Study Of The Thermal Behavior In A Pilot-Scale Rotary Kiln	**I. Qasim**, A. Gunnarsson, F. Normann, K. Andersson, B. Wilhelmsson, A. Zether, Division of Energy Technology - Chalmers University of Technology, Heidelberg Materials Cement Sverige AB, Department of Applied Physics and Electronics - Umeå University
	Electrification of the glass making process through plasma assisted combustion	**N. Striūgas**, Lithuanian Energy Institute
14:45	**Refreshments and poster session**	
15:30	**Parallel sessions**	
	Session F1: Ammonia	
	Heat transfer features of no-carbon energy carriers for the hard-to-abate sector decarbonization	**G.B. Ariemma**, T. Esposito, G. Sorrentino, P. Sabia, G. Langella, R. Ragucci & M. de Joannon, STEMS-CNR, University of Naples Federico II
	Amburn – Ammonia for LPG Replacement in medium size boilers	**A. Valera-Medina**, S. Mashruk & J. Davies, Centre of Excellence on Ammonia Technologies - University of Cardiff
	Session G1: Solid Fuels	
	Advances in NOx and SOx Absorption Process: Updates on Reaction Mechanism	**R. Citra Aprilia**, J. Johansson & F. Normann, Department of Space, Earth and Environment - Chalmers University of Technology
	Emission Reduction and Efficiency Gains with RJM Ultra-Low NOx CleanAir™ Coal	**J. Woodhead**, T Beeley, RJM International
16:30	**End of Day 1**	

*Presenter in bold.

SCHEDULE
DAY 2

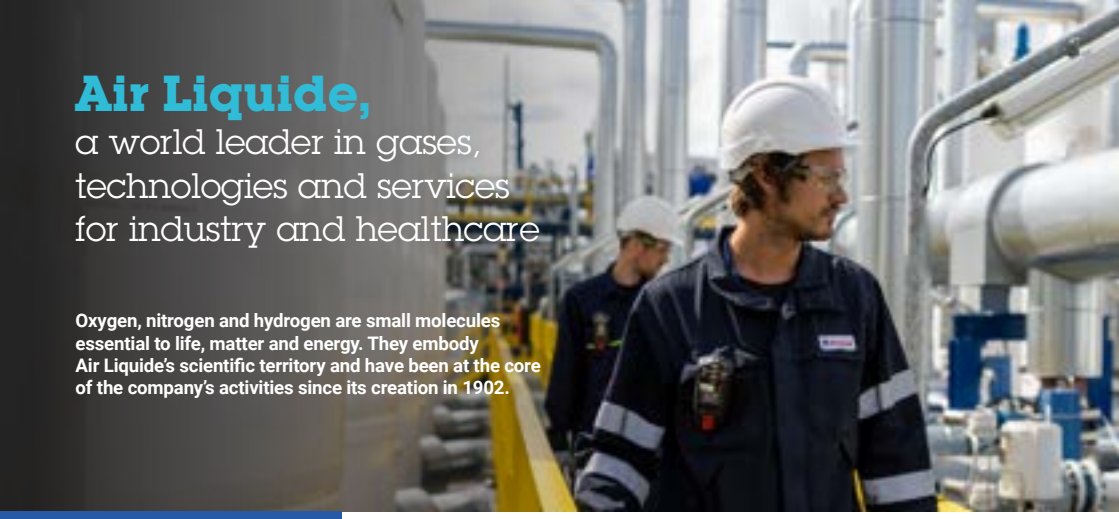
Time	Session	*Authors/Affiliation
08:30	**Arrival and refreshments**	
09:00	**Keynote speech:** Main industrial combustion applications and their drivers – **Louis Ricci**, R&D Director, Fives Combustion Business Unit	
09:45	**Parallel sessions**	
	Session A2: Process heating	
	Development of hydrogen technologies for the industrial decarbonisation	**J. Hercog**, Institute of Power Engineering – National Research Institute, Center for Hydrogen Technologies
	The impact of hydrogen addition to flameless oxyfuel burner on temperature and heat flux distribution in a pilot-scale furnace	**K. Mabic**, M. Adendorff, & N.T. Madhu, E. Iplik, K. Kyprianidis, Linde GmbH, Mälardalen University Sweden, Linde Sverige AB
	Advancements in Green Hydrogen Applications for Sustainable Steel Production	**M. Bissoli**, S. Nardi, D. Astesiano & E. Malfa, TENOVA SpA
	Session B2: Hydrogen	
	H2 combustion, from R&D developments to industrial demonstration	**N. Riaute** & J. Caudal, Air Liquide
	New roof burner for 0 to 100 % hydrogen flexibility in reheating furnaces	H. Mohanna, **S. Caillat**, P. Sedmak & M. Duy Le, Fives Stein
	An integrated approach of the potential of hydrogen combustion for the decarbonization of tiles and bricks industry	C. Poirier, **D. Honoré**, C. Lacour, O. Torres, S. Houidi, L. Blanchard & O. Lebasle, CTMNC, CORIA - CNRS, CLEIA
10:45	**Refreshments**	

