ICEF 2022
ICE Forward Conference

CONFERENCE
October 16–19, 2022

Crowne Plaza Indianapolis Downtown Union Station Hotel, Indianapolis, IN

Program

event.asme.org/ICEF

The American Society of Mechanical Engineers®
ASME®

ASME
SETTING THE STANDARD

Welcome to ICEF 2022!

Welcome to the 2022 ASME ICE Forward Conference (previously the Internal Combustion Engine Fall Technical Conference). After two years of virtual events, ICE Forward is once again an in-person event welcoming participants from all over the world. The Internal Combustion Engine Division (ICED) executive committee, together with the ASME staff have worked diligently to make this event engaging and exciting. The four-day event, which also celebrates the 100-year anniversary of ICED, begins on the evening of Sunday, October 16th with a welcome reception and ends with a symposium on the afternoon of Wednesday, October 19. Technical presentations, keynotes, an invited lecture, a panel discussion, and technical tours are planned throughout Monday, Tuesday, and Wednesday. The annual awards ceremony will also be held in the evening of Monday, October 17th.

The ICE Forward conference is intended to cultivate a collegial environment in which participants can discuss and exchange information related to the science and engineering of internal combustion engines. This event provides a forum for experts from industry, academia, and governmental agencies from all over the world to share the latest technological developments. The conference program is distributed into seven technical tracks with multiple concurrent sessions, spread over two days. Newly updated tracks cover a wider range of topics than previous conferences:

1. Off-Road Systems
2. Fuels and Carbon Management
3. Advanced Combustion
4. Powertrain, Electrification, and Emissions Systems
5. Fuel Injection and Sprays
6. Modeling and Simulation
7. Design, Lubrication, and Thermal Management

In addition to a high-quality technical program, the conference also offers a variety of networking opportunities for you to establish new connections, nurture existing ones, and mentor students and early career engineers.

We are especially grateful to the many volunteers who ensure the conference's high technical standards and engaging program. This conference is made possible by the contributions of our track and session chairs and organizers, technical paper reviewers, paper authors, and sponsors. We are thankful to all the speakers for participating and sharing their expertise and knowledge with the community.

You may be wondering why we decided to change the name of our conference and why we are doing it now. As mentioned, the ICED turned 100 years old in 2021. This is a tremendous milestone worthy of an in-person celebration, and so we postponed our anniversary festivities until this year's event. But as we mark this significant centennial milestone that celebrates our past, we must also look forward to our future—a future that no doubt includes a massive shift to low-carbon and carbon-free technologies.

The internal combustion engine has a firm place in this future. Improved efficiency, cleaner fuels, hybridization, and advanced aftertreatment technologies are all areas of significant research for on-road and off-road engines alike. It's up to us, the IC engine community, to take these innovations and keep our industry relevant and moving forward—ICE forward.

Accordingly, with a revamped conference name, a robust set of technical tracks, and the return to in-person events, we continue to pave the way forward for our community.

Thank you for attending ICE Forward and we hope you have a successful conference week!

Sincerely,

Kelly Senecal, Ph.D.
Co-founder, Convergent Science
Conference Chair

Sundar Krishnan, Ph.D.
Professor of Mechanical Engineering, University of Alabama
Conference Co-Chair

ASME ICE Division Executive Committee

Chair
Sibendu Som, PhD
Director of the Center for Advanced Propulsion and Power Systems
Argonne National Laboratory

Vice Chair and Conference Chair
Kelly Senecal, PhD
Owner & Vice President
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Incoming Member
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Will Northrop, PhD
Professor
University of Minnesota

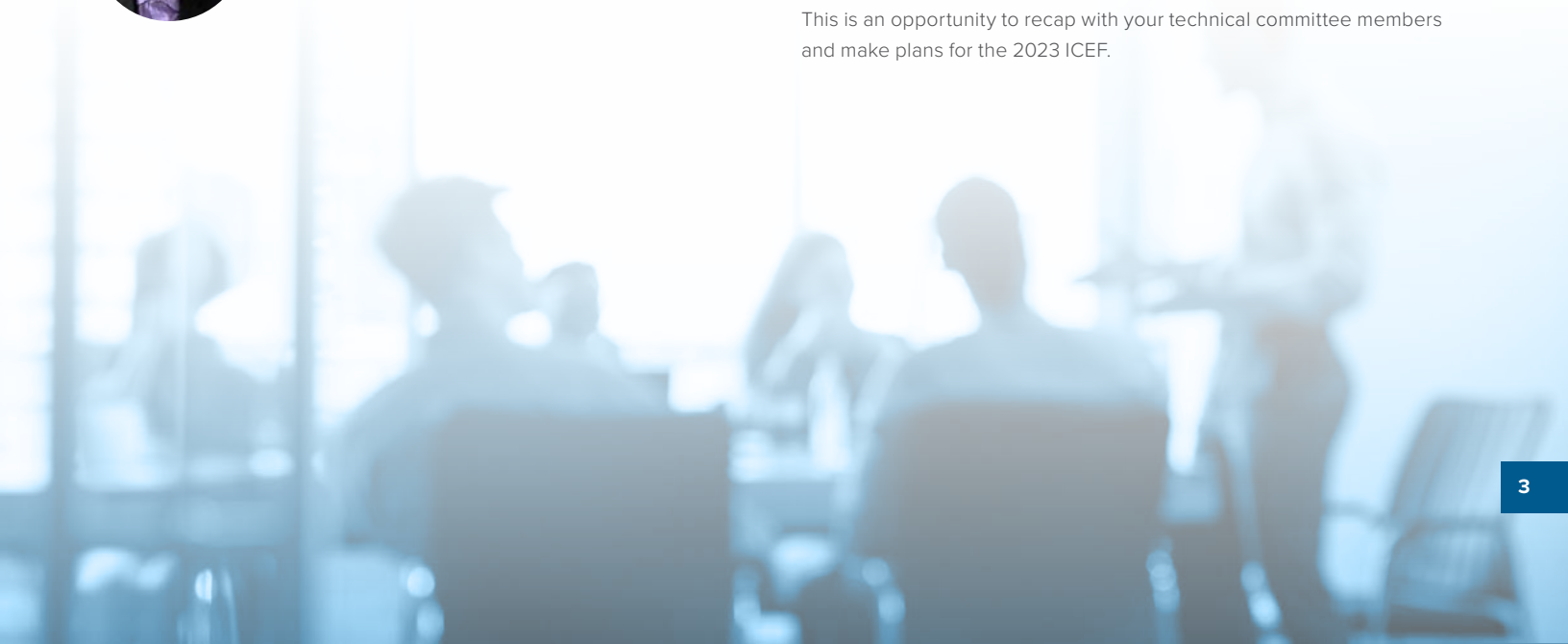
Industry Advisor
Ronald O. Grover, Jr., PhD
Staff Researcher
General Motors

Associates Meeting
Tuesday, October 18
4:30PM–5:30PM
Edison South
Mezzanine Level

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

Technical Committees Meeting
Tuesday, October 18
5:30PM–6:00PM
Edison South
Mezzanine Level

This is an opportunity to recap with your technical committee members and make plans for the 2023 ICEF.



Contents

REGISTRATION INFORMATION

Grand Hall Foyer, First Fl.

Registration Hours:

Sunday, October 16
2:00PM–6:30PM

Monday, October 17
7:00AM–6:30PM

Tuesday, October 18
7:00AM–5:00PM

Wednesday, October 19
7:00AM–1:00PM

ASME MEETING POLICY

Attendees are required to always wear their badges in order to gain access to the meeting rooms and meal functions. This is also a security precaution. If you lost or misplaced your badge, please come by registration in the Grand Hall Foyer, First Fl. and we will be happy to reprint it for you.

INTERNET ACCESS IN THE HOTEL

Basic WiFi is available the guest rooms and meeting space. To access WiFi in the meeting space the SSID is ICEForward and the password is ICE2022

AUDIOVISUAL EQUIPMENT IN SESSION ROOMS

All technical sessions are equipped with one LCD projector and one screen. Laptops will be provided in the sessions. It is preferred that you bring your presentation on a thumb drive and arrive a few minutes earlier 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.

TICKETED FUNCTIONS

Access to technical sessions, breakfast, breaks, keynotes, panels, and the awards banquet will be confirmed by your badge. The off-site event is for paid attendees of the conference only. If you wish to bring a guest to the awards dinner, you must purchase an additional ticket ($95) at registration. For questions regarding any possible ticketed items, you can ask a conference representative located in the registration area in the Grand Hall Foyer, 1st Fl.

