Program

ASME ICEF 2023
The ICE Forward Conference
ASME Internal Combustion Engine Division

CONFERENCE
October 8-11, 2023
Pittsburgh Marriott City Center,
Pittsburgh, Pennsylvania, USA

https://event.asme.org/ICEF
Welcome to the ASME ICE Forward 2023 Conference. After an exceptional ASME ICE Forward 2022 conference at which we celebrated the 100th year anniversary of the ASME Internal Combustion Engine Division (ICED), we are excited to build on that momentum with the ASME ICE Forward 2023 conference. The ICED executive committee, along with ASME staff, have worked diligently to put together what promises to be an engaging and exciting event. The ASME ICE Forward 2023 conference will begin with our traditional welcome reception, featuring a poster session along with networking opportunities, on Sunday, October 8. Two keynote lectures are scheduled for Monday, October 9. On Monday morning (8 am), Mr. James Gamble of Wabtec will present his keynote lecture on the role of the ICE in decarbonizing freight rail while on Monday afternoon (1:10 pm), Mr. Mike Rochford of Caterpillar will talk about preparing for a decarbonized future. On Tuesday morning (8 am), Emeritus Prof. Dave Foster of University of Wisconsin-Madison will present the 2nd ASME ICE Division Distinguished Invited Lecture. The traditional Tuesday luncheon lecture will be presented by Dr. Carlo Bussi of Ferrari, who will discuss the evolution of ICE technology in Formula One Racing. A special panel session focused on the opportunities and challenges with hydrogen ICEs is scheduled for Tuesday at 3:10 pm. Also, technical presentations are scheduled throughout Monday and Tuesday. The annual Honors and Awards Banquet will be held on Monday evening. The 2023 ICE Division Undergraduate Student Research Competition winners will present their research on Monday during lunch while the 4th Annual Early Career Networking Breakfast will provide networking opportunities for early career researchers on Tuesday morning. Finally, conference attendees may also participate in technical tour(s) organized by our local host, Wabtec, on Wednesday morning (advance registration required).

The ICE Forward conference has historically been a collegial forum for participants to discuss current and future trends, and to exchange information related to the science and engineering of internal combustion engines. This event is tailored to provide opportunities for experts and early-career researchers alike from industry, academia, and governmental agencies worldwide to share the latest technological developments and to network with peers and future collaborators. The conference program is distributed into seven technical tracks with multiple concurrent sessions, spread over two days. The technical tracks cover a wide range of topics: (1) Off-Road Systems; (2) Fuels and Carbon Management; (3) Advanced Combustion; (4) Powertrains and Hybridization; (5) Emissions Control (CLEERS* at ICE Forward); (6) Modeling and Simulation; and (7) Design, Lubrication, and Thermal Management. We are excited to note that, starting from ASME ICE Forward 2023, a new technical track (Track 5) has been formed with emissions control as the primary focus. This track features technical papers and presentations from the CLEERS (Cross-Cut Lean Exhaust Emissions Reductions Simulations) research community, along with those of other emissions control researchers.

As always, we are grateful to the volunteers of the ASME ICE Forward conference who ensure the conference’s high technical standards and engaging program. This conference is made possible by the collaborative efforts of our track and session chairs and organizers, technical reviewers, authors, attendees, and sponsors. We are thankful to all the speakers for participating and sharing their expertise and knowledge with the ICE community.

We are convinced that the internal combustion engine will have a strong, continuing presence as part of the future global energy and transportation portfolio. With increasing focus on higher efficiencies, cleaner fuels, hybridization, and advanced aftertreatment technologies for both on-road and off-road engines, it is evident that the ICE is indeed moving forward.

We hope to see you as an author, speaker, sponsor, or attendee at the ASME ICE Forward 2023 conference, which will be singularly focused on moving the ICE forward!

Sundar Rajan Krishnan
Conference Chair
Professor of Mechanical Engineering, The University of Alabama

Dustin Osborne
Conference Co-Chair
Principal Engineer, Southwest Research Institute
Associates Meeting
Tuesday, October 10
5:10–6:10PM
Marquis Ballroom

Make plans to attend the associates meeting to learn more about the ASME and the ICE Division organizational structure.

Technical Committees Meeting
Wednesday, October 11
7:00–7:50AM
Marquis Ballroom

This is an opportunity to recap with your technical committee members and make plans for ICEF2024.

Let’s get social
Post that you are planning to attend the conference, that you are authoring a technical paper, exhibiting, sponsoring, or that you are having an amazing time at ICEF!

https://www.linkedin.com/groups/12154802/
AUDIOVISUAL EQUIPMENT IN SESSION ROOMS

All technical sessions are equipped with one LCD projector, one screen, and a Laptop. Please bring your presentation on a thumb drive at least 15 minutes prior to the session start time.

BADGE REQUIRED FOR ADMISSION

All conference attendees must wear the official ASME ICE Forward badge at all times in order to gain admission to special sessions, technical sessions, exhibits, meals, and other conference events. Without a badge, you will NOT be allowed to attend any conference activities.

CONFERENCE APP

ICE Forward will utilize a mobile event app in place of a printed program to enhance the conference experience for attendees, speakers, and sponsors.

You will be able to:

• Connect with Attendees
• View Speaker Profiles
• Access Session Information
• Watch On-Demand Content
• Download Final Papers
• And More!

*All features may not be available at all events.

Keep an eye on your email for more information on how to access and navigate the ASME Conference App!
INTERNET ACCESS IN THE HOTEL
Wi-Fi is included in your guest room and in the meeting space.
You can access WiFi in the conference space.
Network Name: MarriottBonvoy_Conference
Password: ICEF2023

CONFERENCE PROCEEDINGS
Each attendee will receive an email with a unique code to access digital copies of all the papers accepted for presentation at the conference. The official conference archival proceedings will be published after the conference and will not include accepted papers that were not presented at the conference. The official conference proceedings are registered with the Library of Congress and are submitted for abstracting and indexing. The proceedings are published on the ASME Digital Library. You will be provided with an individual link to the online papers via email. In the event you do not receive the email, send a request to conferencepubs@asme.org.

SPEAKER READY ROOM
The Executive Boardroom (10th FL) will serve as the Speaker Ready Room on Monday from 7:00AM to 5:00PM and Tuesday from 7:00AM to 3:00PM on a first-come, first-served basis. An LCD projector and screen will be available for authors to practice their presentations. All necessary connecting cables will be provided.

PRESENTER ATTENDANCE POLICY
According to ASME’s Presenter Attendance Policy, if a paper is not presented at the conference, the paper will not be published in the official Archival Proceedings, which are registered with the Library of Congress and are abstracted and indexed. The paper also will not be published in the ASME Digital Collection and may not be cited as a published paper.

HOW TO BECOME A MEMBER OF THE ICE DIVISION
1. www.asme.org
2. Click on “My ACCOUNT”
3. Click on “Additional Info”
4. Click on “Edit” on “Technical Division Interests”.
5. Select your division interests.
6. SAVE your selections.

Please ensure that you have granted permission to receive communications from the ICED.

1. Login to asme.org and click on Communication Preferences.
2. Click “Login to Preference Center”.
3. Under ASME Sections and Technical Division Communications, Opt-In to division communications by checking the box next to Technical Divisions.
4. Check all your Preferences to be sure you receive the information from ASME that you are interested in.
5. Click “Save Preferences”.

CONFERENCE INFORMATION
**ICE DIVISION DISTINGUISHED LECTURE**

**TUESDAY, OCTOBER 10**  
8:00AM–9:15AM  |  MARQUIS BALLROOM, 2ND FL

Where Do We Go From Here?

David E. Foster, Ph.D.  
Phil and Jean Myers Professor Emeritus of Mechanical Engineering  
University of Wisconsin-Madison

**KEYNOTE SESSIONS**

**MONDAY, OCTOBER 9**  
8:00AM–9:15AM ET  |  MARQUIS BALLROOM, 2ND FL

The Role of the ICE in Decarbonizing Freight Rail

James Gamble  
Vice President, Engine and Power Solutions Technology  
Wabtec

**MONDAY, OCTOBER 9, 2023**  
1:10 PM–2:20PM ET  |  MARQUIS BALLROOM, 2ND FL

Preparing for a Reduced-Carbon Future

Mike Rochford  
Vice President and General Manager - Systems Products & Services  
Caterpillar Inc.

**TUESDAY, OCTOBER 10**  
11:35AM–1:00PM ET  |  MARQUIS BALLROOM, 2ND FL

ICE Technology Evolution in F1 – The Pathway Toward Sustainable Power Units

Carlo Bussi, Ph.D.  
Head of PU Performance and Control Strategies  
Direzione Gestione Sportiva  
Ferrari S.p.A.
PANEL SESSION

TUESDAY, OCTOBER 10
3:10PM–5:10PM MARQUIS BALLROOM, 2ND FL

Opportunities and Challenges for Hydrogen ICE (H2ICE)

This panel discussion will focus on exploring the opportunities and challenges surrounding H2ICE technology, which has garnered substantial interest within the industry. We have assembled a distinguished group of experts from both industry and government agencies with the intent to create a dynamic and intimate setting, fostering an in-depth conversation with conference attendees. This event will delve into key technical aspects of H2ICE technology development and research.

