THE FUEL AND ENERGY RESEARCH FORUM’S
1st FERIA CONFERENCE, THE EUROPEAN CONFERENCE ON FUEL AND
ENERGY RESEARCH AND ITS APPLICATIONS

MONDAY 6th TO WEDNESDAY 8th SEPTEMBER 2021

The Jubilee Conference Centre, Jubilee Campus, University of Nottingham, UK

PROGRAMME

Opening Session: The Auditorium, 09.00–9.45

09.00 Opening address: Dr D J A McCaffrey, 1st FERIA Conference Chairman and FERF General Secretary

09.10 Welcome address: Prof Christopher Tuck, University of Nottingham, UK

09.15 Keynote address: Technical Challenges for Expanding Fuel Inventory in Large Scale Biomass Combustion
Jenny Jones, Professor of Sustainable Energy, University of Leeds, UK

Session 1A - PACT/IFRF 1: The Auditorium, 10.00-11.20

Session Chair: Bill Nimmo

10.00 The Translational Energy Research Centre: Maximising UK benefits from transition to a Low carbon future
Mohamed Pourkashanian, University of Sheffield, UK

10.20 Metal emissions from biomass combustion under air- and oxy-fuel conditions
János Szuhánszki, University Energy Institute, University of Sheffield, UK

10.40 Research priorities for development of supercritical CO₂ combustion systems
Richard Marsh, Cardiff University, UK

11.00 The development of new chemical kinetic mechanism for combustion in supercritical carbon dioxide
James M Harman-Thomas, University of Sheffield, UK.

Session 1B - Conversion Processes 1: Lecture Theatre MR 5, 10.00-11.20

Session Chair: Will Quick

10.00 The net-zero potential of bio-gas fast pyrolysis for the agricultural sector
Katie Chong, EBRI, Aston University, Birmingham, UK

10.20 Field applied cladding solution for the conversion of a supercritical boiler from coal to biomass
Colin Bateman, Integrated Global Services, USA
Monday 6th September

10.40 Two-stage catalytic hydrothermal conversion of rapeseed oil into hydrocarbons via hydrolysis and decarboxylation
Jude Onwudili, Energy and Bioproduct Research Institute, Aston University, UK

11.00 Methodology for the design of a rotary kiln for the pyrolysis of biomass
Katie Chong, EBRI, Aston University, Birmingham, UK

**Session 2A - PACT/IFRF 2: The Auditorium, 11.45–13.05**

**Session Chair: Mohamad Pourkashanian**

11.45 Experimental and kinetic modelling of ammonia/methane combustion processes
Daniel O. Okuo, University of Sheffield, UK.

12.05 Controlling capture plants to avoid CO2 emissions penalties during peak load demand
Muhammad Akram, University of Sheffield, UK

12.25 De-risking innovation in power plants with CO2 capture: from process modelling to pilot-scale demonstration
Laura Herraiz Palomino, University of Edinburgh, UK

12.45 A review of R&D into additive manufacturing techniques and their application to combustion components and systems
Sébastien Caillat, Fives, France

**Session 2B - IChemE-CESIG: Lecture Theatre MR 5, 11.45–13.05**

**Session Chair: Katie Chong**

11.45 IChemE Clean Energy SIG Climate Change Context and Action Plan for Responsible Production
Michael Green, IChemE Clean Energy Special Interest Group, UK

12.05 Feasibility assessment of bioenergy carbon capture, utilisation and storage
Katie Chong, EBRI, Aston University, Birmingham, UK

12.25 The case for techno-economic & life cycle analysis to assess the use of hydrogen in a low-carbon energy system
Mike Keast, Mike Keast Technology Ltd, UK

12.45 Number One – Hydrogen 1H : First choice fuel for mitigation of global warming
Mike Menzies, Kinson Power Ltd, Dorset, UK

**Session 3A – Net Zero Research: The Auditorium, 14.20–16.00**

**Session Chair: Peter Sage**

14.20 Multi-Objective Optimisation and Exergoeconomic Analysis of sCO2 Cycles for Combined Cycle Power Plant
Dhinesh Thanganadar, Cranfield University, UK

14.40 Image based flame monitoring techniques for stoker furnaces
Shoaib Shah, University of Nottingham, UK

15.00 NOx prediction of an oxy-biomass combustion process through flame imaging and online deep learning
Li Qin, University of Kent, UK