Conference Information

CONFERENCE APP

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

You will be able to:

- Connect with Attendees
- View Speaker Profiles
- Access Session Information
- Watch On-Demand Content

Keep an eye on your email for more information on how to access and navigate the ASME Conference App!

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 PRACTICE ROOM

Illinois Central, First Level of the hotel will serve as the Author Practice/ Speaker Ready Room from 7:00AM to 5:00PM on Monday and Tuesday. 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.

Keynote Sessions, Invited Lecture, & ICE Panel Session

This year's keynote speakers represent institutions ranging from a world leading corporation to an up-and-coming startup to a premier engineering university. While their backgrounds are diverse, they share one thing in common. All three of our prestigious keynotes are working to bring the ICE forward as a key part of our sustainable future.

KEYNOTE SESSIONS

MONDAY, OCTOBER 17
8:00AM–9:15AM **GRAND HALL, FIRST FL.**

EDUCATING THE NEXT GENERATION OF ENGINEERS TO HELP BRING THE ICE FORWARD

Dr. Greg Shaver
Professor of Mechanical Engineering
Purdue University

TUESDAY, OCTOBER 18
8:00AM–9:15AM **GRAND HALL, FIRST FL.**

A CRITICAL AND CREDIBLE PATHWAY TO ZERO EMISSIONS

Dr. Tim Frazier
Vice President – Research & Technology
Cummins Inc.

TUESDAY, OCTOBER 18
11:35AM–1:00PM **GRAND HALL, FIRST FL.**

THE DIESEL ENGINE WITHOUT THE DIESEL FUEL: DRIVING RAPID DECARBONIZATION IN HEAVY DUTY APPLICATIONS

Dr. Julie Blumreiter
Chief Technology Officer and Co-Founder
ClearFlame Engine Technologies

The internal combustion engine has come a long way since de Rivaz's hydrogen-powered combustion system of the early 1800s. But how has it changed? Hear an expert perspective from none other than John Heywood, Emeritus Professor from MIT. Among many other accomplishments, Professor Heywood is known far and wide as the author of Internal Combustion Engine Fundamentals, the premier textbook for all things ICE. You won't want to miss what is sure to be an educational and inspiring event.

INVITED LECTURE

TUESDAY, OCTOBER 18
3:20-4:20 PM **GRAND HALL, FIRST FL.**

THE EVER-EVOLVING ICE

John Heywood, Ph.D.
Sun Jae Professor, Emeritus
Massachusetts Institute of Technology

Moderator
Kelly Senecal, Ph.D.
Owner & Vice President
Convergent Science

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/

Keynote Sessions, Invited Lecture, & ICE Panel Session

Don't miss this rare opportunity to hear from the distinguished ASME ICE Award winners on the future of the internal combustion engine. The panel includes experts from industry, academia, and national labs. Join us as we reflect, refocus, and reimagine the impact of ICEs from both a personal and societal level. Audience participation is highly encouraged for this fun and engaging event!

ICE PANEL SESSION

MONDAY, OCTOBER 17
3:00 – 4:30 PM **GRAND HALL, FIRST FL.**

MOVING FORWARD WITH THE INTERNAL COMBUSTION ENGINE

Robert Wagner, PhD
Director
Buildings and Transportation Science Division
Oak Ridge National Laboratory
ICE Award Winner, 2014

Terry Alger, PhD
Director Automotive Propulsion Systems Department
Southwest Research Institute
ICE Award Winner, 2016

Paul Miles, PhD
Manager Applied Combustion Research
Sandia National Laboratory
ICE Award Winner, 2017

Dr. Kelly Senecal, PhD
Co-Founder and Owner
Convergent Science
Visiting Professor, University of Oxford
ICE Award Winner, 2019

André Boehman, PhD
Professor of Mechanical Engineering
Director of the Walter E. Lay Automotive Laboratory
University of Michigan
ICE Award Winner, 2020

Ronald O. Grover, Jr., PhD
Staff Researcher
General Motors Research and Development,
Propulsion Systems Research Lab
Moderator

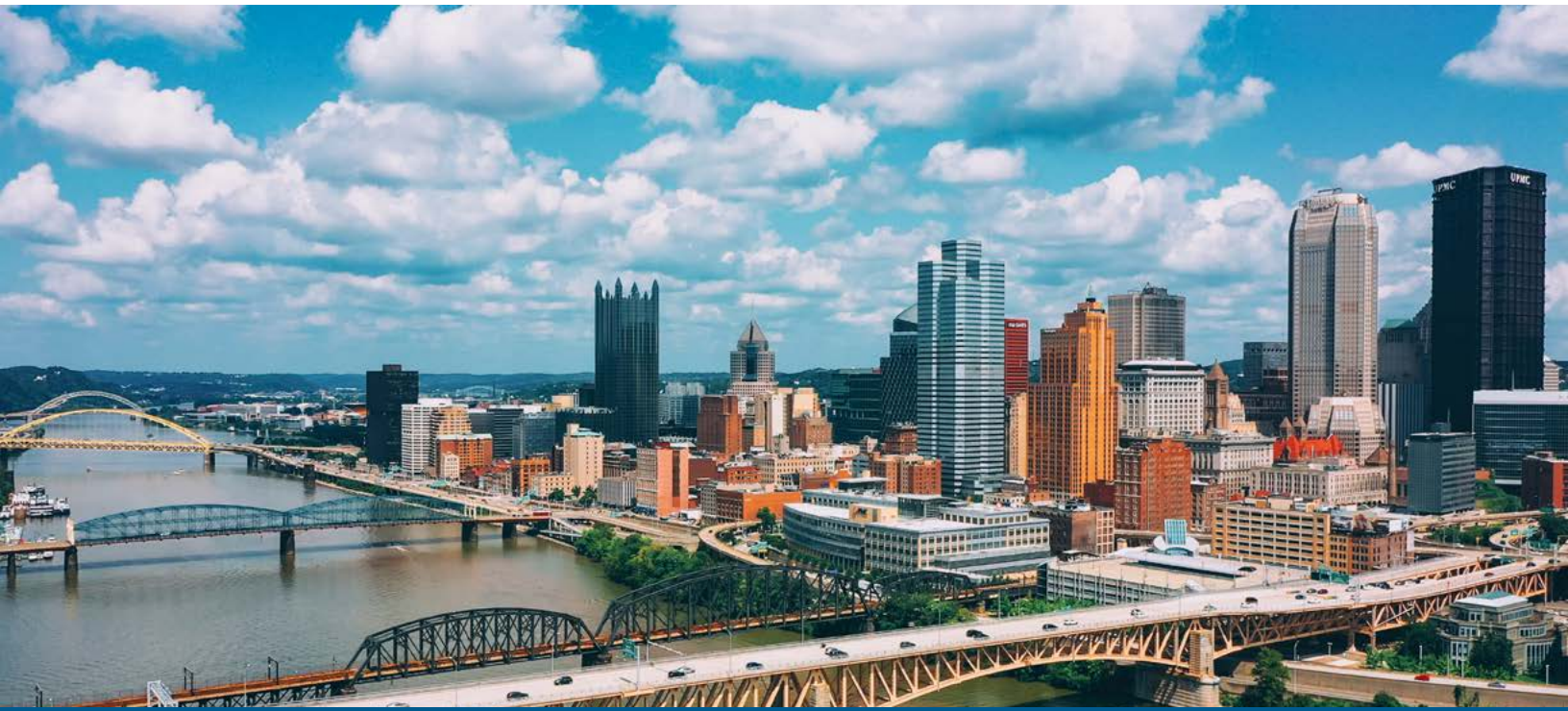
ICEF 2023

The only technical conference focused exclusively on internal combustion engines.

SAVE THE DATE

October 8 – 11, 2023
Pittsburgh, Pennsylvania USA

OPEN ACCESS OPPORTUNITY FOR AUTHORS!



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DIESEL TECHNOLOGY FORUM

EXHIBITORS

Cambustion

UT99 SMART FILTRATION

Technical Posters

SUNDAY, OCTOBER 16 (DURING THE WELCOME RECEPTION)
5:00PM–6:30PM **GRAND HALL BAR, FIRST FL.**

The ASME ICEF Technical Poster Session is a perfect opportunity to showcase your research to the larger internal combustion engine community and receive valuable feedback from experts in the field. The posters will be displayed during the welcome reception, which will allow for a relaxed atmosphere for the audience to mingle with presenters and engage in fruitful discussion and exchange of ideas.