Thomas Howell
Segment Leader of Conventional Powertrain
AVL

Arvind Thiruvengadam
Principal Engineer of Advanced Engines
PACCAR

Brent Keppy
Manager of Powertrain Solutions
Bosch North America

Li Qiao
Moderator
Professor, Associate Head for Engagement & Recognition
Purdue University

Gurpreet Singh
Program Manager, Vehicle Technologies Office
U.S. Department of Energy

Panel Organizers
Yuanjiang Pei, Aramco Americas
Sibendu Som, Argonne National Laboratory
Yu Zhang, Cummins
Kelly Senecal, Convergent Science

Lee Stark
Technical Strategy and Integration Director
Cummins
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WELCOME RECEPTION SPONSOR

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LOCAL HOST

Wabtec
CORPORATION
SUNDAY, OCTOBER 8 (DURING THE WELCOME RECEPTION)
5:00PM–6:30PM  MARQUIS BALLROOM FOYER, 2ND FL

TECHNICAL POSTER PRESENTERS

Flavio Dal Forno Chuahy  
Oak Ridge National Laboratory  
**111113 Computational Modeling of a 1:10 and 1:1 Scale Large-Bore Marine Two-Stroke Engine**

Scott Curran  
Oak Ridge National Laboratory  
**109040 Cyclic Variability of Low-Load Dual-Fuel Ammonia Combustion for Marine Applications Using a Port Fuel Injection System on a 6.7l Four-Stroke Diesel Engine**

Scott Curran  
Oak Ridge National Laboratory  
**120440 Initial Experimental Results for Lean Natural Gas Combustion in a Pre-Chamber Spark-Ignition Heavy-Duty Multi-Cylinder Engine**

Muhammad Hendy  
The University of Alabama  
**120666 Recurrence Quantification Analysis of Cyclic Combustion Variations in Dual Fuel Low Temperature Combustion**

Brian Kaul  
Oak Ridge National Laboratory  
**120428 Emissions and Efficiency Impacts of Biodiesel/Very Low Sulfur Fuel Oil Blends in the Enterprise Research Engine**

Prateek Khatri  
University at Buffalo  
**110160 Thermally Stable Pd/SSZ-13 Catalysts With Excellent Methane Oxidation Activity Under Lean Conditions**

William Partridge  
Oak Ridge National Laboratory  
**110505 What Is the Best Configuration of Sampling Capillary for Fast-SpaciMS in Catalytic Monoliths?**

Joshua Landis  
University of Massachusetts Lowell  
**120546 Analysis of Nox Production & Ammonia Generation Efficiency in Ammonia/Hydrogen Combustion Engines**

Shawn Reggeti  
University of Minnesota  
**120637 Turbulent Jet Ignition for Ammonia Engines with an Actively Fueled Pre-Chamber**

Poonam Rani  
University of Virginia  
**110167 Impact of Engine Oil Derived Species on the Performance of Cu-SSZ-13 SCR Catalysts**

Arun Ravi Varma  
Carnegie Mellon University  
**111707 CFD Model Development for Highly Dilute Stoichiometric Heavy-Duty Natural Gas Engines**

ASME ICED Technical Poster Chair  
Kalyan Srinivasan, Ph.D.  
Professor, University of Alabama
Awards

MONDAY, OCTOBER 9
6:30PM–9:00PM  MARQUIS BALLROOM A&B, 2ND FL

ASME’s Internal Combustion Engine (ICE) Division recognizes the outstanding achievements in the internal combustion engine field through its honors and awards program. Every year, ICEF hosts the Awards Dinner, this year sponsored by Aramco Americas, where we recognize these remarkable individuals.

Click here for more information on the ICE awards or to complete a nomination packet. Special thanks to the numerous volunteers that serve on ICE’s award committees. Without their expertise, time, and dedication, this would not be possible. Congratulations to all award recipients!

AWARDS BANQUET sponsored by Aramco Americas

ASME SOCIETY AWARDS

ASME INTERNAL COMBUSTION ENGINE AWARD

The Internal Combustion Engine Award (ICE) recognizes eminent achievement or distinguished contribution over a substantial period of time, which may result from research, innovation, or education in advancing the art of engineering in the field of internal combustion engines; or in directing the efforts and accomplishments of those engaged in engineering practice in the design, development, application, and operation of internal combustion engines. In 1966, by bequest, the Diesel and Gas Engine Power Division established this award.

Jeffrey D. Naber, Ph.D.
Richard & Elizabeth Henes Professor in Energy Systems
Mechanical Engineering - Engineering Mechanics Dept
Michigan Technological University

ASME FELLOWS

The ASME Committee of Past Presidents confers the Fellow grade of membership on worthy candidates to recognize their outstanding engineering achievements.

Sibendu Som, Ph.D.
Director - Advanced Propulsion and Power Department
Argonne National Laboratory

ICED AWARDS

MERITORIOUS SERVICE AWARD

The ASME Internal Combustion Engine Division created this award to honor loyal service, guidance, leadership, and worthy contributions to the progress of the ICE Division.

Charles Finney
Senior R&D Staff
Oak Ridge National Laboratory

ASME DEDICATED SERVICE AWARD

The ASME Dedicated Service Award honors unusual dedicated voluntary service to the Society marked by outstanding performance, demonstrated effective leadership, prolonged and committed service, devotion, enthusiasm, and faithfulness.

Kalyan Srinivasan, Ph.D.
Professor
The University of Alabama

Christopher R. Stoos
Lead Engineer
Locomotive Technology Center
Southwest Research Institute
Awards

MERITORIOUS SERVICE AWARD (CONT’D)

Dan E. Richardson
Global Power Cylinder Senior Technical Advisor
Cummins, Inc.

ENGINE IMPACT AWARD

The ASME Internal Combustion Engine Division created this award to honor internal combustion engine related research and development that has been put into practice towards a commercial product developed by industry. This award is specifically created to recognize researchers in industry who have made tremendous contributions to the ICE community.

Nicholas Dillon
Georgia Southern University

“Investigations of Low-Reactivity X-98 Ethanol in Reactivity Controlled Compression Ignition with High-Reactivity Jet-A for Performance and Emissions Improvement”

Ziming Zhou
University of Michigan – Shanghai Jiao Tong University Joint Institute

“Planar In-cylinder Flow Field Prediction based on Physics-inspired Automated Machine Learning Framework”

Dr. Noah Van Dam
University of Massachusetts Lowell
Undergraduate Student Research Competition Chair

BEST PAPER AWARD FROM ICEF202


Pedro Piqueras
Universitat Politècnica de València, CMT - Clean Mobility & Thermofluids

Benjamín Pla
Universitat Politècnica de València, CMT - Clean Mobility & Thermofluids

Enrique José Sanchis
Universitat Politècnica de València, CMT - Clean Mobility & Thermofluids

Elena García
Universitat Politècnica de València, CMT - Clean Mobility & Thermofluids

CONFERENCE AWARDS

ICE DIVISION UNDERGRADUATE STUDENT RESEARCH COMPETITION PRESENTATIONS AND LUNCH

MONDAY, OCTOBER 9
11:35AM–1:00PM  MARQUIS BALLROOM A&B, 2ND FL

The students will present during Monday’s Lunch.

LUNCH SPONSORED BY Engine Technology Forum

The ASME ICED undergraduate student research competition is an annual event inviting undergraduate researchers that have studied in the field of internal combustion engines, emissions systems, fuels and sprays, or carbon management. Up to two winning submissions are selected to deliver their presentations to a group of leading experts in the internal combustion engine field at the ASME ICE Forward Conference.

