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CONFERENCE PROCEEDINGS

CHEMEICON 2025

"Emerging Frontiers in Process Engineering - Advancing Towards Greener Horizon"

The Second International Research Conference of Department of Chemical & Process Engineering, University of Moratuwa

DEC 16, 2025

Preface

We are pleased to present the proceedings of the 2nd International Research Conference on Chemical and Process Engineering: ChemEICon 2025, organized by the Department of Chemical and Process Engineering, University of Moratuwa, Sri Lanka, and held on December 16th, 2025.

The theme of this year's conference, "Emerging Frontiers in Process Engineering: Advancing Towards Greener Horizon," reflects our collective responsibility to address pressing global challenges through technical innovation. As the world transitions toward a circular economy, the role of chemical and process engineering has never been more critical. ChemEICon 2025 provided a platform for meaningful dialogue by bringing together a global community of academics, industry professionals, and young researchers. We were particularly honoured to feature insights from our esteemed keynote speakers, Prof. Sachin Arvind Mandavgane and Dr. Patrick Leaney, whose contributions effectively bridged strategic industrial perspectives with academic excellence.

The extended abstracts presented in this proceedings are organized under three thematic areas: Sustainable Biomaterials & Bioprocessing Technologies, Environmental Systems, Emissions & Energy Transition, and Process Modelling, AI & Circular Systems. This publication is the result of a rigorous double-blind peer-review process, ensuring that only scientifically sound and high-quality research is disseminated to the broader community. We extend our sincere gratitude to the reviewers, the organizing committee, and our sponsors for their invaluable support. Most importantly, we thank the authors for their commitment to advancing a more sustainable and "greener" future.

We hope that this volume will support and inspire researchers and practitioners, encouraging ongoing innovation and collaboration in the field of chemical and process engineering.

Editors | ChemEICon 2025

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Dr. Bandara Dissanayake

Dr. Kalindu Fernando

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Table of Content

Message by the Conference Chair II
Message by the Head of Department of Chemical & Process Engineering, University of Moratuwa III
Message by the Keynote Speaker - Prof. Sachin Mandavgane IV
Message by the Keynote Speaker - Dr. Patrick Leaney V
Organizing Committee VI
List of Reviewers VIII
Conference Agenda X
Session 01 - Sustainable Biomaterials & Bioprocessing Technologies 12
Comparative Study of One-Step and Two-Step Slow Pyrolysis of Bamboo in Inert and Oxidative Media 13
Development of a Polar Bear-Inspired Starch Bio-composite Reinforced with Graphene Oxide-Coated Coconut Coir 18
Optimizing Wine Production: A Comparative Study of Yeast Fermentation in Seasonal Fruit Juices 24
Comparative Chemical Characterization of Cellulose Extracted from Pineapple Leaves, Corn Cobs, and Bamboo 30
Session 02 - Environmental Systems, Emissions & Energy Transition 36
Comparative Evaluation of Sedimentation and Pulsator Clarifier Systems Using Aluminium Sulphate Coagulant in Water Treatment 37
Environmental Impact of Liquified Natural Gas Fire Accident Emissions 41
Transitioning Sri Lanka's Transport Sector from Petroleum to Renewable Energy: A Comparative Evaluation of Solar and Wind-Powered Electric Mobility 48
Green Hydrogen Economy in Sri Lanka: Opportunities and Challenges 53
Biochar-Assisted Purification of Wood Vinegar Derived from Coconut Shell Pyrolysis 60
Session 03 -Process Modelling, AI & Circular Systems 67
CFD Analysis of the Influence of Tank Geometry on Laminar Flow Stability in Continuous Latex Dipping Processes 68
Optimizing Environmental Sustainability in Process Engineering: Leveraging Quantum Neural Networks for Energy Efficient AI 76
Socio-Behavioural Barriers and Policy Gaps in Implementing Circular Economy Models in Coastal Tourism: A Qualitative Study in the Kalutara District, Sri Lanka 83
Simulation Study of Adsorption-Based VOC Removal from Industrial Painting Emissions 88

Message by the Conference Chair

It is with great pleasure that I extend my warmest welcome to all participants of the 2nd International Research Conference on Chemical and Process Engineering (ChemEICon 2025). Hosted by the Department of Chemical and Process Engineering, University of Moratuwa, this conference continues our ongoing commitment to fostering knowledge creation, promoting innovative engineering solutions, and strengthening the global network of researchers, practitioners, and industry partners.