15.20 Optimal control of energy storage systems for large thermal plant operators
Katy Honour, University of Leeds, UK
Monday 6th September

15.40  *Biomass characterisation and densification for evaluating suitability of non-conventional biomass sources for power generation*
Johnson Ho Lau, University of Nottingham, UK

**Session 3B – BFRC: Lecture Theatre MR 5, 14.20–16.00**

**Session Chair: Richard Marsh**

14.20  *An alternative route to minimum flaring – plant optimised flare gas recovery systems using ejector technology*
Simon Kretzschmar, Greens Combustion, UK

14.40  *Recent advances in zero routine flaring initiative*
Kumar Patchigolla, Cranfield University, UK

15.00  *Recent advances in H2 and NH3 combustion for decarbonisation of power generation and industry*
Richard Marsh, Cardiff University, UK

15.20  *Optimisation of integrated bioenergy and high value product processing pathways for biomass resources*
Fatih Güleç, University of Nottingham, UK

15.40  *Panel Discussion*
lead by Richard Withnall, BFRC, UK

16.30  **Poster Session 1: The West Atrium**

17.30  **The 2nd Clean Energy Science Lecture: The Auditorium**

The 2021 Clean Energy Science Lecture, to be delivered by Professor Mohamed Pourkashanian, University of Sheffield, “Research Challenges for Zero Carbon and Sustainable Fuels: Prospects and the Pathway Forward for the Clean Energy of the Future”.

18.30  **Poster Session 2: Poster Reception and Buffet Dinner: The West Atrium**

**END OF DAY 1**
Tuesday, 7th September 2021

Session 4A - SuperGen 1: The Auditorium, 09.00–10.20

Session Chair: Paula Blanco Sanchez

09.00  Electrosynthesis of biofuels via co-valorisation of bio-feedstocks and captured CO2
       Jin Xuan, Jonathan Wagner, Loughborough University, UK

09.20  Sustainable digestate-derived biochar for carbon dioxide capture
       Yuanting Qiao, Chen Zhang, Queens University Belfast, UK

09.40  Results from preliminary investigation of the production of biopropane from catalytic hydrothermal processing of biomass-derived butyrates
       Jude Onwudili, Aston University, UK

10.00  Characterisation of biomass wastewaters as the feedstocks in Supercritical Water Gasification for hydrogen generation
       Chai Siah, Faculty of Engineering, Nottingham University, UK

Session 4B – Biomass & Waste 1: Lecture Theatre MR 5, 09.00–10.20

Session Chair: Cheng Gong Sun

09.00  Investigation of the properties of process slag samples from BGL fixed-bed gasification of waste materials
       Markus Reinmöller, TU Bergakademie Freiberg, Germany

09.20  Challenges of increasing biomass fuel flexibility while maintaining reliability for Biomass CHP
       Trudy Beeley, RWE Generation UK

09.40  Political Influence in the management and recycling of waste
       Mike Menzies, Kinson Power Ltd, UK

10.00  Milling and combustion performance of alternative fuels for low carbon energy production
       Orla Williams, Faculty of Engineering, University of Nottingham, UK

Session 5A - Conversion Processes 2: The Auditorium, 10.40–12.20

Session Chair: Ed Lester

10.40  Effect of hydrothermal Pre-treatment of FCC catalyst in conversion of biomass waste to in-situ upgraded bio-oil
       Abubakar Mashi Haruna, University of Nottingham, UK

11.00  Hydrodeoxygenation of p-cresol over CuNi/C catalyst derived from metal-organic frameworks precursor
       Ahmed Ibrahim, University of Nottingham, UK

11.20  Hydrothermal carbonisation of pine kraft lignin: Effect of process variables on coalification and inorganic metals removal
       Umaru Musa, University of Nottingham, UK

11.40  Thermal kinetics study of paper and plastic waste gasification
       Ahmad Al-Moftah, Cardiff University School of Engineering, UK

12.00  Study of syngas production from pyrolysis/gasification of waste tyre and biomass through process simulation
       Fahima Al-Balushi, University of Sheffield, UK
Session 5B – Methods:  Lecture Theatre MR 5,  10.40 – 12.20

Session Chair: Julian Steer

10.40 Improving biomethane quality infrastructure: A traceable international comparison of siloxane and total silicon measurement capabilities
John Alden, National Physical Laboratory, Teddington, UK

11.00 Evaluation of depth filtration in non-woven filtration media using micro-computed tomography (µCT) and scanning electron microscopy (SEM) techniques - a case study
Daniel Curry, University of Sheffield, UK