TECHNICAL POSTER PRESENTERS

Argonne National Laboratory
Vyaas Gururajan
100496 Numerical Simulations for Mobile Carbon Capture

Argonne National Laboratory
Alexander Hoth
100423 Development of a Supercharged Octane Number (SON)

Argonne National Laboratory
Chi Young Moon
100527 Measurements of Internal Injector Deposits Using X-Ray Computed Tomography

Illinois Institute of Technology
Jorge Pulpeiro Gonzalez
100524 Residual Gas Fraction Measurement and Estimation for the CFR Engine Operating Under HCCI Conditions

Michigan Technological University
Tyler White
100522 A Compression Ignition, Mono-Fueled, Natural Gas, Single Cylinder Research Engine

Oak Ridge National Laboratory
Kevin Dean Edwards
100535 Prediction of Engine Knock in a Gasoline Direct Injection (Di) Engine

Oak Ridge National Laboratory
Charles Finney
100536 Effects of Thermal Diffusivity Treatments on Materials Temperatures Predictions

University of Minnesota
Shawn Reggeti
100485 Combustion Modes and Emissions From Ammonia-Hydrogen Fuel Blends in Spark-Ignition Engines

University of Wisconsin-Madison Engine Research Center
Mohan Ananth
100396 A Hybrid Vof-Lagrangian Eulerian Approach for UWS Sprays

ASME ICED Technical Poster Chair
Kalyan Srinivasan, PhD
Professor, University of Alabama

Undergraduate Research Competition Presentations and Lunch

MONDAY, OCTOBER 17
11:35AM–1:00PM **GRAND HALL, FIRST FL.**

The ASME ICED undergraduate 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.

Research in a Constant Volume Combustion Chamber on F-24 Synthetic Surrogate Blended from Iso-Paraffinic Kerosene (IPK) and Fischer-Tropsch Synthetic Kerosene (S8)

Lily Parker
Georgia Southern University

Developing an Algorithm for Minimizing Steady State Engine Testing Time

Antonio Scalzi
Oakland University

Steven DeCoste
Oakland University

Scott Curran, PhD
ASME ICED Undergraduate Research Competition
Oak Ridge National Laboratory

Awards

MONDAY, OCTOBER 17
6:30PM–9:30PM **GRAND HALL, FIRST 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 DINNER sponsored by Aramco Americas

Included in your conference registration.

2022 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.

Roy J. Primus
Retired Senior Principal Engineer at GE Global Research

2022 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.

Timothy Jacobs, PhD
Professor and Department Head, Department of Multidisciplinary Engineering
Professor, J. Mike Walker '66 Department of Mechanical Engineering
Texas A&M University

ASME SOICHIRO HONDA MEDAL AWARD

The Soichiro Honda Medal recognizes an individual for an outstanding achievement or a series of significant engineering contributions in developing improvements in the field of personal transportation. With special attention concentrated on the brilliance of the achievement or on the overall effect of a series of contributions.

As a result of a generous unrestricted donation to ASME by Honda Motor Company, Ltd., in 1980, the Society established the Soichiro Honda Medal in recognition of Mr. Honda's exemplary achievements in the field of personal transportation in 1983.

Subir Chowdhury, PhD
Chairman and CEO
ASI Consulting Group, LLC

2022 MERITORIOUS 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.

Cosmin Dumitrescu, PhD
Associate Professor
West Virginia University

Doug Longman
Group Leader
Argonne National Laboratory

2022 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.

Eric Dillen
Senior Engineering Manager, Advanced Engine Technologies
Wabtec Corporation

John Deur, PhD
Director, Combustion Research
Cummins Inc.

BEST PAPER ASME 2021 ICE FALL CONFERENCE

Machine Learning-Enabled Prediction of Transient Injection Map in Automotive Injectors with Uncertainty Quantification

Sudeepta Mondal, Gina M. Magnotti, Bethany Lusch, Romit Maulik, Roberto Torelli

ASME FELLOWS

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

Kalyan Srinivasan, PhD, 2021
Professor
University of Alabama

Thomas Lavertu, PhD, 2021
Senior Engineer, Advanced Engine Technologies
Wabtec

Kelly Senecal, PhD, 2021
Owner & Vice President
Convergent Science

Bradley Zigler, PhD, 2022
Senior Director
44 Energy Technologies

Networking Events

WELCOME RECEPTION & TECHNICAL POSTER SESSION

Sunday, October 16
Grand Hall Bar, First Fl.
5:00PM–6:30PM

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 17
Edison North, Second Fl.
7:00AM–8:00AM

Tuesday, October 18
Edison North, Second Fl.
Early Career Networking
7:00AM–8:00AM

Wednesday October 19
Grand Central Station A-D
6:30AM–7:30AM

COFFEE BREAKS

Grand Hall North & East
First Fl.

Monday, October 17
9:15AM–9:30AM
2:40PM–3:00PM
4:30PM–4:45PM

Tuesday, October 18
9:15AM–9:30AM
3:05PM–3:20PM
4:20PM–4:30PM

LUNCHES sponsored by Caterpillar

CATERPILLAR®

Grand Hall, First Fl.

Monday, October 17
11:35AM–1:00PM Lunch with the Undergraduate Competition Winners

Tuesday, October 18
11:35AM–1:00PM Lunch Keynote with Dr. Julie Blumreiter, ClearFlame

AWARDS BANQUET sponsored by Aramco

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Grand Hall, First Fl.

Monday, October 17
6:30PM–9:30PM

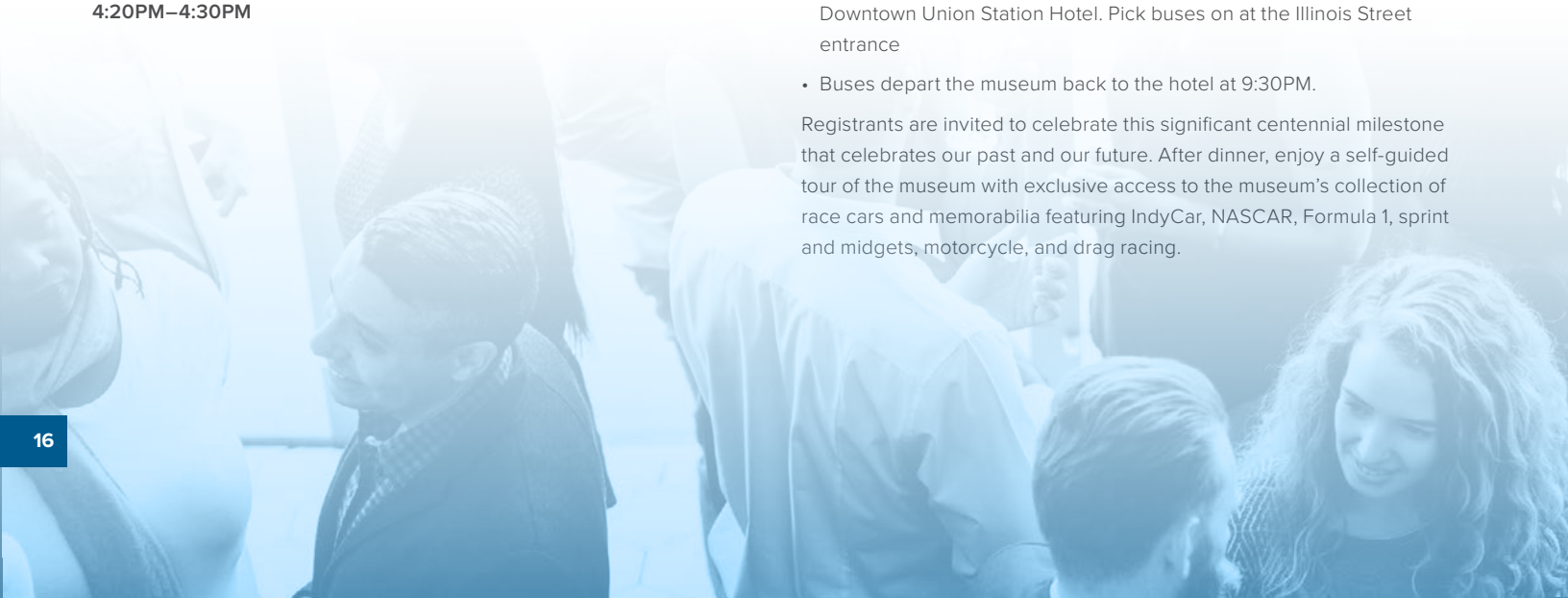
100TH ASME ICED ANNIVERSARY DINNER

INDIANAPOLIS MOTOR SPEEDWAY MUSEUM
LEGENDS • DARING • SPEED

Tuesday, October 18

- Anniversary dinner is included in your conference registration Transportation provided
- Buses depart at 6:00PM & 6:15PM from the Crowne Plaza Indianapolis Downtown Union Station Hotel. Pick buses on at the Illinois Street entrance
- Buses depart the museum back to the hotel at 9:30PM.