The two winning students will receive free conference registration for the conference along with paid travel and lodging expenses for the conference. Many of the past winners have made connections during the conference leading to recruitment for career and graduate school opportunities.
ICED Webinar Series: The Future of the Internal Combustion Engine

BEST PRESENTATION


Katherine J. Asztalos
Argonne National Laboratory

BEST STUDENT PRESENTATION


Myles Hicks
Engineer
Donaldson Emissions

ICED WEBINAR SERIES: THE FUTURE OF THE INTERNAL COMBUSTION ENGINE

DECEMBER 13, 2023
8:30–9:30AM EASTERN TIME

Complimentary Registration

Fundamental Hydrogen-Air Mixing, Combustion and Particulate Formation Processes in H2ICE

Hydrogen is regarded as a carbon-neutral fuel or energy carrier owing to no carbon-dioxides formation through combustion and its high energy density. The combustion behavior of hydrogen is different from conventional hydrocarbon fuels due to high diffusivity and burning velocity, low ignition energy, low flame quenching distance and wider flammable range, leading to excellent lean stratified combustion. Hydrogen combustion was analyzed in KAIST from a high-pressure hydrogen jet, mixing with air and combustion behavior in a constant-volume combustion chamber and a reciprocating engine. Schlieren images were taken at different ambient pressures to determine the behavior of the hydrogen jet, especially the stratified charge formation at different pressure. Direct combustion image and pressure measurement were used to analyze the combustion characteristics. An outwardly-opening injector injected the hydrogen-producing hollow-cone-shaped jet at 100 bars at all conditions. The jet collapse was caused by a pressure difference between the inside and outside of the hollow-cone-shaped jet. Energy conversion efficiency was maximized when the spark discharge occurred right after the end of the injection in a single-cylinder hydrogen engine experiment. The amount of NOx emission increased as the ignition timing was advanced since the in-cylinder pressure and temperature were changed. When the engine operated at homogenous combustion mode, it emitted high NOx emissions because of higher in-cylinder pressures and temperatures. However, even though the pressure and temperature were lower at lean stratified charge mode, more NOx was produced than in lean homogenous combustion mode because of the locally rich area near the spark plug. The optimization of lean stratified charge combustion was carried out to mitigate the gaseous pollutant formation.
In the Technion, recent experimental studies found elevated particle formation in a non-premixed hydrogen and hydrogen-rich reformate combustion compared to hydrocarbon fuels in a wide range of direct-injection spark-ignition engine operation regimes. This discovery contradicted all previously published data on particle formation in hydrogen combustion. In this presentation, we conceptualize the particle formation mechanism in non-premixed hydrogen combustion in internal combustion engines (ICE). This enabled us to match the previously published and newly gained data. The interconnected series of fundamental and engine-based experiments were accomplished, which allowed understanding and describing the physics behind the observed peculiarities in particle formation. The results show that enhanced particle formation in non-premixed hydrogen combustion in ICE results from a combined influence of the hydrogen’s low flame quenching distance that intensifies lubricant evaporation and the interaction between the lubricant vapor formed near the cylinder surface and the gaseous jet.

SPEAKERS

Leonid Tartakovsky, Ph.D.
Technion – Israel Institute of Technology

Assoc. Professor Leonid Tartakovsky is a Director of the Technion Internal Combustion Engines Laboratory at the Faculty of Mechanical Engineering and a member of the Nancy & Stephen Grand Technion Energy Program. Prof. Tartakovsky holds a Ph.D. degree in Mechanical Engineering from the Central Automobile and Automotive Engines Research Institute – NAMI in Moscow. His research interests are focused on carbon-neutral propulsion technologies, thermochemical recuperation of waste heat, hydrogen and reformates combustion and emissions control. L. Tartakovsky serves as an Associate Editor of the SAE International Journal of Engines and Frontiers in Aerospace Engineering – Energetics and Propulsion. He is the Editorial Board member of several journals. Prof. Tartakovsky is a recipient of the SAE Forest R. McFarland Award, was elected SAE Fellow in 2016, and SAE Top Contributor in 2019. He is a Founding Chairman of three international conferences, served on the Organizing Committee of multiple conferences and has above 110 publications in journals, book chapters, and conference proceedings.

Choongsik Bae, Ph.D.
Korea Advanced Institute of Science and Technology (KAIST)

Prof. Choongsik Bae serves as a professor at the Korea Advanced Institute of Science and Technology (KAIST) and leads the Future Transport Power Lab, since 1998. He is also leading the CERC (Combustion Engineering Research Center) as a director. Throughout his academic career, he had the privilege of supervising 34 Ph.D. students and 50 M.S. students. He obtained his B.S. and M.S. in Aerospace Engineering from Seoul National University, Republic of Korea, and Ph.D. in Mechanical Engineering from Imperial College London, United Kingdom, in 1998. He is active in the interaction with the industry that he has worked as a Technical Advisor of Hyundai Motors on the occasion of his sabbatical leave from 2011 to 2012. He has been the Dean of the College of Engineering at KAIST during 2019–2020, working for innovation in engineering education. Throughout his research career, he made distinguishing research and technological achievements, including 152 international research papers. Several outstanding awards, such as the SAE Arch T. Colwell Merit award in 1997, SAE Harry Horning Award in 2006, the SAE Fellow obtainment in 2012, and Presidential Commendation in 2022, distinguish what he achieved. Prof. Bae is currently working on the research for transport carbon-neutral transport power, including hydrogen jet formation, hydrogen combustion engine, and e-fuel engine combustion, mobile carbon capture, etc. He also continues research in conventional gasoline engines with the variety of diagnostics, such as PIV, LIF, LIBs, and optical imaging of in-cylinder flow, mixing, and combustion process.

MODERATOR

Avinash Kumar Agarwal, Ph.D.
Indian Institute of Technology Kanpur

Avinash Kumar Agarwal is a Professor of I C Engines at IIT Kanpur. He is interested in combustion, conventional and alternative fuels, Methanol/ DME/Hydrogen/HCNG fueled engine development, optical diagnostics, and laser ignition. Prof. Agarwal has published over 510 peer-reviewed international journal and conference papers, 63 edited books, and 129 book chapters, attracting 15200+ Scopus and 23000+ Google Scholar citations. He edited Handbook of Combustion and 60+ Springer books on energy, environment, and sustainability. For his outstanding contributions, Prof. Agarwal is conferred upon Sir J C Bose National Fellowship (2019) by SERB, SAE India Foundation GURU Award (2022), Clarivate Analytics India Citation Award-2017 in Engineering and Technology, Prestigious Shanti Swarup Bhatnagar Prize (2016) in Engineering Sciences, and many other awards in addition to inaugural version of Distinguished Alumni Award-2021 by MNIT Jaipur and Distinguished Alumni Award-2022 by IIT Delhi. He is an elected Fellow of the SAE (2012), ASME (2013), INAE (2019), ISEE (2016), RSC (2018), NASI (2018), WSSET (2020), AAAS (2020), and CI (2022). At IIT Kanpur, Prof. Agarwal has established a state-of-the-art Engine Research Laboratory, and he was also the founder-director of IIT Kanpur’s Science and Technology Research Park.
The ASME Internal Combustion Engine (ICE) Division Executive Committee has been holding a complimentary webinar series titled, The Future of the Internal Combustion Engine. The goal of this series is to communicate the role of the ICE in our decarbonized society.

A dedicated webinar committee ensures that both the latest academic research topics and industry developments are covered.

- Light Duty
- Heavy Duty
- Combustion
- Hybridization
- Alternative Fuels
- Computer Simulations
- AI, and much more!

Past webinars are available to be seen on-demand!
The ASME Internal Combustion Engine (ICE) Division Executive Committee has been holding a complimentary webinar series titled “The Future of the Internal Combustion Engine”. The goal of this series is to communicate the role of the ICE in our decarbonized society.

**Topics include**

- Light Duty
- Heavy Duty
- Combustion
- Hybridization
- Alternative Fuels
- Computer Simulations
- AI, and much more!

**Watch the on-demand webinars!**
Welcome Reception & Technical Poster Session

Welcome Reception Sponsored by Caterpillar

Sunday, October 8
5:00PM–6:30PM
Marquis Ballroom Foyer, 2nd FL

All conference registrants are invited to join their colleagues for complimentary light refreshments during this Sunday evening event. Greet friends and meet thinkers from around the world who are shaping the future of ICE, all in a casual atmosphere. Be sure to visit the technical posters during this time!

Breakfast

Monday, October 9
Madison Ballroom A&B, 2nd FL
7:00AM–8:00AM

Tuesday, October 10
Student & Early Career Networking Breakfast
Madison Ballroom A&B, 2nd FL
7:00AM–8:00AM

Wednesday, October 11
Breakfast and ICE Technical Committees Meeting
Madison Ballroom A&B, 2nd FL
7:00AM–8:00AM

Networking Breaks

Grand Ballroom Foyer
2nd FL

Monday, October 9
9:15AM–9:30AM
1:00PM–1:10PM
2:20PM–2:30PM
4:10PM–4:30PM

Tuesday, October 10
9:15AM–9:30AM
1:00PM–1:10PM
2:50PM–3:10PM

Lunch with Undergraduate Competition Winners and Tuesday Keynote

Monday Lunch Sponsored by Engine Technology Forum

Monday, October 9
Marquis Ballroom A&B, 2nd FL
11:35AM–1:00PM

Lunch & Keynote
Tuesday, October 10
Marquis Ballroom A&B, 2nd FL
11:35AM–1:00PM

Awards Banquet Sponsored by Aramco Americas

Monday, October 9
6:30PM–9:00PM
Marquis Ballroom A&B, 2nd FL
UNLOCK THE POTENTIAL OF H2ICE WITH CONVERGE CFD SOFTWARE

Overcome design challenges and capture key H2ICE phenomena with fully autonomous meshing and fast detailed chemistry:

• High-speed gas jets
• Fuel-air mixing
• Shock waves
• Fast-moving flame fronts
• Combustion of H2 & H2 blends
• Emissions

Learn more about CONVERGE’s powerful tools for modeling H2 combustion at convergecfd.com/applications/hydrogen!
WABTEC GROVE CITY ENGINE PLANT TOURS
Advance Registration Required

Wednesday, October 11
8:00AM–12:00PM

Located halfway between Erie and Pittsburgh, Grove City is home to both of Wabtec’s diesel engine manufacturing plants and approximately 1000 employees. The variety of engines spans from non-emissions mechanical-fuel-injection FDL (228) to the latest T4 GEVO (250), and from an inline-6 to a V-16. Markets include locomotive, marine, and stationary power.