11.20 Concentration measurement of pulverised coal and biomass in a pneumatic conveying pipeline through multi-modal sensing and machine learning
Faisal Abbas, University of Kent, UK

11.40 Using Advanced Image Processing to Characterise the Performance of Metallurgical Coke in Blast Furnaces
Teshan Rezel, University of Nottingham, UK

12.00 Novel rheometric methodology for the study of coking coals and their blends using parallel plate and cup geometries
George Thomas, University of Nottingham, UK


Session Chair: Katie Chong

13.30 Co-processing of biofuel oil with vacuum gas oil to transport fuels in FCC
Abubakar Mashi Haruna, University of Nottingham, UK

13.50 Production of BTX aromatics from the pyrolysis of non-edible vegetable oil
Paula Blanco-Sanchez, Aston University, Energy & Bioproducts Res. Inst., Birmingham, UK

14.10 Integrated conversion of refuse derived fuel to bio-oil and biogas
Onyinyech Okoligwe, Loughborough University, UK

14.30 Integrated algae-based biomethane fuel purification and carbon sequestration via hydrothermal carbonisation of digestate
Jonathan Wagner, Loughborough University, UK

Session 6B – Fuels:  Lecture Theatre MR 5,  13.30 – 14.50

Session Chair: Julian Steer

13.30 Uncovering the Spatially Resolved Molecular Compositions and Formation Mechanisms of Engine Deposits using 3D OrbiSIMS
Max Edney, University of Nottingham, UK

13.50 Valorisation of anaerobic digestate through fuel pellet production
Ashley Cathcart, Queen’s University Belfast, UK

14.10 Novel purification routes for crude glycerol from biodiesel plants as a suitable feedstock for sustainable aviation fuel
Taha Attarbachi, University of Manchester, UK
Tuesday 7th September

14.30  **Hy4Heat decarbonisation of the gas grid: Gas appliances with dual fuel operation on natural gas and hydrogen**  
Gordon Andrews, Leeds University, UK

**Session 7A – Modelling/Simulation:**  The Auditorium,  15.20 – 17.00

**Session Chair: Malgorzata Wiatros-Motyka**

15.20  **Cradle to grave life cycle energy-economic-emissions assessment of a biomass chemical looping gasification combined cycle power plant w/o CCS using hematite in the United Kingdom**  
Usama Mohamed, University of Sheffield, UK

15.40  **Optimising the integration of torrefaction and novel drying strategies in biomass pelleting plants by life cycle analysis**  
Johnson Ho Lau, University of Nottingham, UK

16.00  **CA Model Based Control Strategy to Minimise Fines Peaks in Wood Pellets Handling**  
Jeff Dissanayake, University of Greenwich, UK

16.20  **NOx emissions reduction by co-combustion of pulverised coal with additives: Modelling using a furnace slice model**  
Alan Williams, University of Leeds, UK

16.40  **A mathematical model to predict particle ignition**  
Tejas Ashar, University of Sheffield, UK

17.00  **Cyclic and Monotonic Response of Class F Ponded Fly Ash**  
Tarunjit Singh Butalia, The Ohio State University, USA (video presentation)

**Session 7B - Conversion Processes 3:**  Lecture Theatre MR 5,  15.20 – 17.00

**Session Chair: Orla Williams**

15.20  **Lab-based experimental study and simulation of pyrolysis and gasification of biomass and plastics for H2 production**  
Yue Chai, University of Sheffield, UK

15.40  **The effect of length on the degradation of wood pellets and the generation of fines by impact**  
Gulab Singh, University of Greenwich, UK

16.00  **Experience in a two-stage pyrolytic conversion of wood sawdust into synthesis gas**  
Vladimir Lavrenov, Russian Academy of Sciences, Moscow, Russia

16.20  **Microwave irradiation assisted heterogeneous transesterification of desert date oil to biodiesel using eggshell derived calcium oxide**  
Umaru Musa, University of Nottingham, UK

16.40  **Scattering properties of pulverized solid fuel particles in air and oxy-fuel combustion**  
Ying Gu, Ruhr-University Bochum, Germany (video presentation)

19.30 for 20.00 **Conference Dinner : The Trent Building, University Park Campus**  
Guest of Honour, Prof. Alan Williams, University of Leeds  
*Coach pick up, 18.50.h. from the Jubilee Conference Centre, 19.00.h. from Newark Hall of Residence*