Registrants are invited to celebrate this significant centennial milestone that celebrates our past and our future. After dinner, enjoy a self-guided tour of the museum with exclusive access to the museum's collection of race cars and memorabilia featuring IndyCar, NASCAR, Formula 1, sprint and midgets, motorcycle, and drag racing.



COLUMBUS MIDRANGE ENGINE PLANT (CMEP) TOUR

FULL
Wednesday October 19, 2022
7:30AM–12:00PM

12:00PM–1:00PM
Lunch will be provided at the Grand Central Foyer, at the hotel.

Located just south of Columbus, Indiana, the Columbus Midrange Engine Plant (CMEP) occupies a 400-acre campus with a total manufacturing and office space of 600,000 square feet for its 900 employees. The main structure is unusual in being mainly below ground level to maximize energy efficiency while also boasting internal courtyards to provide shop floor employees access to natural light. The plant's focus is the production of the 6.7L ISB inline-six Diesel. In terms of numbers, CMEP is Cummins' highest volume plant, manufacturing ~3500 engines per week and over 3 million to date – all engines from CMEP go into Ram pickup trucks.

The tour will cover every aspect of the engine manufacturing process conducted at CMEP, from block machining through final assembly of the over 400 parts that make up each engine through quality checks, testing, painting, packing, shipping, etc.

CUMMINS TECHNICAL CENTER (CTC) TOUR

FULL
Wednesday October 19, 2022
7:30AM–12:00PM

12:00PM–1:00PM
Lunch will be provided at the Grand Central Foyer, at the hotel.

Located in Columbus, Indiana, the Cummins Technical Center (CTC) is home to research and development conducted on diesel and alternate fuel engines, components subsystems and other advanced power systems to meet future emissions and energy efficiency demands. The CTC campus sits on 37 acres with an office building and attached laboratory building. The two buildings combined have approximately 500,000 sq. ft. under roof to provide workspace for the site's 1200 employees.

The Tech Center tour will visit several key areas including: Test operations with its 94 test cells that can handle engines ranging from 100 to 3,000 horsepower, including special test cells for altitude testing capable of simulating engine operation at altitudes up to 12,000 feet and environmental test cells capable of simulating cold weather engine operation at temperatures down to 40 below. Several test cells are devoted to detailed emissions testing.

The Advanced Chemical Systems and Integration (ACSI) Laboratories dedicated to evaluation of ceramic, composite, and catalyst materials, aftertreatment sensors, etc. Evaluation capabilities include chemical analysis, physical and/or mechanical property testing, corrosion, wear, fatigue, and non-destructive visual and instrumental testing. In addition, micro and pilot scale gas reactors are available to evaluate material contact and interaction with exhaust gases.

The Experimental Mechanics Lab (EML) to investigate and determine the component-level durability of Cummins' products. EML capabilities include vibration and strain measurement, fatigue testing, ultrasonic diagnostics, high speed imaging and digital image correlation, etc.

Additional stops will include the advanced manufacturing test area featuring 3D printing technology, a display of Cummins new fuel agnostic platforms capable of running Diesel, gasoline, propane, natural gas, and hydrogen fuels, and a historical display of Cummins engines ranging from the company's beginnings in 1919 to the present.


CATERPILLAR®

EARLY CAREER NETWORKING BREAKFAST

TUESDAY OCTOBER 18
7:00AM–8:00AM **EDISON NORTH, MEZZANINE LEVEL**

Purpose

To facilitate networking, during breakfast, between early career attendees with senior colleagues at ASME ICEF2022.

Who should attend?

Students, postdocs, and early career engineers within the first 2-3 years of professional work

We are excited to invite you to participate in the 3rd Annual Early Career Networking Event at ASME ICE Forward 2022. Engagement with colleagues during networking breaks designed to facilitate more focused one-on-one discussions has always been a hallmark of ASME ICEF conferences. To ensure that our early career attendees have the opportunity to engage in these networking discussions, we are excited to offer this organized networking event. We hope you will join us and benefit from the discussions with key leaders from the academia, industry, and national labs.

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

ACADEMIA

Prof. Will Northrop
University of Minnesota-Twin Cities

Prof. Benjamin Lawler
Clemson University

Dr. Andrea Strzelec
University of Wisconsin-Madison

INDUSTRY

Dr. Dustin Osborne
Southwest Research Institute

Dr. Yuangjiang Pei
Aramco

Dr. Emily Bierman
John Deere

NATIONAL LABS

Dr. Paul Miles
Sandia National Laboratories

Dr. Scott Curran
Oak Ridge National Laboratory

Dr. Bifen Wu
Argonne National Laboratory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Partnering for the future of energy
We are pleased to support The American Society of Mechanical Engineers ICE FORWARD 2022 Conference.
As a sponsor, we join with our colleagues across the industry highlighting how innovation and technology are addressing energy challenges.
americas.aramco.com
where energy is opportunity™

LOW CLIMATE IMPACT PROPULSION TECHNOLOGIES SYMPOSIUM

INCLUDED IN YOUR ICEF REGISTRATION

WEDNESDAY, OCTOBER 19TH
1:00PM–5:00PM
RECEPTION 5:00PM–6:30PM

This symposium will feature expert views on future sustainable transport technologies and provide the attendees an opportunity to interact with industry experts on the challenges and opportunities to develop low climate impact propulsion technologies.

SYMPOSIUM AGENDA	
12:00PM–1:00PM	**Lunch**
1:00PM–1:10PM	**Welcome**
1:10PM–2:40PM	**Session 1 On-Road Technologies** **Moderator: Yu Zhang,** *Team Lead, Aramco Americas*
1:10PM–1:40PM	**Keynote: Wole Akinyemi,** *Executive Director, Cummins*
1:40PM–2:40PM	**Panelists:** **Wole Akinyemi,** *Executive Director, Cummins* **Ron Reese**, *Senior Technical Fellow, Stellantis* **Daniel Mohr**, *Technical Director, Cummins* **Graham Conway**, *Principal Engineer, Southwest Research Institute*
2:40PM–3:00PM	**Break**
3:00PM–4:30PM	**Session 2 Off-Road Technologies** **Moderator: Doug Longman,** *Section Manager, Engine Combustion Research, Argonne National Laboratory*
3:00PM–3:30PM	**Keynote: Michael Cleveland,** *Director of Advanced Energy, Progress Rail*
3:30PM–4:30PM	**Panelists:** **Michael Cleveland,** *Director of Advanced Energy, Progress Rail* **Lisa A Notestein,** *Technology Manager – PSBU, Cummins* **Bryan Geisick,** *Combustion System Manager, John Deere* **Tom Lavertu,** *Engineering Technical Lead, Wabtec* **Ivan Tate,** *Head of Product Engineering, FPT Industrial North America*
4:30PM–5:00PM	**Aramco Transport Technologies Overview** **David Cleary,** *Director, Aramco Research Center - Detroit*
5:00PM–6:30PM	**Reception with an open bar**

THANK YOU SYMPOSIUM ORGANIZERS!