Time	Session	*Authors/Affiliation
11:15	**Parallel sessions**	
	Session C2: Modelling	
	CFD Modelling of Sustainable Industrial Combustion in Glass Furnaces: Validation and Application on Different Scenarios	C. Cravero, **A. Lamberti**, D. Marsano, G. Milanese & B. Sommariva, Dipartimento di Ingegneria Meccanica
	CFD simulations of lean steel gas for valorisation in steel slab reheating furnace	**A. Sayed Kassem,** J.-L. Tanguy, P. Vienot, C. Deutsch, G. Ghazal & P.-D. Nguyen, ArcelorMittal
	Session D2: Heat recovery and carbon capture	
	Flue gas treatment for heat recovery	L. Pasquier, **L. Payet** & E. Carlu, ALLICE
	An experimental study on the stabilization limits of methane and biogas oxyflames under CO2 dilution for CCS applications	**L. Pirateque Henao**, B. Lecordier, C. Lacour, A. Cessou & D. Honoré, INSA Normandie Université
12:15	**Lunch**	
13:15	**Keynote speech:** The Iron Power Cycle – **Philip de Goey**, Eindhoven University of Technology	
14:00	**Session E2: Metal combustion – Chaired by Philip de Goey**	
	Aluminium-steam reaction in a swirled stabilized flame: a new way for hydrogen production	**J.F. Brilhac**, C. Schönnenbeck, O. Allgaier, V. Tschamber, U.S. Schubert, E. Schweers, N. Windhab & L. Portugues, Université de Haute-Alsace, Energy-13 GmbH, CEEC Jena Friedrich Schiller University
	New Insights into Iron Particle Combustion	**Z. Mansouri**, Nottingham Trent University
14:45	**Refreshment break**	

*Presenter in bold.

SCHEDULE
DAY 2

Time	Session	*Authors/Affiliation
15:00	**Walk to coach**	**Please note:** Tour places are limited for health and safety reasons and were allocated on a first-come, first-served basis at the time of ticket purchase.
15:15	**Coach travel to Energy Innovation Centre, University of Sheffield**	
15:45	**Tour of Energy Innovation Centre**	
17:15	**Coach returns to Sheffield city centre**	
19:00	**Drinks reception and gala dinner at Inox - University of Sheffield, Durham Road, Sheffield S10 2TG**	
22:00	**End of Day 2**	



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60 countries

More than **4M** customers and patients

More than **6,500** employees contributing to Innovation & Technologies

366 new patents in 2024

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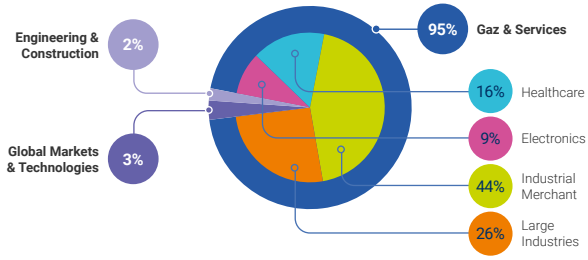
Our activities

Air Liquide provides industrial and medical gases, technologies and services to nearly every sector of the world's economy.