ChemEICon is growing into a highly anticipated platform within our academic and professional community. Each year, it brings together experts from diverse areas of chemical and process engineering. In 2025, our theme centers on **"Emerging Frontiers in Process Engineering: Advancing Towards Greener Horizon"**, a timely focus given the rapidly evolving technological landscape and the pressing need for sustainable, high-impact engineering solutions. The challenges of our era from resource limitations to climate vulnerabilities demand that we, as engineers, reimagine processes, rethink systems, and push the boundaries of innovation. I am confident that the discussions taking place here will inspire transformative ideas and forge collaborative pathways that extend well beyond this event.

I extend my heartfelt appreciation to our two distinguished keynote speakers, whose contributions add immense value to this year's program. My sincere thanks also go to the authors who submitted their research, the reviewers who dedicated their time to ensuring a rigorous and fair evaluation process, and the organizing committee whose commitment and hard work made this conference possible. I am equally grateful to our partners and sponsors for their generous support and belief in the vision of ChemEICon.

I hope that ChemEICon 2025 will be an enriching and memorable experience for everyone that sparks new ideas, builds meaningful collaborations, and strengthens our shared commitment to sustainable and impactful engineering.

I wish each of you a productive and inspiring conference, and I look forward to the knowledge and connections that will emerge through ChemEICon 2025.

Dr. G.S.M.D.P. Sethunga

Conference Chair

Department of Chemical and Process Engineering

Message by the Head of Department of Chemical & Process Engineering, University of Moratuwa

The International Research Conference on Chemical and Process Engineering (ChemEICon), is organized by the Department of Chemical and Process Engineering, University of Moratuwa, Sri Lanka and this year ChemEICon 2025 is held for the second time. It is an excellent forum for researchers, academics, industrial experts and any interested person, who are eager to explore emerging frontiers in chemical and process engineering. The conference is held at the University of Moratuwa with a sharper focus on the theme 'Advancing Towards Greener Horizon'. The thematic areas cover a wide range of subjects including Sustainable Process Technologies, Carbon Capture and Utilization (CCU), Circular Economy and Waste Valorization, Digitalization and AI, Green Engineering, and many more which address solutions for world's critical problems faced today.

ChemEICon is an ideal platform to disseminate new research findings, and I congratulate the presenters of research papers in ChemEICon 2025 for their successful research. This year the conference is significant as there are two international speakers delivering keynote speeches on chemical and process engineering discipline. I extend my gratitude to our keynote speakers and also all industry participants for their invaluable contributions. I thank the conference organizing committee for their hard work, commitment and thoughtful planning of this conference. All staff and students at the Department of Chemical and Process Engineering who contributed to make the conference successful are gratefully acknowledged. Finally, I warmly welcome all participants to ChemEICon 2025.

Prof (Ms.) M. Y. Gunasekera

Head

Department of Chemical and Process Engineering

Faculty of Engineering

University of Moratuwa

Message by the Keynote Speaker - Prof. Sachin Mandavgane

It is a great honour to share my thoughts for the 2nd International Research Conference on Chemical and Process Engineering, themed "Emerging Frontiers in Process Engineering: Advancing Towards Greener Horizons." This theme reflects not only the direction in which global research is evolving, but also the responsibility that scientific communities now carry, to rethink, redesign, and reinvent engineering systems with sustainability at their core.