Yu Zhang, *Team Lead, Propulsion Technology Development, Aramco Americas*
Sibendu Som, *Director of Center for Advanced Propulsion and Power, Argonne National Laboratory*
Kelly Senecal, *Owner & Vice President, Convergent Science*
Doug Longman, *Section Manager, Engine Combustion Research, Argonne National Laboratory*
Yuanjiang Pei, *Team Lead, Computational Modeling, Aramco Americas*

ICED Webinar Series
The Future of the Internal Combustion Engine

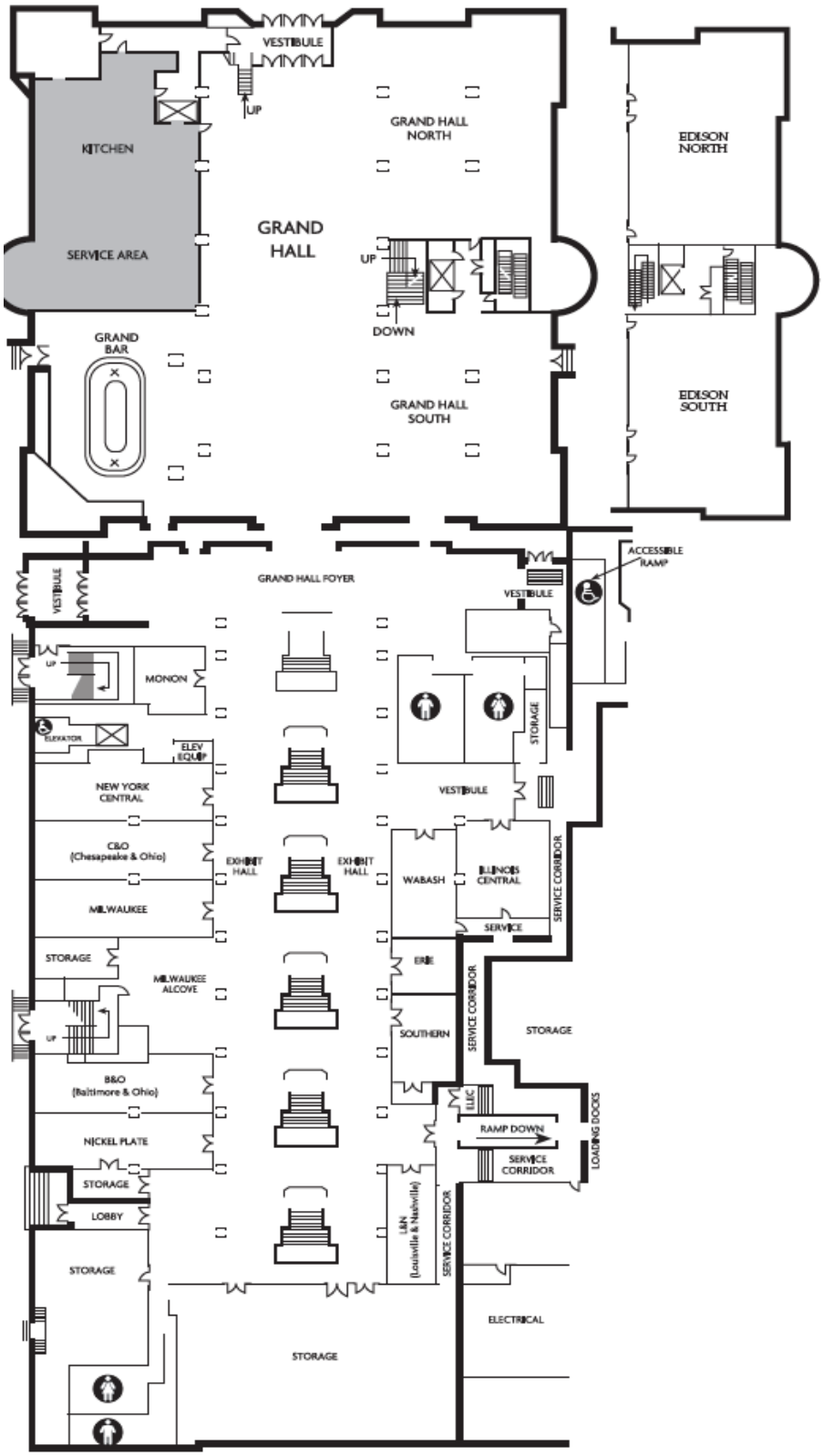
The ASME Internal Combustion Engine (ICE) Division Executive Committee has been holding a complimentary webinar series titled “The Future of the Internal Combustion Engine”. The goal of this series is to communicate the role of the ICE in our decarbonized society.

Topics include

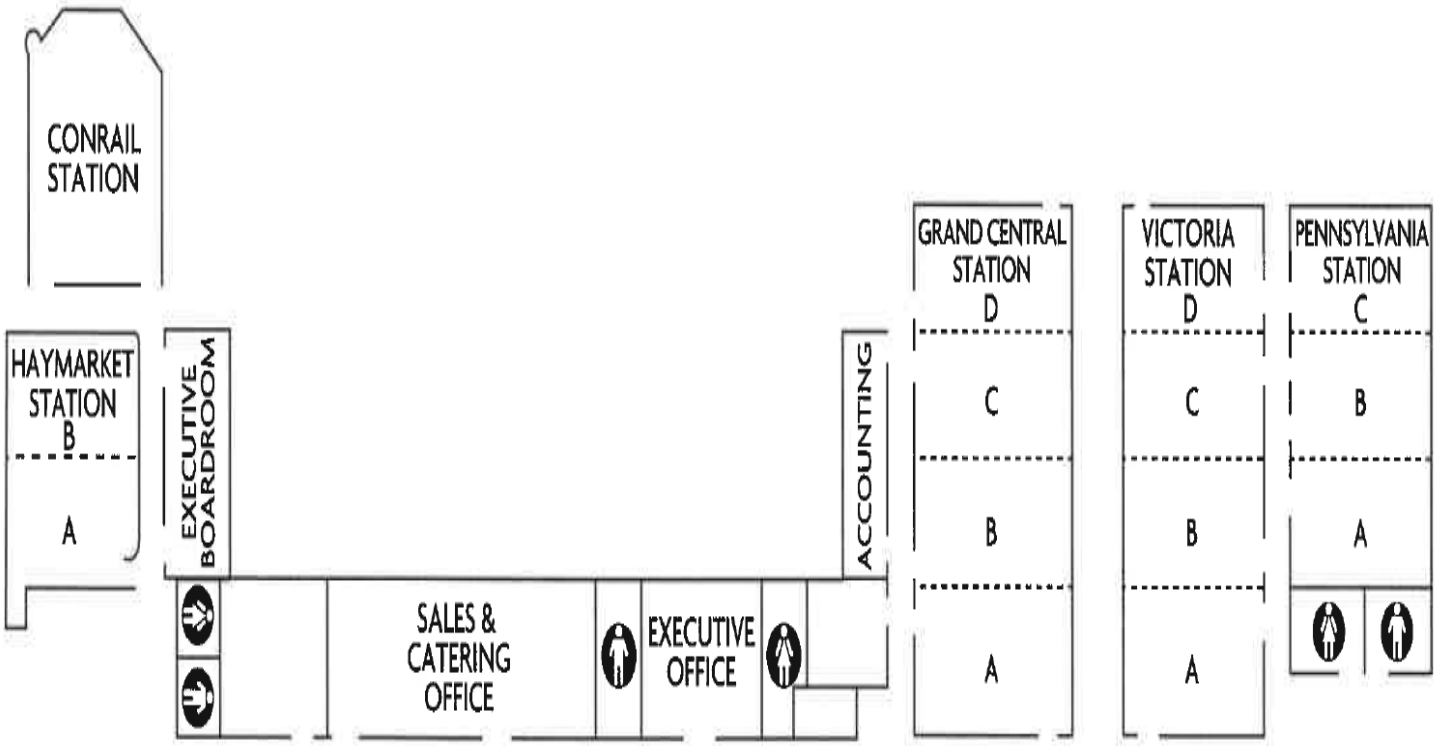
- Light Duty
- Heavy Duty
- Combustion
- Electrification
- Alternative Fuels
- Computer Simulations
- AI, and much more!

Watch the on-demand webinars!

CROWNE PLAZA HOTEL CONFERENCE CENTER



CROWNE PLAZA HOTEL FUNCTION SPACE



Track Chairs

TRACK 01 - OFF-ROAD SYSTEMS

Matt Hart
Wabtec Corp.

Muni Biruduganti
Argonne National Laboratory

Chris Stoos
Southwest Research Institute

TRACK 02 - FUELS AND CARBON MANAGEMENT

Hailin Li
West Virginia University

Hunter Mack
University of Massachusetts Lowell

TRACK 03 - ADVANCED COMBUSTION

Cosmin Dumitrescu
West Virginia University

Gokul Vishwanathan
Propane Education & Research Council

TRACK 04 - POWERTRAIN, ELECTRIFICATION, AND EMISSIONS SYSTEMS

Fabrizio Ponti
University of Bologna

Richard Burke
University of Bath

Shahrokh Etemad
Fairfield University

TRACK 05 - FUEL INJECTION AND SPRAYS

Joshua Bittle
University of Alabama

Tiegang Fang
North Carolina State University

TRACK 06 - MODELING AND SIMULATION

Yuanjiang Pei
Aramco Americas

Muhsin Ameen
Argonne National Laboratory

TRACK 07 - DESIGN, LUBRICATION, AND THERMAL MANAGEMENT

Dan Richardson
Cummins Inc.