BREAKDOWN OF 2024 GROUP REVENUE BY ACTIVITY (1)



Large Industries
We produce and deliver gases in large quantities in industrial basins identified for their growth opportunities and potential for local synergies.

Healthcare
Present in both hospitals and patients' homes, we provide medical products and services to meet the needs of patients, doctors, care facilities, and the healthcare system as a whole.

Global Markets & Technologies
We also provide technological solutions (molecules, equipment and services) that are essential to major international scientific projects, as well as space and deep-tech(2) markets.

Industrial Merchant
We are constantly innovating to be able to supply a wide range of customers, for numerous applications requiring industrial gases in small and medium quantities (in bulk or cylinders).

Electronics
We innovate for our electronics customers, who use our gases and advanced materials for the manufacturing of smaller, faster semiconductors, as well as flatscreens and photovoltaic cells.

Engineering & Construction
We build plants and equipment to produce and manage gases for a wide range of industrial customers.

SCHEDULE DAY 3

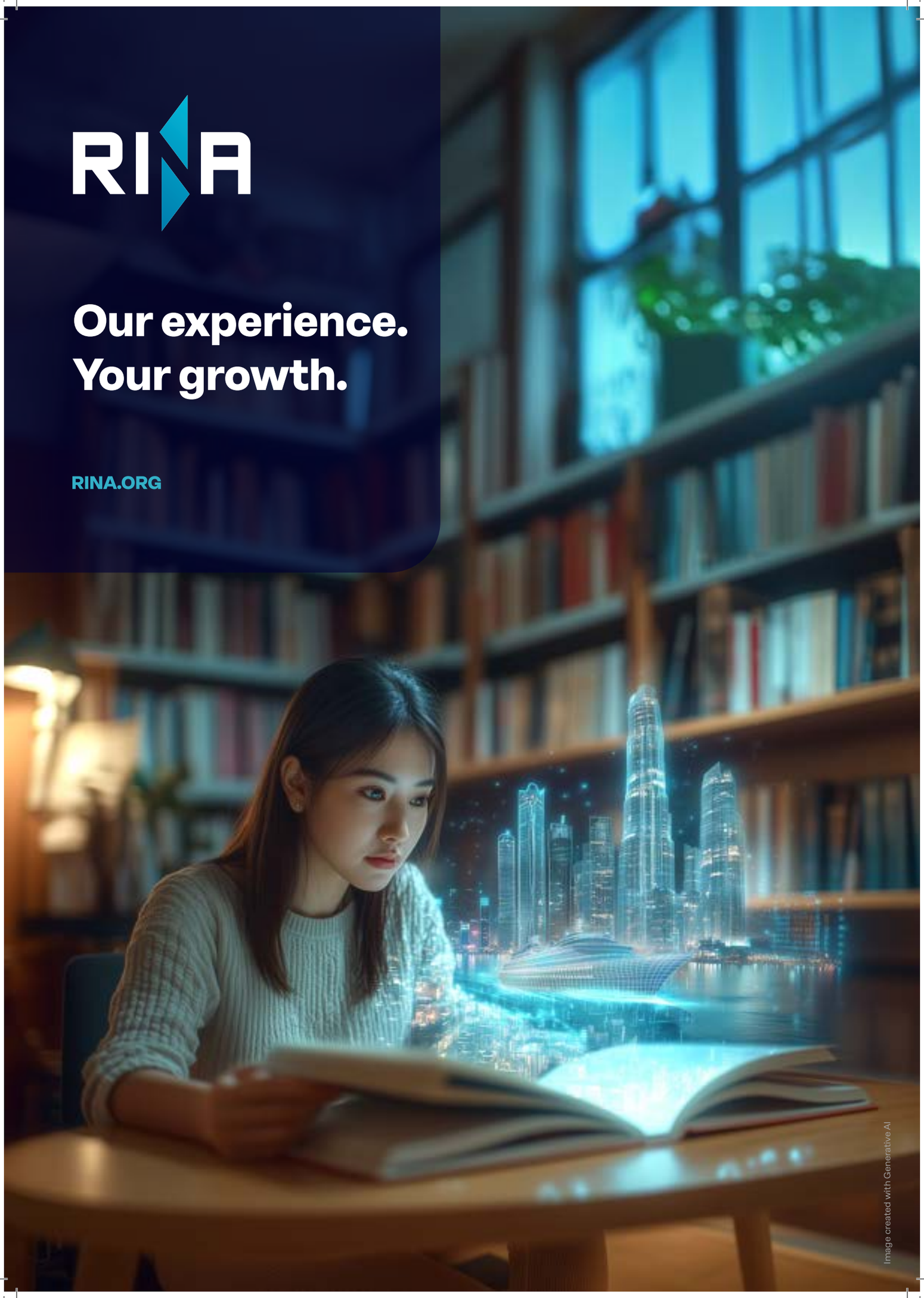
Time	Session	*Authors/Affiliation
08:30	**Arrival and refreshments**	
09:00	**Keynote speech:** Industry 5.0: Towards a Sustainable, Human-Centric and Resilient Industrial Transition – **Seán O'Reagain**, Directorate-General for Research and Innovation, European Commission	
09:30	**Introduction to demonstrator projects session** – Nico Schmitz (RWTH Aachen University) and Sébastien Caillat (Fives Stein)	
09:35	**Demonstrator project marketplace** with refreshments	
	D01: **FlexHeat2Anneal:** Fuel Flexibility in Burner-Radiant Tube Systems for Continuous Annealing Lines	**E. Busson**, M. Mühlbach, N. Schmitz, J.G. Wünning & C. Wuppermann, Department for Industrial Furnaces and Heat Engineering - RWTH Aachen University, WS Wärmeprozesstechnik GmbH
	D02: **HyInHeat:** Investigation of ammonia combustion to decarbonize industrial process heating	**J. Leicher**, M. Biebl, B. Feller & A. Giese, Gas- und Wärme-Institut Essen
	D03: **ZeroCO2-Glas:** Decarbonization of Container Glass Melting with Hybrid Heating and Hydrogen-Oxyfuel Combustion	**F. Ott**, S. Pietsch, N. Schmitz, S. Thiele, D. Orzol & C. Wuppermann, Department for Industrial Furnaces and Heat Engineering - RWTH Aachen University, IPGR e.V.
	D04: **DevH2forEAF:** Results from the Experimental Campaigns with the H2 Oxyfuel Burner for Electric Arc Furnaces (EAF)	E. Faraci, **I. Luzzo**, A. Provesi, J. Greguoldo, F. Vecchiet, G. Rinaldi, F. Ferrari, F. Nastro, D. Gaspardo & D. Olivieri, Rina Consulting CSM, SMS Group S.p.a., NipponGases S.p.a., Ferriere Nord Zona Industriale Rivoli