**END OF DAY 2**
Wednesday, 8th September 2021

Session 8A – Industrial Processes: The Auditorium, 09.00 – 10.40
Session Chair: Trudy Beeley

09.00 Development of mild combustion low NOx burner for non-oxidising furnaces in the steel industry
Sébastien Caillat, Fives Stein, Maisons-Alfort, France

09.20 The Uskmouth Power Station coal to waste derived fuel conversion: Vision for the future
Philip Jenkinson, SIMEC Atlantis Energy, UK

09.40 CFD optimisation of T-fired boilers for ultra-low NOx performance using separated under-fired air
Stephen Caesar, RJM International, Winchester, UK

10.00 The application of an intelligent flame monitoring system in coal-fired power plant boilers
Rachel Avelena, RJM International, Winchester, UK

10.20 Mercury emissions from UK coal fired power plants
David Graham, Uniper Technologies Ltd, Nottingham, UK

Session 8B – Biomass & Waste 2: Lecture Theatre MR 5, 09.00 – 10.40
Session Chair: Cheng Gong Sun

09.00 Value-in-use assessment of fuels for power generation
Dan Eyre, Uniper Technologies Ltd, Ratcliffe-on-Soar, Nottingham, UK

09.20 Renewable energy from sweet sorghum stalk residue
Francis Olanrewaju, University of Leeds, UK

09.40 Combustion potential of bagasse and sugarcane straw for bioenergy applications
Orla Williams, University of Nottingham, UK

10.00 Bunkering the improbable: Challenges of flow, handling and safety with waste and biomass
Baldeep Kaur, University of Greenwich, UK (video presentation)

10.20 ClearTrack 2019-2022: Design and chemical process optimisation of an advanced thermal conversion system for trains
Farhad Beik, Cranfield University, UK

Session 9A - Ash and mineral matter: The Auditorium, 11.05 – 12.45
Session Chair: John Patrick

11.05 Pilot-scale fluidized bed agglomeration mitigation for agricultural fuels with kaolin and dolomite bed additives
Jonathan Morris, University of Sheffield, UK

11.25 The influence of ash mineral content on the utilisation of coals for the blast furnace ironmaking process
Julian Steer, Cardiff University, UK

11.45 Fireside corrosion and deposition on heat exchangers in biomass combustion systems
Nigel Simms, Cranfield University, UK

12.05 WtE/biomass field applied boiler tube fireside corrosion and erosion protection
Colin Bateman, Integrated Global Services (IGS) Europe s.r.o., Czech Republic
12.25  Process analysis and investigation of the high temperature agglomeration behaviour in fluidized-bed gasification
Markus Reinmöller, TU Bergakademie Freiberg, Germany

Session 9B - CCUS: Lecture Theatre MR 5, 11.05 – 12.45

Session Chair: Ed Lester

11.05  Prediction of burnout times of biomass char using experimentally determined CO/CO₂ ratios
Kenny Kwong, University of Cambridge, UK

11.25  Intelligent scheduling and flexible operation for large scale coal-fired power plant with post-combustion carbon capture
Jin Ma, East China University of Science and Technology, PR China

11.45  Reducing CO₂ emissions from fluid catalytic cracking units in oil refineries by integration with chemical looping combustion
Fatih Güleç, University of Nottingham, UK

12.05  Preliminary study of CO₂ frost formation during cryogenic carbon capture using tomography Analysis
Yuan Chen, University of Edinburgh, UK

12.25  Waste to Energy with BECCS for the urban environment: Opportunities and challenges for development
Dan Su, University of Edinburgh, UK

Session 10A – Fuel and Energy Research: The Auditorium, 14.00 – 15.00

Session Chair: Bill Nimmo

14.00  Recent developments in EU policy related to coal and outcomes of the CoalTech2051 project
Brian Ricketts, EURACOAL, Belgium

14.20  The study of sulphur emission in the raceway region of a blast furnace
Chay Davies-Smith, Cardiff University, School of Engineering, Cardiff, UK

14.40  Wet electrostatic scrubbing for flue gas treatment
Arianna Parisi, Naples, Italy

15.00  Absorbents from waste fuels
Ed Lester, University of Nottingham, UK

Closing remarks: The Auditorium

15.20  Dr D J A McCaffrey, 1st FERIA Conference Chairman and FERF General Secretary

END OF CONFERENCE