David Rutledge
Cummins Inc.

TRACK 08 – TECHNICAL POSTERS

Kalyan Srinivasan
University of Alabama

SUNDAY, OCTOBER 16, 2022

TECHNICAL POSTERS
5:00PM–6:30PM **GRAND HALL BAR**

Session Chair: **Kalyan Kumar Srinivasan** - *University of Alabama*

Numerical Simulations for Mobile Carbon Capture
ICEF2022-100496
Track 8: Posters
Vyaas Gururajan - *Argonne National Laboratory,* **Sibendu Som** - *Argonne National Laboratory*

Development of a Supercharged Octane Number (SON)
ICEF2022-100423
Track 8: Posters
Alexander Hoth - *Argonne National Laboratory,* **Christopher Kolodziej** - *Argonne National Laboratory,* **Muhammad Waqas** - *Argonne National Laboratory*

Measurements of Internal Injector Deposits Using X-Ray Computed Tomography
ICEF2022-100527
Track 8: Posters
Chi Young Moon - *Argonne National Laboratory,* **Brandon Sforzo** - *Argonne National Laboratory.* **Alan Kastengren** - *Argonne National Laboratory,* **Christopher Powell** - *Argonne National Laboratory*

Residual Gas Fraction Measurement and Estimation for the CFR Engine Operating Under HCCI Conditions
ICEF2022-100524
Track 8: Posters
Jorge Pulpeiro Gonzalez - *Illinois Institute of Technology,* **Alexander Hoth** - *Michigan Technological University,* **Hee Je Song** - *Argonne National Laboratory,* **Christopher Kolodziej** - *Argonne National Laboratory*

A Compression Ignition, Mono-Fueled, Natural Gas, Single Cylinder Research Engine
ICEF2022-100522
Track 8: Posters
Tyler White - *Michigan Technological University*

Prediction of Engine Knock in a Gasoline Direct Injection (Di) Engine
ICEF2022-100535
Track 8: Posters
Kevin Dean Edwards - *Oak Ridge National Laboratory,* **Charles Finney** - *Oak Ridge National Laboratory,* **Wael Elwasif** - *Oak Ridge National Laboratory,* **Benjamin Hernandez** - *Oak Ridge National Laboratory,* **Russell Whitesides** - *Lawrence Livermore National Laboratory,* **Ronald Grover** - *General Motors,* **Muniappan (Anbu) Anbarasu** - *General Motors,* **Nitesh Attal** - *Convergent Science*

Effects of Thermal Diffusivity Treatments on Materials Temperatures Predictions
ICEF2022-100536
Track 8: Posters
Charles Finney - *Oak Ridge National Laboratory,* **Zachary Mills** - *Oak Ridge National Laboratory*

Combustion Modes and Emissions from Ammonia-Hydrogen Fuel Blends in Spark-Ignition Engines
ICEF2022-100485
Track 8: Posters
Shawn Reggeti - *University of Minnesot,* **Seamus Kane** - *University of Minnesota,* **William Northrop** - *University of Minnesota*

A Hybrid Vof-Lagrangian Eulerian Approach for Uws Sprays
ICEF2022-100396
Track 8: Posters
Andrea Strzelec - *University of Wisconsin-Madison, College of Engineering,* **Mario Trujillo** - *University of Wisconsin-Madison Engine Research Center.* **Mohan Ananth** - *University of Wisconsin-Madison Engine Research Center*

MONDAY, OCTOBER 17, 2022

02-01 HYDROGEN AND AMMONIA
9:30AM–11:35AM **CHESAPEAKE & OHIO**

Sesson Chair: **Hailin Li** - *West Virginia University*
Session Chair: **Valentin Soloiu** - *Georgia Southern University*

Numerical Investigation of a Heavy-Duty Compression Ignition Engine Converted to Ammonia Spark Ignition Operation
ICEF2022-88071
Track 2: Fuels and Carbon Management
Jinong Liu - West Virginia University, Christopher Ulishney - *West Virginia University,* **Cosmin Dumitrescu** - *West Virginia University*

Hydrogen Enriched Ammonia Engines: Assessment of Hydrogen Concentration in the Fuel Feed from the Laminar Flame Speed Viewpoint
ICEF2022-88682
Track 2: Fuels and Carbon Management
Yuchao Yan - *Zhejiang University,* **Zhentao Liu** - *Zhejiang University,* **Jinlong Liu** - *Zhejiang University*

Influence of Exhaust Gas Recirculation on Nox Emissions of a Hydrogen Fueled Spark Ignition Engine
ICEF2022-89084
Track 2: Fuels and Carbon Management
Sebastian Oswald Söhnlein - *Ostbayerische Technische Hochschule (OTH) Amberg-Weiden,* **Jörn Alexander Judith** - *Karlsruhe University of Applied Sciences,* **Marco Taschek** - *Ostbayerische Technische Hochschule (OTH) Amberg-Weiden,* **Moritz Hammer** - *Ostbayerische Technische Hochschule (OTH) Amberg-Weiden,* **Maurice Kettner** - *Karlsruhe University of Applied Sciences*

Operating Range and Emissions From Ammonia-Hydrogen Mixtures in Spark-Ignited Engines
ICEF2022-91825
Track 2: Fuels and Carbon Management
Evan Swift - *University of Minnesota,* **Seamus Kane** - *University of Minnesota,* **William Northrop** - *University of Minnesota*

Numerical Study of Hydrogen Combustion in Wankel Rotary Engines
ICEF2022-90888
Track 2: Fuels and Carbon Management
Kevin Moreno Cabezas - *King Abdullah University of Science and Technology,* **Xinlei Liu** - *King Abdullah University of Science and Technology,* **Giovanni Vorraro** - *King Abdullah University of Science and Technology,* **Hong Im** - *King Abdullah University of Science and Technology.* **James Turner** - *King Abdullah University of Science and Technology*

03-02 COMBUSTION DIAGNOSTICS

9:30AM–11:35AM **MILWAUKEE**

Session Chair: **Marcis Jansons** - *Wayne State University*

Cycle-Resolved Emissions Analysis of Polyfuel Reciprocating Engines via In-Situ Laser Absorption Spectroscopy, ICEF2022-88543
Track 3: Advanced Combustion
Kevin K. Schwarm - *University of California, Los Angeles (UCLA),* **Nicolas Q. Minesi** - *University of California, Los Angeles (UCLA),* **Barathan Jeevaretanam** - *University of California, Los Angeles (UCLA),* **Sarah Enayati** - *University of California, Los Angeles (UCLA),* **Tsu-Chin Tsao** - *University of California, Los Angeles (UCLA),* **R. Mitchell Spearrin** - *University of California, Los Angeles (UCLA)*

Laminar Flame Speed Measurements of Primary Reference Fuels at Extreme Temperatures
ICEF2022-90501
Track 3: Advanced Combustion
Adam Susa - *Stanford University,* **Lingzhi Zheng** - *Stanford University,* **Zach Nygaard** - *Stanford University,* **Alison Ferris** - *Stanford University,* **Ronald Hanson** - *Stanford University*

Interaction and Ignition Process of Multiple Injections of Conventional and Oxygenated Fuels in an Optical, Heavy-Duty Diesel Engine
ICEF2022-90394
Track 3: Advanced Combustion
Rajavasanth Rajasegar - *Sandia National Laboratories,* **Aleš Srna** - *Sandia National Laboratories*

Optical Diagnostics of Passive Pre-Chamber Jet Ignition in a Modified Egr Diluted Gdi Engine
ICEF2022-88897
Track 3: Advanced Combustion
Dong Eun Lee - *Purdue University,* **Tianxiao Yu** - *Purdue University,* **Li Qiao** - *Purdue University*

Investigation of Flow and Flame Propagation in a Spark Ignition Direct Injection Engine Using Particle Image Velocimetry
ICEF2022-90622
Track 3: Advanced Combustion
Li Shen - *University of Oxford,* **Christopher Willman** - *University of Oxford,* **Richard Stone** - *University of Oxford*

The presenting author will not present in person during the conference. Attendees are encouraged to view the video on demand available on the conference app.