Time	Session	*Authors/Affiliation
	D05: **HyTecHeat:** HYbrid TEChnologies for sustainable steel reheating	F. Cirilli, **I. Luzzo**, G. Jochler, N. Zacchetti, S. Zanlucchi, D. Astesiano, M. Bissoli, E. Malfa, I. Morena, E. Salvo, P. Marrelli & G. Ferri, Rina Consulting CSM, Tenova, Industrie De Nora, Snam S.p.A
	D06: **CH0C project:** A low-carbon dioxide and low-NOx oxy-fuel boiler pilot	**L. Ricci**, S. Juma & L. Tardelli, Fives Pillard, TotalEnergies OneTech, NaTran
	D07: **TwingHy:** Digital Twins for Green Hydrogen Transition in Steel Industry	**J. Losacker**, N. Schmitz, C. Wuppermann, S. Caillat, H. Mohanna, J. Visús Pool, J. Jiménez, S. Shubham, J. Lumbreras, D. Mira, J. Falk & J. Lindwall, Department for Industrial Furnaces and Heat Engineering - RWTH Aachen University, Fives Stein, Nippon Gases España, Celsa Group, BSC, Swerim AB
	D08: **H2Glass:** Special demo-project session participation of H2GLASS	**C. Caccamo**, Sintef
	D09: **H2AI:** Full-scale demonstration of replicable technologies for hydrogen combustion in Hard-to-Abate Industries: The aluminium use-case	**M. Lubrano Lavadera**, A. Parente, H2AL consortium.