The highlights of each facility are listed below. Attendees may choose ONE facility to tour.

Grove City Main – GRV

The 440,000 sq. ft. GRV plant produces up to 1,500 new engines each year, with both component machining and final assembly all on site. The facility also houses six test cells for final testing, along with the latest emissions testing capability. This tour will cover component machining, engine assembly, and engine test.

Grove City Remanufacturing – GRR

The 240,000 sq. ft. GRR plant overhauls locomotive engines and is also the site of individual component return & repair operations. The facility is responsible for producing over 1,200 remanufactured engines each year. This tour will cover the entire engine and component remanufacturing process, from incoming inspections to rebuild and full assembly.

Visitor Restrictions

- Age: Under 16 not allowed
- No canes or crutches allowed. Wheelchairs can be accommodated.
- Attire: full-length pants, and non-slip closed-toed shoes required
- PPE: Safety glasses, ear plugs, and vests will be provided.
- No cameras or taking of pictures inside the facilities
- Must stay within the walkway and with tour guides
Student and Early Career Networking Breakfast

TUESDAY OCTOBER 10
7:00AM–8:00AM MARQUIS BALLROOM A&B, 2ND FL

This one-hour in-person event is free to conference registrants and is a fantastic opportunity for students, postdocs, and early career engineers in the field of internal combustion engines to connect and engage with successful leaders in the field in an informal, unmoderated, small group discussion setting.

Meet with the following key leaders of the field in an informal unmoderated group discussion setting:

• Matthew Hart, Wabtec Corp.
• Christopher Stoos, Southwest Research Institute
• Yuanjiang Pei, Aramco Americas
• David Rutledge, Cummins Inc.
• Josh Pihl, Oak Ridge National Laboratory
• Muhsin Ameen, Argonne National Laboratory
• Cosmin Dumitrescu, West Virginia University
• Hunter Mack, University of Massachusetts Lowell
• Hailin Li, West Virginia University
• Vittorio Ravaglioli, University of Bologna

Target Participants:

• Engineering Students
• Postdocs
• Engineers within first three years of professional work

What to expect:

• Key leaders from industry, academia, and national labs will be positioned at multiple tables in a round-table discussion style atmosphere.
• Attendees are invited to meet with these senior colleagues over breakfast and enjoy conversation in a small group setting.
• Conversations are intended to be informal with open-ended discussions.

This is your opportunity to:

• Connect and engage with well-established professionals and ICE research leaders from industry, academia, and national labs.
• Gain valuable professional connections, insight, and career advice from successful senior colleagues.
• Connect with other early-career colleagues, students, and peers attending the event.
• Help boost your professional network!

ASME ICED Student and Early Career Networking Breakfast Chair
Dustin Osborne
Southwest Research Institute
TRACK 1: OFF-ROAD SYSTEMS
Chair: Matthew Hart, Wabtec Corp.
Co-Chair: Munidhar Biruduganti, Argonne National Laboratory
Co-Chair: Christopher Stoos, Southwest Research Institute

TRACK 2: FUELS AND CARBON MANAGEMENT
Chair: Hailin Li, West Virginia University
Co-Chair: Hunter Mack, University of Massachusetts Lowell

TRACK 3: ADVANCED COMBUSTION
Chair: Cosmin Dumitrescu, West Virginia University
Co-Chair: Gokul Vishwanathan, Propane Education & Research Council

TRACK 4: POWERTRAINS AND HYBRIDIZATION
Chair: Fabrizio Ponti, University of Bologna
Co-Chair: Richard Burke, University of Bath
Co-Chair: Shahrokh Etemad, Fairfield University

TRACK 5: EMISSIONS CONTROL (CLEERS* AT ICE FORWARD)
Chair: Vitaly Prikhodko, ORNL
Co-Chair: Josh Pihl, ORNL

TRACK 6: MODELING AND SIMULATION
Chair: Yuanjiang Pei, Aramco Americas
Co-Chair: Muhsin Ameen, Argonne National Laboratory

TRACK 7: DESIGN, LUBRICATION, AND THERMAL MANAGEMENT
Chair: Dan Richardson, Cummins Inc.
Co-Chair: David Rutledge, Cummins Inc.
Innovations in advanced internal combustion engines, fuels, and technology lead us toward a sustainable future. Faster.

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engine tech forum.org
SUNDAY, OCTOBER 8, 2023

TECHNICAL POSTERS
10/8/2023  5:00PM–6:30PM

**Technical Conference Schedule**

*Subject to change. Please refer to the ASME Events App for updated information.*

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**Technical Conference Schedule**

Emissions and Efficiency Impacts of Biodiesel/Very Low Sulfur Fuel Oil Blends in the Enterprise Research Engine

*Poster Presentation: ICEF2023-120428*


Thermally Stable Pd/SSZ-13 Catalysts With Excellent Methane Oxidation Activity Under Lean Conditions

*Poster Presentation: ICEF2023-110160*

Prateek Khatri - University at Buffalo, Talia Mon - University at Buffalo, Joshua Pacheco - Zeolyst International, Bjorn Moden - Zeolyst International, Eleni A. Kyriakidou - University at Buffalo

What Is the Best Configuration of Sampling Capillary for Fast-SpaciMS in Catalytic Monoliths?

*Poster Presentation: ICEF2023-110505*

Tomas Hlavaty - University of Chemistry and Technology, Prague, Martin Isoz - University of Chemistry and Technology, Prague, Petr Koci - University of Chemistry and Technology, Prague, Dhruba Deka - Oak Ridge National Laboratory, William Partridge - Oak Ridge National Laboratory

Poster on Analysis of NOx Production and Ammonia Generation Efficiency in Ammonia/Hydrogen Combustion Engines

*Poster Presentation: ICEF2023-120546*

Joshua Landis - University of Massachusetts Lowell, Visal Veng - University of Massachusetts Lowell, Behiol Nawaz - University of Massachusetts Lowell, Mdayer Nasim - University of Massachusetts Lowell, Shubhramanti Das - University of Massachusetts Lowell, J. Hunter Mack - University of Massachusetts Lowell, Juan Trelles - University of Massachusetts Lowell

Turbulent Jet Ignition for Ammonia Engines With an Actively Fueled Pre-Chamber

*Poster Presentation: ICEF2023-120637*

Shawn Reggeti - University of Minnesota, William Northrop - University of Minnesota

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Computational Modeling of a 1:10 and 1:1 Scale Large-Bore Marine Two-Stroke Engine

*Poster Presentation: ICEF2023-111113*

Flavio Chuahy - Oak Ridge National Laboratories, Brian Kaul - Oak Ridge National Laboratory, Michael Kass - Oak Ridge National Laboratory, Charles Finney - Oak Ridge National Laboratory

Cyclic Variability of Low-Load Dual-Fuel Ammonia Combustion for Marine Applications Using a Port Fuel Injection System on a 6.7l Four-Stroke Diesel Engine

*Poster Presentation: ICEF2023-109040*

Scott Curran - Oak Ridge National Laboratory, Brian Kaul - Oak Ridge National Laboratory

CFD Model Development for Highly Dilute Stoichiometric Heavy-Duty Natural Gas Engines

*Poster Presentation: ICEF2023-111707*


Initial Experimental Results for Lean Natural Gas Combustion in a Pre-Chamber Spark-Ignition Heavy-Duty Multi-Cylinder Engine

*Poster Presentation: ICEF2023-120440*

Scott Curran - Oak Ridge National Laboratory, Mike Bunce - MAHLE Powertrain

Recurrence Quantification Analysis of Cyclic Combustion Variations in Dual Fuel Low Temperature Combustion

*Poster Presentation: ICEF2023-120666*

Muhammad Hendy - The University of Alabama, Abhinandhan Narayanan - The University of Alabama, Kalyan Kumar Srinivasan - The University of Alabama, Sundar Rajan Krishnan - The University of Alabama

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MONDAY, OCTOBER 9, 2023

02-01: HYDROGEN AND AMMONIA

09/10/2023  9:30AM–11:35AM
SALON 2 GRAND BALLROOM

Impact of Engine Oil Derived Species on the Performance of Cu-SSZ-13 SCR Catalysts

Poster Presentation: ICEF2023-110167
Poonam Rani - University of Virginia, Huifang Shao - Afton Chemical Corporation, William S. Epling - University of Virginia

Combustion Performance and Emissions Characterization of Methane-Hydrogen Blends (up to 50% by Vol.) in a Spark-Ignited CFR Engine