Today, chemical and process engineering is undergoing a profound transition. Beyond efficiency and productivity, the focus is increasingly on decarbonisation, circular economy models, resource recovery, waste minimisation, and climate resilience. The discipline is uniquely positioned to bridge scientific innovation with real-world implementation, enabling technologies that are environmentally sound, economically feasible, and socially meaningful.

The relevance of this conference is particularly visible in the context of Sri Lanka, which has recently faced severe climate-linked events including cyclones, extreme rainfall, flash floods, and landslides. Such experiences underscore the urgent need for robust and adaptable systems in agriculture, industry, energy, waste management, and urban planning. For island nations and climate-sensitive geographies, the move toward renewable energy systems, green materials, low-carbon processes, circular resource utilisation, and disaster-resilient infrastructure is not only an academic pursuit—it is a national imperative. Process engineering research and innovation can significantly support these transitions and aid in long-term sustainability planning.

My own work in agricultural residue valorisation and circular bio-economy pathways has consistently demonstrated that sustainability and economic viability are not opposing goals. When scientific innovation integrates with community needs, especially in rural and resource-dependent economies, waste streams transform into value chains and environmental stewardship becomes a shared practice. Such approaches reflect the broader vision of process engineering for societal benefit.

Conferences such as this provide a vital platform for collaboration among researchers, industry leaders, students, and policymakers. The diverse thematic areas represented from carbon capture, renewable energy systems, and AI-enabled green engineering to sustainable assessments and cross-disciplinary innovation highlight the collective momentum toward greener horizons.

I congratulate the organizers for their commitment in creating this forum for knowledge exchange and collaboration. I am confident that the discussions and outcomes from this conference will contribute meaningfully toward shaping a more sustainable and resilient future for Sri Lanka and the global community.

Professor

Department of Chemical Engineering

Visvesvaraya National Institute of Technology, Nagpur, India

Message by the Keynote Speaker - Dr. Patrick Leaney

Patrick Leaney is a retired Chartered Chemical Engineer and a Fellow of the Institution of Chemical Engineers in the UK. After graduating with a PhD from Imperial College he spent 33 years in the Oil and Gas, Petrochemicals and Renewables industries holding senior roles in engineering and project management, process design, technology scale-up and licensing. He also holds an MBA in Finance and Organizational Behavior from the University of California, Berkeley.

He retired in 2015 and has spent the last ten years tutoring disadvantaged students in the UK in A-level Chemistry and Mathematics and is now volunteering in Sri Lanka alongside his partner Ms. Jane Groom, a communications specialist. His volunteering role includes giving workshops and presentations to Engineering Faculties in Sri Lanka focusing on engineering practice, continuing professional development and the key challenge of sustainability for the chemical and process engineering community.

Dr. Patrick Leaney

Charted Chemical Engineer

Organizing Committee

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Dr. Dilhara Sethunga	Conference Chair
Dr. Tharushi Keerthisinghe	Program Chair
Ms. Dasuni De Silva	Conference Secretary

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Dr. Duleeka Gunarathne	University of Moratuwa, Sri Lanka

List of Reviewers

Snr. Prof. (Mrs.) B.M.W.P.K. Amarasinghe	Department of Chemical & Process Engineering, University of Moratuwa, Sri Lanka.
Prof. A.D.U.S. Amarasinghe	Department of Chemical & Process Engineering, University of Moratuwa, Sri Lanka.
Prof. M. Narayana	Department of Chemical & Process Engineering, University of Moratuwa, Sri Lanka.
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Dr. Amila Wickramasinghe	School of Natural Sciences, Western Sydney University, Australia.
Dr. (Mrs.) H.S. Sitinamaluwa	Department of Materials Science & Engineering, University of Moratuwa, Sri Lanka.
Dr. Praneeth Wijesinghe	Department of Interdisciplinary Studies, University of Ruhuna, Sri Lanka.
Dr. Rochelle Silva	Residues and Resource Reclamation Centre, Nanyang Environment & Water Research Institute, Singapore.
Dr. Sachini Senadheera	Korea Biochar Research Center & Division of Environmental Science and Ecological Engineering, Korea University, South Korea.
Dr. F.S.B. Kafi	Department of Physics and Electronics, University of Kelaniya, Sri Lanka.