Technical Conference Schedule

04-01 ENGINE CONTROLS AND DIAGNOSTICS

9:30AM–11:35AM **NICKLE**

Session Chair: **Vitaly Prikhodko** - *Oak Ridge National Laboratory*

Machine Learning and Genetic Algorithm Method for Powertrain Development: Rapid Generation of Engine Calibration Maps
ICEF2022-91169
Track 4: Powertrain, Electrification, and Emissions Systems
Zachary Williams - *Southwest Research Institute,* **Prathik Meruva** - *Southwest Research Institute,* **Daniel Christopher Bitsis Jr.** - *Southwest Research Institute*

Reinforcement Learning Based Control of an Organic Rankine Cycle Waste Heat Recovery System Over a Drive Cycle for Heavy-Duty Diesel Engines
ICEF2022-94827
Track 4: Powertrain, Electrification, and Emissions Systems
Daniel Egan - *Clemson University,* **Bin Xu** - *Clemson University,* **Qilun Zhu** - *Clemson University,* **Robert Prucka** - *Clemson University*

Control-Oriented Ignition Delay Model Applied to Gasoline Compression Ignition
ICEF2022-89516
Track 4: Powertrain, Electrification, and Emissions Systems
Vittorio Ravaglioli - *University of Bologna,* **Fabrizio Ponti** - *University of Bologna,* **Giacomo Silvagni** - *University of Bologna,* **Matteo De Cesare** - *Marelli Europe SpA*

Intelligen CKC – a Tool for Motion Profile Generation and Optimisation in Free Piston Linear Generator Applications
ICEF2022-90071
Track 4: Powertrain, Electrification, and Emissions Systems
Sam Cockerill - *Libertine FPE Limited*

Machine Learning-Based Fault Detection and Diagnosis of Internal Combustion Engines Using an Optical Crank Angle Encoder
ICEF2022-88851
Track 4: Powertrain, Electrification, and Emissions Systems
Hosna Geraei - *McMaster University,* **Essam Seddik** - *Arab Academy for Sciences and Technology and Maritime Transport,* **Ghabi Neame** - *McMaster University,* **Yixin Huangfu** - *McMaster University,* **Saeid Habibi** - *McMaster University*

The presenting author will not present in person during the conference. Attendees are encouraged to view the video on demand available on the conference app.

06-04 NOVEL PROPULSION CONCEPTS

9:30AM–11:35AM **BALTIMORE & OHIO**

Session Chair: **Anqi Zhang** - *Aramco Services Company: Aramco Research Center - Detroit*

Parametric Studies of Deflagration-to-Detonation Transition in a Pre-Chamber/Main-Chamber System
ICEF2022-89674
Track 6: Modeling and Simulation
Rui Xuan Zhu - *University of Oxford,* **Shizhi Tang** - *Shanghai Jiao Tong University,* **Shuyue Lai** - *Shanghai Jiao Tong University,* **Xiaohang Fang** - *University of Oxford*, **Martin Davy** - *University of Oxford,* **Chao Xu** - *Energy Systems Division, Argonne National Laboratory*

A Computational Assessment of Combustion Submodels for Predictive Simulations of Pre-Chamber Combustion Engines
ICEF2022-90917
Track 6: Modeling and Simulation
Mickael Silva - *King Abdullah University of Science and Technology,* **Xinlei Liu** - *KAUST,* **Ponnya Hlaing** - *KAUST,* **Emre Cenker** - *Saudi Aramco,* **James Turner** - *KAUST,* **Hong Im** - *KAUST*

Effect of Port Angle on Swirl and Closed Cycle Performance of an Opposed Piston 2-Stroke Engine
ICEF2022-91182
Track 6: Modeling and Simulation
Patrick O'Donnell - *Clemson University*

Numerical Analysis of the Effect of Pre-Injection Strategy on Performance and Emissions of a Two-Stroke Opposed-Piston Engine
ICEF2022-90896
Track 6: Modeling and Simulation
Rafael Menaca - *King Abdullah University of Science and Technology,* **Giovanni Vorraro** - *King Abdullah University of Science and Technology,* **Mickael Silva** - *King Abdullah University of Science and Technology,* **Hong Im** - *King Abdullah University of Science and Technology,* **James Turner** - *King Abdullah University of Science and Technology*

Multi-Dimensional Computational Investigation of a Bottoming Internal Combustion Engine for a Hybrid Solid Oxide Fuel Cell System
ICEF2022-91247
Track 6: Modeling and Simulation
Ioannis Nikiforakis - *Stony Brook University,* **Amr Shaalan** - *Stony Brook University,* **Zhongnan Ran** - *Stony Brook University,* **Rodrigo Ristow Hadlich** - *Stony Brook University,* **Jason Loprete** - *Stony Brook University,* **Dimitris Assanis** - *Stony Brook University*

02-02 FUEL PROPERTY EFFECTS

1:00PM–2:40PM **CHESAPEAKE & OHIO**

Session Chair: **Hailin Li** - *West Virginia University*
Session Chair: **Valentin Soloiu** - *Georgia Southern University*

Using Machine Learning to Predict Derived Cetane Number and Fuel Similarity
ICEF2022-89295
Track 2: Fuels and Carbon Management
Jim Cowart - *US Navy,* **Terrence Dickerson** - *US Navy,* **Andy Mcdaniel** - *US Navy,* **Dianne Luning Prak** - *US Navy*

Effect of Ethanol Addition on the Laminar Burning Velocity of Gasoline Surrogates With Toluene
ICEF2022-90452
Track 2: Fuels and Carbon Management
Varun Shankar - *University of Oxford,* **Xiaohang Fang** - *University of Oxford,* **Nathan Hinton** - *University of Oxford,* **Martin Davy** - *University of Oxford,* **Felix Leach** - *University of Oxford*

Predicting the Cetane Number, Sooting Tendency, and Energy Density of Terpene Fuel Additives
ICEF2022-91163
Track 2: Fuels and Carbon Management
Travis Kessler - *University of Massachusetts Lowell,* **Amina Sublaban** - *University of Massachusetts Lowell,* **J. Hunter Mack** - *University of Massachusetts Lowell*

Exploring the Benefits of Oxidative Coupling of Methane on Natural Gas Engine Efficiency Through One-Dimensional Simulation
ICEF2022-91822
Track 2: Fuels and Carbon Management
Evan Swift - *University of Minnesota,* **Chaitanya Wadkar** - *University of Minnesota,* **Lee Hyewon** - *University of Minnesota,* **Satbir Singh** - *Carnegie Mellon University,* **William Northrop** - *University of Minnesota*

03-01 DUAL FUEL COMBUSTION

1:00PM–2:40PM **MILWAUKEE**

Session Chair: **Cosmin Dumitrescu** - *West Virginia University*
Session Chair: **Gokul Vishwanathan** - *Propane Education & Research Council*

Method to Reach High Substitution of an Ammonia Fueled Engine Using Dual Fuel RCCI and Active Combustion Control _x000B_
ICEF2022-88759
Track 3: Advanced Combustion
Domenico Chiera - *Woodward, Inc,* **James Wood** - *Woodward, Inc,* **Andrew Jones** - *Woodward,* **Michael Buehner** - *Woodward, Inc,* **Nolan Polley** - *Woodward, Inc,* **Greg Hampson** - *Woodward*

Injection Strategies for Pomdme and Diesel With Premixed Natural Gas on a Dual-Fuel Combustion, ICEF2022-90926
Track 3: Advanced Combustion
Deivanayagam Hariharan - *The University of Alabama,* **Sundar Krishnan** - *The University of Alabama,* **Kalyan Srinivasan** - *The University of Alabama, Tuscaloosa*

An Experimental Comparison of Cyclic Variations in Diesel-Natural Gas and POMDME-Natural Gas Dual Fuel Combustion
ICEF2022-91094
Track 3: Advanced Combustion
Abhinandhan Narayanan - *The University of Alabama, Tuscaloosa,* **Deivanayagam Hariharan** - *The University of Alabama,* **Sundar Krishnan** - *The University of Alabama,* **Kalyan Srinivasan** - *The University of Alabama*

Impact of Discharge Current Profiling on Ignition Characteristics of Hydrogen/Methane Blends
ICEF2022-88393
Track 3: Advanced Combustion
Long Jin - *University of Windsor,* **Simon Leblanc** - *University of Windsor,* **Xiaoxi Zhang** - *University of Windsor,* **Alex Bastable** - *University of Windsor,* **Tjong Jimi** - *University of Windsor,* **Ming Zheng** - *University of Windsor*