Technical Paper Publication: ICEF2023-110538
Jason Loprete - Stony Brook University, Rodrigo Ristow Hadlich - Stony Brook University, Amanda Sirna - Stony Brook University, Amr Shaalan - Stony Brook University, Dimitris Assanis - Stony Brook University

Investigation of the Laminar Burning Velocity and Exhaust Characteristics of Methane-Ammonia-Hydrogen Ternary Blends

Technical Paper Publication: ICEF2023-109918
Md Nayer Nasim - University of Massachusetts Lowell, Behlil Nawaz - University of Massachusetts Lowell, Shubhra Kanti Das - University of Massachusetts Lowell, Joshua Landis - University of Massachusetts Lowell, Amr Shaalan - Stony Brook University, Noah Van Dam - University of Massachusetts Lowell, Juan Pablo Trelles - University of Massachusetts Lowell, Dimitris Assanis - Stony Brook University, J. Hunter Mack - University of Massachusetts Lowell

The Application of Argon-Oxygen Atmosphere to Investigate the Formation and Evolution of Fuel Nitrogen Oxides During the Oxidation of Hydrogen-Ammonia Fuel Mixtures Under Representative Engine In-Cylinder Conditions

Technical Paper Publication: ICEF2023-110096
Yuchao Yan - Zhejiang University, Ruomiao Yang - Zhejiang University, Juan Ou - Zhejiang University, Zhentao Liu - Zhejiang University, Jinlong Liu - Zhejiang University

Investigation of the Effect of Ammonia Addition on the Two-Stage Ignition Process of Dimethyl Ether Based on Chemical Kinetic Analysis

Technical Paper Publication: ICEF2023-110108
Juan Ou - Zhejiang University, Ruomiao Yang - Zhejiang University, Yuchao Yan - Zhejiang University, Zhentao Liu - Zhejiang University, Jinlong Liu - Zhejiang University

03-01: FUNDAMENTAL SPRAYS/IGNITION/COMBUSTION

10/9/2023  9:30AM–11:35AM
SALON 3 GRAND BALLROOM

Spark Plasma Stretching and Flame Propagation via High Frequency Pulsed Current Management

Technical Paper Publication: ICEF2023-109853
Linyan Wang - University of Windsor, Xiao Yu - University of Windsor, Ming Zheng - University of Windsor

Data-Driven Detection and Prediction of Spray Collapse Characteristics for Multi-Component Fuel Mixtures

Technical Paper Publication: ICEF2023-110017
Fengnian Zhao - Shanghai Jiao Tong University, Ziming Zhou - Shanghai Jiao Tong University, Wensong Liu - Shanghai Jiao Tong University, David Hung - Shanghai Jiao Tong University
Technical Conference Schedule

**Cellular Instabilities in Spherically Expanding Hydrogen-Oxygen-Carbon Dioxide Flames**

Technical Paper Publication: ICEF2023-110157

Behlol Nawaz - University of Massachusetts Lowell, Md Nayer Nasim - University of Massachusetts Lowell, Shubhra Kanti Das - University of Massachusetts Lowell, J. Hunter Mack - University of Massachusetts Lowell

**Experimental Study and Analysis of Ultra-Low Temperature Fuel Spray With a Heavy-Duty Injector Under Vaporizing Conditions**

Technical Paper Publication: ICEF2023-110171

Zhihao Zhao - Michigan Technological University, Anqi Zhang - Aramco Americas, Henry Schmidt - Michigan Technological University, William Atkinson - Michigan Technological University, Jeffrey Naber - Michigan Technological University

**Visualization of Methane/Air Pre-Chamber Combustion Using an Optical Pre-Chamber Enclosed in an Optical Rapid Compression Machine**

Technical Presentation Only: ICEF2023-109931

Akash Dhotre - University of Minnesota, Twin Cities, Sayan Biswas - University of Minnesota, Twin Cities

**Potential of H2-Assisted Light-Off of Oxidation Catalyst in H2-Diesel Dual-Fuel Engines**

Technical Paper Publication: ICEF2023-110095

Pedro Piqueras - Universitat Politècnica de València, Joaquin De La Morena - Universitat Politècnica de València, Enrique José Sanchis - Universitat Politècnica de València, Carla Conde - Universitat Politècnica de València, José Martin Herreros - University of Birmingham, Athanasios Tsolakis - University of Birmingham

**Pt- and Pd-Based Catalysts for NOx Reduction From H2 Combustion Engines**

Technical Presentation Only: ICEF2023-109410

Jieling Shao - Chalmers University of Technology, Phuoc Hoang Ho - Chalmers University of Technology, Louise Olsson - Chalmers University of Technology, Derek Creaser - Chalmers University of Technology

**Reactivity of Potential Net-Zero Carbon Fuels on Emissions Control Catalysts**

Technical Presentation Only: ICEF2023-109532

Sreshtha Sinha Majumdar - Oak Ridge National Laboratory, Josh Pihl - Oak Ridge National Laboratory

**NOx SCR for Alternative Fuel Engines: Activity Loss and HCN Formation in the Presence of HCHO**

Technical Presentation Only: ICEF2023-110027

Simon Barth - Karlsruhe Institute of Technology, Maria Casapu - Karlsruhe Institute of Technology, Jan-Dierk Grunwaldt - Karlsruhe Institute of Technology

**Emissions Control Catalyst Tolerance to Renewable Fuel-Based Phosphorous**

Technical Presentation Only: ICEF2023-110497

Todd Toops - Oak Ridge National Laboratory, Dhruba Deka - Oak Ridge National Laboratory, Jonathan Willocks - Oak Ridge National Laboratory

**A Phenomenological Thermal Spray Wall Interaction Modeling Framework Applied to a High Temperature Ignition Assistant Device**

Technical Paper Publication: ICEF2023-109989

Surya Kaundinya Oruganti - Argonne National Laboratory, Roberto Torelli - Argonne National Laboratory, Kenneth S. Kim - U.S. Army DEVCOM Army Research Laboratory, Eric Mayhew - U.S. Army DEVCOM Army Research Laboratory, Chol-Bum "Mike" Kweon - U.S. Army DEVCOM Army Research Laboratory
Quantitative Validation of a Computational Fluid Dynamics Methodology for Gasoline Sprays Under Cold Start Conditions

Technical Paper Publication: ICEF2023-110054
Dimitris Assanis - Stony Brook University, Joonsik Hwang - Mississippi State University, Gaurav Guleria - Stony Brook University, Dario Lopez-Pintor - Sandia National Laboratories, Scott Wagnon - Lawrence Livermore National Laboratory, Russel Whitesides - Lawrence Livermore National Laboratory

Numerical Evaluation of Wall-Guided Spark Assistance for Cold Operations in a Heavy-Duty Gasoline Compression Ignition Engine

Technical Presentation Only: ICEF2023-109828
Le Zhao - Aramco Americas, Yu Zhang - Aramco Americas, Yuanjiang Pei - Aramco Americas, Anqi Zhang - Aramco Americas

A Hybrid VOF-Lagrangian-Eulerian Treatment for Spray Formation

Technical Presentation Only: ICEF2023-110187
Mario Trujillo - University of Wisconsin--Madison, Chia-Wei Kuo - University of Wisconsin-Madison

Numerical Evaluation of Spray Models in a DISI Engine Under Cold-Start Conditions

Technical Presentation Only: ICEF2023-119484
Diego Bestel - Argonne National Laboratory, Le Zhao - Aramco Americas, Anqi Zhang - Aramco Americas, Ji-Woong Park - Aramco Americas, Roberto Torelli - Argonne National Laboratory, Joohan Kim - Argonne National Laboratory, Muhsin Ameen - Argonne National Laboratory

Effect of Engine Speed and Biogas Composition on Performance of a Small Biogas-Diesel Dual-Fuel Generator

Technical Paper Publication: ICEF2023-109342

Effect of Gas Composition on the Oxidation of Gas Component Emissions of a Dual-Fuel Diesel-Natural Gas Engine at Low Load Conditions

Technical Paper Publication: ICEF2023-109624
Christopher Ulishney - West Virginia University, Cosmin Dumitrescu - West Virginia University

Alternative Spark Plug Electrode Materials for Economical, Reliable Engine Operation

Technical Paper Publication: ICEF2023-109959

Large-Bore Locomotive Engines: Numerical Simulations of Natural Gas/Diesel Dual-Fuel Operation

Technical Paper Publication: ICEF2023-110164

Biofuels and E-Fuels Used in a Multi-Fuel-Engine as Solution for Rapid Reduction of Greenhouse Gas Impacts of NRMM Engines

Technical Paper Publication: ICEF2023-109334
Matthias Thees - RPTU University at Kaiserslautern, Michael Guenthner - RPTU University at Kaiserslautern, Jonas Fuhrmeister - RPTU University at Kaiserslautern

01-01: DUAL FUEL AND ADVANCED IGNITION SYSTEMS
10/9/2023  9:30AM–11:35AM  CITY CENTER B

Chair: Munidhar Biruduganti - Argonne National Laboratory
Co-Chair: Matthew Hart - Wabtec Corporation
Understanding Diesel-Pilot Assisted Methane Combustion in a Compression Ignition Engine