*Presenter in bold.

SCHEDULE
DAY 3

Time	Session	*Authors/Affiliation
11:00	**Topic-Oriented Panel** – Moderated by Sébastien Caillat and Karen Finney	
	1. Burner technology and combustion equipment 2. Emissions 3. Impact on product/process	
12:30	**Event summary and closing remarks** - Prof. Mohamed Pourkashanian OBE, IFRF General Secretary and EIC Managing Director	
12:45	**Lunch and networking**	
15:00	**Conference end**	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ABOUT OUR KEYNOTE SPEAKERS

Jörg Leicher, Research Engineer and Combustion Specialist at GWI

Jörg has been working in the Department of Industrial Combustion Technology of GWI where he is currently in charge of the Numerical Simulations Group. His professional interests include the modelling of industrial combustion processes, the impact of natural gas quality on industrial gas-fired applications and the use of alternative fuels such as hydrogen.

Anna Domènech Abella, Head of Innovation and Industrial Engineer at CELSA Group

Anna, an Industrial Engineer with a master's in International Business Management, brings 14 years of expertise in funding and innovation management to the table Since 2021, she has served as the Head of Innovation at CELSA Group, spearheading the coordination of innovation initiatives aimed at realising the Group's Net Positive objectives across their business units across Europe.

Louis Ricci, R&D Director at Fives, Energy | Combustion Business Unit

Louis has 25 years' experience in combustion and coordinates R&D topics and decarbonation actions across three subsidiaries of the Fives group to progress and develop innovation in thermal energy and environmental concerns around combustion. He has technical expertise in combustion and pyro processes and is the inventor of multiple combustion systems.

Philip De Goey, Full Professor of Combustion Technology at Eindhoven University of Technology

Philip is a pioneer in combustion research, renowned for inventing the Heat Flux Method and the FGM method for combustion modeling. His current research at TU/e heavily focuses on sustainable fuels, particularly metal fuels, and he is a driving force behind initiatives like Team SOLID and Metalot, accelerating the commercialisation of clean combustion technologies.

Seán O'Reagain, Senior Adviser 'Human Centricity' at Directorate-General for Research and Innovation, European Commission

Seán has wide experience of the industrial dimension of European research and innovation policy and programmes, including managing the industrial technologies programme under Horizon Europe. Previously, he oversaw the development of the first public-private partnerships with industry at European level and, most recently, has guided the setting up of the Processes4Planet and Made in Europe partnerships.

MEET THE IFRF TEAM

Since 1948 the IFRF has been the research hub of the global industrial combustion community.

With an ever-growing network of combustion and energy specialists, our mission is to advance applied combustion research and connect our members to knowledge, research information and business opportunities across the world.

Conference organisational committee

Sauro Pasini - IFRF President

Sébastien Caillat - IFRF Vice-President, Fives Group

Prof. Mohamed Pourkashanian OBE - IFRF General Secretary, EIC - University of Sheffield

Greg Kelsall - IFRF Executive Director

Melissa Ayres - Company Secretary, EIC - University of Sheffield

Siobhan Green - Administration, EIC - University of Sheffield

Niamh Haughey - Marketing and Communications (maternity cover), EIC - University of Sheffield

Rhianne Spurden - Marketing and Communications, EIC - University of Sheffield

Conference scientific programme committee

Sébastien Caillat - Fives Group

Benedicte Cuenot - Safran

Mario Ditaranto - Sintef

Greg Kelsall - IFRF

Jörg Leicher - GWI

Sauro Pasini - IFRF

Mohamed Pourkashanian - IFRF

Anna Pubill Melsió - Air Liquide

Nico Schmitz - University of Aachen

Nils Skoglund - University of Umeå

Giancarlo Sorrentino - CNR

Yong Yan - Beihang University

Dave Schalles - Bloom Engineering

Philip de Goey - Eindhoven University of Technology

Siobhan Green - IFRF/EIC - University of Sheffield

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