Dr. Charith Rathnayaka	School of Science, Technology and Engineering, University of the Sunshine Coast, Australia.
Dr. Samavath Mallawarachchi	Department of Biological and Agricultural Engineering, Texas A&M University, United States.
Mr. Ishara Wijesinghe	School of Mechanical, Medical and Process Engineering, Faculty of Engineering, Queensland University of Technology, Australia.
Mrs. Udya Devaraja	Department of Biosystem Engineering, SLTC Research University, Sri Lanka.

CONFERENCE AGENDA

08:00 - 08:45	Arrival of Guests and Registration
08:45 - 08:50	Lighting of the Oil Lamp
08:50 - 08:55	National Anthem
08:55 - 09:00	Welcome Speech by the Chair of ChemEICon 2025
09:00- 09:05	Speech by Vice-Chancellor, University of Moratuwa
09:05 - 09:10	Speech by Dean, Faculty of Engineering
09:10 - 09:15	Speech by Dean, Faculty of Graduate Studies
09:15 - 09:20	Speech by Head of the Department
09:20 - 09:40	Keynote Speech by Prof. Sachin Mandavgane
09:40 - 10:00	Keynote Speech by Dr. Patrick Leaney
10:00 - 10:30	Refreshments
10:30 - 12:00	Session 1
12:00 - 13:00	Lunch
13:00 - 14:30	Session 2
14:30 - 15:45	Session 3
15:45 - 16:00	Refreshments
16:00 - 16.25	Awards Ceremony
16:25 - 16:30	Vote of Thanks

CONFERENCE AGENDA

Session 1 - Sustainable Biomaterials & Bioprocessing Technologies

10.30 - 10.35	Introduction to the track and panel
10.35 - 10.50	Comparative Study of One-Step and Two-Step Slow Pyrolysis of Bamboo in Inert and Oxidative Media
10.50 - 11.05	Development of a Polar Bear-Inspired Starch Bio-composite Reinforced with Graphene Oxide-Coated Coconut Coir
11.05 - 11.20	Optimizing Wine Production: A Comparative Study of Yeast Fermentation in Seasonal Fruit Juices
11.20 - 11.35	Comparative Chemical Characterization of Cellulose Extracted from Pineapple Leaves, Corn Cobs, and Bamboo

Session 2 - Environmental Systems, Emissions & Energy Transition

13:00 - 13:05	Introduction to the track and panel
13:05 - 13:20	Comparative Evaluation of Sedimentation and Pulsator Clarifier Systems Using Aluminium Sulphate Coagulant in Water Treatment
13:20 - 13:35	Environmental Impact of Liquified Natural Gas Fire Accident Emissions
13:35 - 13:50	Transitioning Sri Lanka's Transport Sector from Petroleum to Renewable Energy
13:50 - 14:05	Green Hydrogen Economy in Sri Lanka: Opportunities and Challenges
14:05 - 14:20	Biochar-Assisted Purification of Wood Vinegar Derived from Coconut Shell Pyrolysis

Session 3 - Process Modelling, AI & Circular Systems

14:30 - 14:35	Introduction to the track and panel
14:35 - 14:50	CFD Analysis of the Influence of Tank Geometry on Laminar Flow Stability in Continuous Latex Dipping Processes
14:50 - 15:05	Optimizing Environmental Sustainability in Process Engineering: Leveraging Quantum Neural Networks for Energy Efficient AI
15:05 - 15:20	Socio-Behavioural Barriers and Policy Gaps in Implementing Circular Economy Models in Coastal Tourism
15:20 - 15:35	Simulation Study of Adsorption-Based VOC Removal from Industrial Painting Emissions

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PROCEEDINGS

SESSION 01

SUSTAINABLE BIOMATERIALS & BIOPROCESSING TECHNOLOGIES