Technical Paper Publication: ICEF2023-109875

Amanda Sirna - Stony Brook University, Amir Hassan - Stony Brook University, Rodrigo Ristow Hadlich - Stony Brook University, Jason Loprete - Stony Brook University, Juan Pablo Trelles - University of Massachusetts, Noah Van Dam - University of Massachusetts, Hunter Mack - University of Massachusetts, Dimitris Assanis - Stony Brook University

Propyl Oxymethylene Ether-Ignited Natural Gas Dual Fuel Low Temperature Combustion: A Low Carbon Pathway for High Efficiencies and Low Emissions

Technical Paper Publication: ICEF2023-110454

Abhinandan Narayanan - The University of Alabama, Stephen Mundy - The University of Alabama, Hariraja Thothadri - The University of Alabama, Justin Gray - The University of Alabama, Yamini Baskara Babu - The University of Alabama, Stephen Lucas - Colorado State University, Bret Windom - Colorado State University, Kalyan Kumar Srinivasan - The University of Alabama, Sundar Rajan Krishnan - University of Alabama

Effect of Hydrogen Enrichment on Combustion and Emissions of a Heavy Duty Natural Gas-Diesel Dual Fuel Engine at Low and Medium Load Conditions

Technical Paper Publication: ICEF2023-109966


Characterization of Flex-Fuel Prechamber Enabled Mixing-Controlled Combustion (PC-MCC) With Gasoline/Ethanol Blends at High Load

Technical Paper Publication: ICEF2023-110006

Jared Zeman - Marquette University, Adam Dempsey - Marquette University

Effects of Hydrogen on Combustion in Ammonia–Diesel Dual Fuel Engine and Demonstration of Autothermal Catalyst to Reform Ammonia Into Hydrogen

Technical Paper Publication: ICEF2023-109103


Empirical Investigation of Reactivity-Controlled Compression Ignition Engine Fuelled by Ethanol and DME at Low Engine Load

Technical Paper Publication: ICEF2023-110365

Simon Leblanc - University of Windsor, Linyin Wang - University of Windsor, Long Jin - University of Windsor, Navjot Sandhu - University of Windsor, Xiao Yu - University of Windsor, Ming Zheng - University of Windsor

Ammonia Adsorption in an SCR Catalyst: Improved Mass Transfer Modeling Using a Data-Driven Framework

Technical Presentation Only: ICEF2023-110028

Andres Suarez-Corredor - Scania CV AB, Chalmers University of Technology, Matthäus U. Bäßler - KTH Royal Institute of Technology, Louise Olsson - Chalmers University of Technology, Magnus Skoglundh - Chalmers University of Technology, Björn Westerberg - Scania CV AB

Exhaust Aftertreatment Modeling: Mastering the Challenge of the Virtual Test Bed

Technical Presentation Only: ICEF2023-119327

Thomas Glatz - AVL Mobility Technologies Inc., Johann C. Wurzenberger - AVL, Susanne Kutschi - AVL
Dealing With Emissions at Extreme Temperatures: Simulation-Driven Solutions for the Case of a Plug-in-Hybrid

Technical Presentation Only: ICEF2023-119427

Menelaos Zafeiridis - Exothermia SA, Panagiota Alexiadou - Exothermia SA, Grigoris Koltsakis - Aristotle University of Thessaloniki

Integrated Simulation Methodology for Enabling Near-Zero Emissions in Vehicles

Technical Presentation Only: ICEF2023-119578

Andrea Strzelec - University of Wisconsin-Madison, Santhosh Gundlapally - Gamma Technologies, Syed Wahiduzzaman - Gamma Technologies, Josh Pihl - Oak Ridge National Laboratory, Bruce Vernham - Isuzu Technical Center of North America, Erik Koehler - FEV North America, Mario Trujillo - University of Wisconsin-Madison

Combining Gasoline Compression Ignition and Powertrain Hybridization for Long Haul Applications

Technical Presentation Only: ICEF2023-110182


04-01: POWERTRAIN CONTROLS AND DIAGNOSTICS
10/9/2023 2:30PM–4:10PM CITY CENTER A

Chair: Vittorio Ravaglioli - University of Bologna
Co-Chair: Joaquin De La Morena - Universitat Politécnica de Valencia

Experimental Demonstration of a High-Power Density Electric Generator

Technical Paper Publication: ICEF2023-110134

Matthew Gore - North Carolina State University, Kaushik Nonavinakere Vinod - North Carolina State University, Tiegang Fang - North Carolina State University

48 V High Power Hybrid Architecture for MHD Off-Road Applications

Technical Paper Publication: ICEF2023-110727

Ziming Yan - MAHLE Powertrain, Nathan Peters - MAHLE Powertrain, Rupert De Salis - MAHLE Powertrain, Mike Bunce - MAHLE Powertrain

Experimental Characterization and Modelling of the Electrical and Hydraulic Effects on Injected Mass Variation in a High-Pressure Gdi Injection System Performing Consecutive Injections

Technical Presentation Only: ICEF2023-110151

Giacomo Silvagni - University of Bologna, Vittorio Ravaglioli - University of Bologna, Davide Viscione - University of Bologna, Fabrizio Ponti - University of Bologna, Enrico Corti - University of Bologna, Federico Stola - Marelli Europe S.p.a, Gian Marco Bianchi - University of Bologna

07-01: ENGINE COMPONENT DESIGN
10/9/2023 2:30PM–4:10PM CITY CENTER B

Chair: Dan Richardson - Cummins Inc.
Co-Chair: David Rutledge - Cummins Inc.

Simulation Based Thermal Fatigue Validation Test Development for Exhaust Manifold

Technical Paper Publication: ICEF2023-109157

Ambikapathy Naganathan - Cummins Inc., Billy Holland - Cummins Inc., Caner Demirdogen - Cummins Inc.

Laser-Structured Thin Film Sensor Technology for Sliding Bearings in Internal Combustion Engines

Technical Paper Publication: ICEF2023-109661

Constantin Kiesling - LEC GmbH, Matheus Marques Da Silva - Graz University of Technology, Martin Kober - LEC GmbH, Andreas Wimmer - Graz University of Technology, Jan Friedrich Düssing - Laser Zentrum Hannover e.V., Gunther Hager - Miba Gleitlager Austria GmbH

The Use of PD Patterns to Evaluate the Wear-Resistance and Manufacturing Quality to Estimate Expected Lifetime of Ignition Coils

Technical Paper Publication: ICEF2023-109962

Johan Tidholm - SEM AB, Martin Gordon - SEM AB, Thomas Hammarström - Chalmers University of Technology

Design of a Novel Impulse Turbine for a Supercharged Single Cylinder Diesel Engine: A Simulation Approach

Technical Paper Publication: ICEF2023-110004

Ramkumar Jayaraman - Indian Institute of Technology Madras, Anand Krishnasamy - Indian Institute of Technology Madras, Ramesh A - Indian Institute of Technology Madras
**Technical Conference Schedule**

**06-02: MACHINE LEARNING**

**10/9/2023**

**4:30PM–5:45PM**

**SALON 2 GRAND BALLROOM**

Chair: Pinaki Pal - Argonne National Laboratory  
Co-Chair: Noah Van Dam - University of Massachusetts Lowell

**Multi-Fidelity Neural Network Regression for Efficient Training of Energy-Assisted Diesel Engine Control System**

Technical Paper Publication: ICEF2023-109750


**A Deep Learning Approach to Predict In-Cylinder Pressure of a Compression Ignition Engine**

Technical Paper Publication: ICEF2023-110524

Rodrigo Ristow Hadlich - Stony Brook University, Jason Loprete - Stony Brook University, Dimitris Assanis - Stony Brook University

**Deep Learning of Unsteady Flamelet Progress Variable Manifolds via Hierarchical Clustering and Grouped Multi-Target Artificial Neural Networks**

Technical Presentation Only: ICEF2023-119569

Tadbhagya Kumar - Argonne National Laboratory, Ahmed Almeldein - University of Massachusetts Lowell, Pinaki Pal - Argonne National Laboratory, Islam Kabil - University of Connecticut

**04-02: EMISSIONS CONTROL SYSTEMS**

**10/9/2023**

**4:30PM–5:45PM**

**CITY CENTER A**

Chair: Joaquin De La Morena - Universitat Politècnica de València  
Co-Chair: Vittorio Ravaglioli - University of Bologna

**Impact of Cylinder-to-Cylinder Dispersion of Exhaust Gas Recirculation on the Three-Way Catalyst Performance and Tailpipe Emissions of Spark-Ignition Engines**

Technical Paper Publication: ICEF2023-110087

Pedro Piqueras - Universitat Politècnica de València, Joaquin De La Morena - Universitat Politècnica de València, Enrique José Sanchis - Universitat Politècnica de València, Carla Conde - Universitat Politècnica de València

**Evaluation of Aftertreatment System Configurations for a 48 V Mild Hybrid Commercial Vehicle Under Real Driving Conditions**

Technical Presentation Only: ICEF2023-110513


**07-02: DESIGN FOR TURBOCHARGING AND HYDROGEN ICE**

**10/9/2023**

**4:30PM–5:45PM**

**CITY CENTER B**

Chair: David Rutledge - Cummins Inc.  
Co-Chair: Dan Richardson - Cummins Inc.

**Novel Approaches to Improve the Performance of a Single Cylinder Engine by Turbocharging, Supercharging and Turbo-Compounding: A Comparative Study**

Technical Paper Publication: ICEF2023-110442

Ramkumar Jayaraman - Indian Institute of Technology Madras, Anand Krishnasamy - Indian Institute of Technology Madras, Ramesh A - Indian Institute of Technology Madras

**Hydrogen Internal Combustion Engine Component Investigation and Development for Heavy Duty Truck Applications**

Technical Paper Publication: ICEF2023-110098

Jason Bieneman - MAHLE, Fabio Araujo - MAHLE, Nikhil Nachappa Iychodianda Kushalappa - MAHLE
Technical Conference Schedule

High-Performance Alloys for Conventional ICE and Hydrogen ICE Applications

Technical Paper Publication: ICEF2023-110018

03-03: DUAL FUEL COMBUSTION - II
10/9/2023 4:30PM–5:45PM
SALON 3 GRAND BALLROOM
Chair: Shouvik Dev - NRC Canada
Co-Chair: Adam Klingbeil - Wabtec Corporation

Optimization of the Combustion Chamber Design of a Natural Gas-Diesel Dual Fuel Engine Running at Low Load
Technical Paper Publication: ICEF2023-110482
Francesco Scrignoli - University of Modena and Reggio Emilia, Tommaso Savioli - Atris Engineering s.r.l., Carlo Alberto Rinaldini - University of Modena and Reggio Emilia

Pathways to Improve Fuel Conversion Efficiencies in Diesel – Natural Gas Dual Fuel Combustion at Low Loads
Technical Presentation Only: ICEF2023-110185
Giacomo Silvagni - University of Bologna, Abhinandhan Narayanan - The University of Alabama, Vittorio Ravaglioli - University of Bologna, Fabrizio Ponti - University of Bologna, Kalyan Srinivasan - The University of Alabama, Sundar Krishnan - The University of Alabama

Correlating Cycle-Resolved Unburned Hydrocarbon Emissions With Low Load Cyclic Variations in Diesel – Ng Dual Fuel Combustion
Technical Presentation Only: ICEF2023-110450
Abhinandhan Narayanan - The University of Alabama, Giacomo Silvagni - University of Bologna, Hariraja Thothadri - The University of Alabama, Nik Collins - The University of Alabama, Paulius Puzinauskas - The University of Alabama, Fabrizio Ravaglioli - University of Bologna, Vittorio Ravaglioli - University of Bologna, Kalyan Kumar Srinivasan - The University of Alabama, Sundar Rajan Krishnan - The University of Alabama

05-03: ADVANCED EMISSIONS CONTROL
10/9/2023 4:30PM–5:45PM
MARQUIS C
Chair: Melanie DeBusk - Oak Ridge National Laboratory
Co-Chair: Josh Pihl - Oak Ridge National Laboratory

An Update on the Demonstration of Low NOx Emissions for Nonroad Engines
Technical Presentation Only: ICEF2023-110181
Christopher Sharp - Southwest Research Institute

The Role of Cation Migration in NOx Storage in Pd/FER PNAs
Technical Presentation Only: ICEF2023-110140
Janos Szanyi - Pacific Northwest National Laboratory, Inhak Song - Pacific Northwest National Laboratory, Konstantin Khivantsev - Pacific Northwest National Laboratory, Yong Wang - Pacific Northwest National Laboratory

Thermally Stable Single Atom Catalysts for Low Temperature Oxidation
Technical Presentation Only: ICEF2023-110519
Yong Wang - Washington State University, Dong Jiang - Washington State University, Carlos Eduardo Garcia Vargas - Washington State University
TUESDAY, OCTOBER 10, 2023

02-03: FUEL PROPERTY EFFECTS
10/10/2023 9:30AM–11:35AM
SALON 2 GRAND BALLROOM

Chair: David Hung - Shanghai Jiaotong University
Co-Chair: Hailin Li - West Virginia University

Mixing-Controlled Compression Ignition With Exhaust Rebreathe on a Heavy-Duty Engine: A CFD Modelling Investigation Comparing Diesel Fuel and Ethanol
Technical Paper Publication: ICEF2023-109548
Tyler Johnston - Marquette University, Adam Dempsey - Marquette University

Reducing Methane Emissions From Lean Burn Natural Gas Engines With Prechamber Ignited Mixing-Controlled Combustion
Technical Paper Publication: ICEF2023-109652
Osama Nsaif - Marquette University, Sage Kokjohn - University of Wisconsin-Madison, Randy Hessel - University of Wisconsin-Madison, Adam Dempsey - Marquette University

Predicting Diesel Engine Cetane Number and Similarity for Newer Commercial Sustainable Aviation Fuels
Technical Paper Publication: ICEF2023-109879
Jim Cowart - U.S. Navy, Terrence Dickerson - U.S. Navy, Dianne Luning Prak - U.S. Navy

Combustion Research in Wide DCN Range Synthetic Aviation Fuels in a High Compression Ratio Engine
Technical Paper Publication: ICEF2023-110189
Valentin Soloiu - Georgia Southern University, Amanda Weaver - Georgia Southern University, James Willis - Georgia Southern University, Aidan Rowell - Georgia Southern University, Nicholas Dillon - Georgia Southern University

Uncertainty Quantification of a Deep Learning Based Fuel Property Prediction Model
Technical Presentation Only: ICEF2023-110154
Kiran Yalamanchi - Argonne National Laboratory, Sahil Kommalapati - Argonne National Laboratory, Pinaki Pal - Argonne National Laboratory, Nursulu Kuzhagaliyeva - King Abdullah University of Science and Technology, Abdullah Alramadan - Saudi Aramco Research and Development Center, Balaji Mohan - Saudi Aramco Research and Development Center, Yuanjiang Pei - Aramco Americas, Mani Sarathy - King Abdullah University of Science and Technology, Emre Cenker - Saudi Aramco Research and Development Center, Jihad Badra - Saudi Aramco Research and Development Center

06-03: LOW CARBON MODELING
10/10/2023 9:30AM–11:35AM
CITY CENTER A

Chair: Joohan Kim - Argonne National Laboratory
Co-Chair: Yu Zhang - Cummins Inc.

Computational Investigation on the Effects of Pre-Chamber Volume in an Active Narrow-Throat Pre-Chamber Engine
Technical Paper Publication: ICEF2023-110084
Mickael Silva - King Abdullah University of Science and Technology, Xinlei Liu - King Abdullah University of Science and Technology, Ponnya Hlaing - King Abdullah University of Science and Technology, Emre Cenker - Saudi Aramco Research and Development Center, Abdullah Al-Ramadan - Saudi Aramco Research and Development Center, James Turner - King Abdullah University of Science and Technology, Hong G. Im - King Abdullah University of Science and Technology

A Computational Analysis of Fuel Evaporation and Mixing in a Methanol Opposed-Piston Engine With a Passive Pre-Chamber
Technical Paper Publication: ICEF2023-110099
Rafael Menaca - King Abdullah University of Science and Technology, Mickael Silva - King Abdullah University of Science and Technology, Kevin Moreno-Cabezas - King Abdullah University of Science and Technology, Giovanni Vorraro - King Abdullah University of Science and Technology, James W.G. Turner - King Abdullah University of Science and Technology, Hong G. Im - King Abdullah University of Science and Technology
Technical Conference Schedule

Numerical Evaluation of Fuel-Air Mixing in a Direct-Injection Hydrogen Engine Using a Multi-Hole Injector

Technical Presentation Only: ICEF2023-110152

Bifen Wu - Argonne National Laboratory, Roberto Torelli - Argonne National Laboratory, Yuanjiang Pei - Aramco Americas


Technical Presentation Only: ICEF2023-110573

Andrea Piano - Politecnico di Torino, Federico Millo - Politecnico di Torino, Gianpaolo Quattrone - Politecnico di Torino

01-02: LARGE ENGINE SYSTEMS
10/10/2023  9:30AM–11:35AM
CITY CENTER B

Chair: Harsh Sapra - University of Wisconsin
Co-Chair: Matthew Hart - Wabtec Corporation

A Hybrid Heavy Duty Diesel Power System for Off-Road Applications: Concept Validation

Technical Paper Publication: ICEF2023-109633


Efficiency and Emissions Improvement Package for the 7FDL High-Power, Medium-Speed, Locomotive Diesel Engine

Technical Paper Publication: ICEF2023-109814

Matthew Hart - Wabtec Corporation, Taylor Gray - Wabtec Corporation, Jesse Brigden - Wabtec Corporation, Justin Brumberg - Wabtec Corporation, Aj Grayson - Wabtec Corporation, Alex Shindledecker - Wabtec Corporation

The Development and Application of Advanced Sensor Solutions for Gaining New Insights Into Large Engines

Technical Paper Publication: ICEF2023-110623

Ansel Higgs - Large Engines Competence Center GmbH, Bernhard Rossegger - Large Engines Competence Center GmbH, Anton Tilz - Large Engines Competence Center GmbH, Martin Vareka - Large Engines Competence Center GmbH, Michael Engelmayer - Large Engines Competence Center GmbH, Andreas Wimmer - Large Engines Competence Center GmbH

Injection Technologies for Alternate Fuels

Technical Presentation Only: ICEF2023-110110


03-04: ADVANCED SI/CI CONCEPTS - I
10/10/2023  9:30AM–11:35AM
SALON 3 GRAND BALLROOM

Chair: Niranjan Miganakallu - University of Wisconsin-Madison
Co-Chair: Cosmin Dumitrescu - West Virginia University

Ignition Systems for SI-ICE Fueled by Alternative and Renewable Fuels

Technical Paper Publication: ICEF2023-110153

Jakob Ängeby - SEM AB, Johan Tidholm - SEM AB, Bert Gustafsson - SEM AB, Anders Johnsson - SEM AB

Experimental Study of the Impact of Ethanol Content on Partially Premixed Combustion With Ethanol-Gasoline Blends

Technical Paper Publication: ICEF2023-110191

Brian Gainey - Clemson University, John Gandolfo - Clemson University, Benjamin Lawler - Clemson University

Cooled Spray Technology for Particulate Reduction in a Heavy-Duty Engine

Technical Paper Publication: ICEF2023-110394

Adam Klingbeil - Wabtec Corporation, Tristen Tinar - Southwest Research Institute, Scott Ellis - Southwest Research Institute
Ducted Fuel Injection Provides Consistently Lower Soot Emissions in Sweep to Full-Load Conditions

Technical Presentation Only: ICEF2023-110165

Noad J. Buurman - Eindhoven University of Technology, Gustav Nyrenstedt - Sandia National Laboratories, Charles J. Mueller - Sandia National Laboratories

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Intra-Catalyst Methane Oxidation Pathways of Three Way Catalysts and Implications on Nitric Oxide Conversion Profiles for a Natural Gas Vehicle Exhaust Under Lambda Dithering

Technical Presentation Only: ICEF2023-110183

Dhruba Jyoti Deka - Oak Ridge National Laboratory, Calvin Thomas - General Motors, Josh Pihl - Oak Ridge National Laboratory, William Partridge - Oak Ridge National Laboratory

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05-04: METHANE EMISSIONS CONTROL

10/10/2023

9:30AM–11:35AM

MARQUIS C

Catalyst Deactivation Modes of Pd/γ-Al2O3 for Lean Methane Oxidation

Technical Presentation Only: ICEF2023-110107


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02-04: DUAL FUEL AND FUEL BLENDS - II

10/10/2023

1:10PM–2:50PM

SALON 2 GRAND BALLROOM

The Effects of Intake Throttling With Hot and Cold EGR in a CNG/Diesel Dual Fuel Engine

Technical Paper Publication: ICEF2023-109529

Srinibas Tripathy - Indian Institute of Technology Bombay, Asish Kumar Sarangi - Indian Institute of Technology Bombay, Vimal Kumar Patel - Indian Institute of Technology Bombay, Sheshadri Sreedhara - Indian Institute of Technology Bombay

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Increasing Si/Al Molar Ratio to Improve Low Temperature CH4 Oxidation Over Pd/LTA

Technical Presentation Only: ICEF2023-110161

Tala Mon - University at Buffalo, Jingzhi Liu - Syracuse University, Viktor Cybulskis - Syracuse University, Eleni Kyriakidou - University at Buffalo

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Hydrothermally Durable, Low-Temperature Methane Oxidation Catalysts for Lean-Burn Natural Gas Engines in Hard-to-Electrify Industries

Technical Presentation Only: ICEF2023-119254

Melanie Moses-Debusk - Oak Ridge National Laboratory, Sreshtha Sinha Majumdar - Oak Ridge National Laboratory, Dhruba Deka - Oak Ridge National Laboratory

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Performance and Emissions of an SI Engine Fueled With DME-Propane Blends

Technical Paper Publication: ICEF2023-110498


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Evaluation of the Performance and Exhaust Emissions of a Four Cylinder CI Engine Operating With Dimethyl Ether (DME) and Propane Blends

Technical Paper Publication: ICEF2023-110517


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Advances in the Catalytic Oxidation of Methane Emitted From Natural Gas Engines

Technical Presentation Only: ICEF2023-110512

Michael Harold - University of Houston
Experimental Investigation of a Butylcyclohexane / Propylcyclohexane Based Naphthenic Bio-Blendstock Surrogate Fuel for Use in a Compression Ignition Engine

Technical Paper Publication: ICEF2023-110527

Rodrigo Ristow Hadlich - Stony Brook University, Zhongnan Ran - Stony Brook University, Ruinan Yang - Stony Brook University, Ofei Mante - RTI International, David Dayton - RTI International, Dimitris Assanis - Stony Brook University

Validation of a 1D Modeling Technique to Predict Performance of Turbocharged Engines Including a Double Scroll Turbine With Connection Valve

Technical Paper Publication: ICEF2023-109866


Model-Based Development of Hydrogen Internal Combustion Engine and Aftertreatment Concept for MY 2027 Heavy Duty Vehicle Application

Technical Presentation Only: ICEF2023-110007


Development of a Multizone Model Simulating PPCI and Diffusion Combustion in GCI Engines

Technical Presentation Only: ICEF2023-119513

Jinsu Kim - West Virginia University, Harold Sun - West Virginia University, Ashish Shah - Aramco Americas, Hailin Li - West Virginia University
### Technical Conference Schedule

#### 03-05: ADVANCED SI/CI CONCEPTS - II

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<td>Cosmin Dumitrescu - West Virginia University</td>
<td>Niranjan Miganakallu - University of Wisconsin-Madison</td>
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**The Role of Platinum Surface Catalytic Effects in Hot-Spot Induced Pre-Ignition in a Direct Injection Hydrogen Fueled, Heavy-Duty, Optical-Engine**

Technical Presentation Only: ICEF2023-110198

Rajavasanth Rajasegar - Sandia National Laboratories, Taesong Lee - Sandia National Laboratories,Aleš Srna - Sandia National Laboratories

**Fundamental Investigation of Direct Injection Compression Ignition of Hydrogen in an Internal Combustion Engine for Class 8 Heavy Duty Truck Application**

Technical Presentation Only: ICEF2023-110396


**An Experimental Demonstration of Gasoline Compression Ignition (GCI) Technology on a Light-Duty Diesel Engine: From Idling to Full Torque and Power**

Technical Presentation Only: ICEF2023-110535

Ashish Shah - Aramco - Detroit Research Center, Brock Merritt - Aramco - Detroit Research Center, Praveen Kumar - Aramco - Detroit Research Center, James Braun - Aramco - Detroit Research Center

**Development of Turbulent Jet Controlled Compression Ignition Engine Concept Using Spray Guided Stratification for Fueling a Passive Prechamber**

Technical Presentation Only: ICEF2023-119224

Xin Yu - Aramco Services Company, Anqi Zhang - Aramco Services Company, Andrew Baur - Aramco Services Company, David Cleary - Aramco Services Company

#### 05-05: CATALYST DURABILITY

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<td>Josh Pihl - Oak Ridge National Laboratory</td>
<td>Todd Toops - Oak Ridge National Laboratory</td>
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**Unraveling the Impact of Sulfur Exposure and Regeneration Cycles on a Cu-SSZ-13 SCR Catalyst**

Technical Presentation Only: ICEF2023-109771

Poonam Rani - University of Virginia, Huifang Shao - Afton Chemical Corporation, William S. Epling - University of Virginia

**Understanding Thermal Deactivation Processes of Three-Way Catalysts During Long Term Application**

Technical Presentation Only: ICEF2023-110030

Sarina-Lena Heck - Karlsruhe Institute of Technology, Paolo Dolcet - Karlsruhe Institute of Technology, Gülperi Nails - Karlsruhe Institute of Technology, Jan-Dierk Grunwaldt - Karlsruhe Institute of Technology, Maria Casapu - Karlsruhe Institute of Technology

**Durability Demonstration of a Close-Coupled SCR/ASC**

Technical Presentation Only: ICEF2023-117699

Erik Sheets - Johnson Matthey, John Foster - Daimler, Yaritza Lopez-De Jesus - Johnson Matthey, Alissa Recker - Daimler, Jason Pless - Johnson Matthey, Rasik Pondicherry - Daimler, Jason Barton - Daimler, Aaron Neuman - Daimler, Penelope Markatou - Johnson Matthey
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