Technical Conference Schedule

05-01 EXPERIMENTAL SPRAY DIAGNOSTICS

1:00PM–2:40PM **NICKLE**

Session Chair: **Joshua Bittle** - *University of Alabama*

Investigation of the Spray Characteristics Under Conditions of Marine Diesel Engine Using Image Processing Technique
ICEF2022-89640
Track 5: Fuel Injection and Sprays
Long Liu - *Harbin engineering university,* **Chen An** - *Harbin engineering university,* **Yang Wang - Harbin engineering university, Qian Xiong** - *Harbin engineering university*

Sooting Behavior of Commercial and Bio-Derived Butyl-Acetate/N-Heptane Blends in High-Pressure Spray Combustion Experiments
ICEF2022-90634
Track 5: Fuel Injection and Sprays
Anna Stevenson - *University of Alabama,* **Allen Parker** - *University of Alabama,* **Shawn Reggeti** - *University of Alabama,* **Ajay Agrawal** - *University of Alabama,* **Joshua Bittle** - *University of Alabama*

Experimental Investigation of Spray Characteristics From Medium-Duty Single- and Multi-Hole Injectors Using Diesel and Gasoline Fuels: Non-Reacting and Non-Vaporizing Conditions
ICEF2022-90978
Track 5: Fuel Injection and Sprays
Ji-Woong Park - *Argonne National Lab, Aramco Americas: Aramco Research Center – Detroit,* **Shirin Jouzdani** - *Michigan Technological University,* **Colton Haataja** - *Michigan Technological University,* **Henry Schmidt** - *Michigan Technological University,* **William Atkinson** - *Michigan Technological University,* **Jeffrey Naber** - *Michigan Technological University,* **Tommy Tzanetakis** - *Aramco Americas: Aramco Research Center – Detroit,* **Yuanjiang Pei** - *Aramco Americas: Aramco Research Center – Detroit,* **Feng Tao** - *Cummins Inc.,* **Rajesh Garg** - *Cummins Inc.,* **David Langenderfer** - *Cummins Inc.,* **Yu Zhang** - *Aramco Americas: Aramco Research Center – Detroit,* **Sibendu Som** - *Argonne National Laboratory*

Experimental Investigation of Gasoline Direct Injection (GDI) Sprays Using Diffused Back Illumination (DBI) and Structured Laser Illumination Planar Imaging (SLIPI) Techniques
ICEF2022-90951
Track 5: Fuel Injection and Sprays
Anurag Gaur - *Indian Institute of Technology Delhi,* **Akhil Ailaboina** - *Indian Institute of Technology Delhi,* **Kaushik Saha** - *Indian Institute of Technology Delhi*

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06-01 SI ENGINE MODELING

1:00PM–2:40PM **BALTIMORE & OHIO**

Session Chair: **Noah Van Dam** - *University of Massachusetts Lowell*

Impact of Low- and High-Temperature Chemistry on Engine Knock Prediction
ICEF2022-90780
Track 6: Modeling and Simulation
Ahmet Serhat Bahar - *Syracuse University,* **Benjamin Akih-Kumgeh** - *Syracuse University*

Evaluation of Spray and Combustion Models for Simulating Dilute Combustion in a Direct-Injection Spark-Ignition Engine
ICEF2022-90213
Track 6: Modeling and Simulation
Joohan Kim - *Argonne National Laboratory,* **Muhsin Ameen** - *Argonne National Laboratory,* **Riccardo Scarcelli** - *Argonne National Laboratory,* **Namho Kim** - *Sandia National Laboratories,* **Eshan Singh** - *Sandia National Laboratories,* **Magnus Sjöberg** - *Sandia National Laboratories*

Predicting Combustion Variability Using Machine Learning From the Flow Field Data at Spark Timing for a Gasoline Direct Injection Engine
ICEF2022-91016
Track 6: Modeling and Simulation
Daniel Probst - *Convergent Science,* **Nitesh Attal** - *Convergent Science, Inc,* **Raju Mandhapati** - *Convergent Science, Inc,* **Oshin Avanessian** - *Convergent Science, Inc*

Simulation of Spray, Wall-Film, and Charge Preparation for Light-Duty, Cold-Start Applications
ICEF2022-91141
Track 6: Modeling and Simulation
Kevin Dean Edwards - *Oak Ridge National Laboratory*

04-02 EMISSIONS CONTROL SYSTEMS
4:45PM–6:00PM **NICKLE**

Session Chair: **Vittorio Ravaglioli** - *University of Bologna*

Control-Oriented Reduced-Order Modelling of Conversion Efficiency in Dual-Layer Washcoat Catalysts With Accumulation and Oxidation Functions
ICEF2022-88510
Track 4: Powertrain, Electrification, and Emissions Systems
Pedro Piqueras - *Universitat Politècnica de València - CMT-Motores Térmicos,* **Benjamín Pla** - *Universitat Politècnica de València - CMT-Motores Térmicos,* **Enrique José Sanchis** - *Universitat Politècnica de València - CMT-Motores Térmicos,* **Elena García** - *Universitat Politècnica de València - CMT-Motores Térmicos*

Analysis of Combustion Characteristics and Tailpipe Emissions of Spark-Ignition Engines During the Three-Way Catalyst Warm-Up Phase
ICEF2022-88806
Track 4: Powertrain, Electrification, and Emissions Systems
Pedro Piqueras - *Universitat Politècnica de València,* **Joaquin De la Morena** - *Universitat Politècnica de Valencia,* **Enrique José Sanchis** - *Universitat Politècnica de València,* **Rafael Pitarch** - *Universitat Politècnica de València*

A Design Approach of a Dedicated EGR-System for a Naturally Aspirated_x000B_Gas Engine - From 1D Engine Process Simulation and Design of Experiments Up to the Experimental Validation
ICEF2022-89044
Track 4: Powertrain, Electrification, and Emissions Systems
Youssef Beltaifa - *Karlsruhe University of Applied Sciences,* **Maurice Kettner** - *Karlsruhe University of Applied Sciences,* **Peter Eilts** - *Technical University of Braunschweig,* **Bosse Ruchel** - *WJ Power GmbH*

07-02 FRICTION AND LUBRICATION
4:45PM–6:00PM **MILWAUKEE**

Session Chair: **Dan Richardson, Ph.D.** - *Cummins Inc.*

Minimizing Boundary Friction in Diesel Engines Piston Assembly:x000B_Testing the Rotating Liner Engine Prototype Under Load
ICEF2022-88867
Track 7: Design, Lubrication, and Thermal Management
Amiyo Basu - *University of Texas at Austin,* **Dimitrios Dardalis** - *RSET, Inc.,* **Matt Hall** - *UT Austin,* **Ronald D. Matthews** - *University of Texas at Austin*

A Study of Seizure Mechanism at Around the Piston Pin of a Medium Duty Diesel Engine
ICEF2022-90273
Track 7: Design, Lubrication, and Thermal Management
Yunosuke Sihirotori - *Tokyo city university,* **Takuya Takuya** - *Tokyo City University,* **Akemi Ito** - *Tokyo City University*

A Study on the Oil Film Thickness Between the Lower Rail of Oil Control Ring and Lower Flank of Oil Control Ring Groove of an Engine
ICEF2022-90881
Track 7: Design, Lubrication, and Thermal Management
Ken Miura - *Tokyo City University,* **Akemi Ito** - *Tokyo City University,* **Yuta Nakamura** - *Tokyo City University,* **Rina Yamada** - *Tokyo City University,* **Koichi Nishibe** - *Tokyo City University,* **Miyuki Usui** - *Riken Corporation,* **Naoki Iijima** - *Riken Corporation*

01-02 COMPONENTS AND MATERIALS
4:45PM–6:00PM **CHESAPEAKE & OHIO**

Session Chair: **Munidhar Biruduganti** - *Argonne National Laboratory*

Development of a Lead-Free Bronze Bearing Alloy With Improved Conformability and Seizure Performance,
ICEF2022-88792
Track 1: Off-Road Systems
Jennifer Harvey - *MAHLE Engine Systems UK Ltd.,* **John Stearns** - *MAHLE Industries, Incorporated,* **Jack Merchant** - *MAHLE Engine Systems UK Ltd.*

Deep Learning for Surface Assessment of Cylinder Liners in Large Internal Combustion Engines
ICEF2022-89893
Track 1: Off-Road Systems
Matthias Schwab - *University of Innsbruck,* **Adéla Moravová** - *University of Innsbruck,* **Christoph Angermann** - *University of Innsbruck,* **Steinbjörn Jónsson** - *INNIO Jenbacher GmbH & Co OG,* **Christian Laubichler** - *LEC GmbH,* **Constantin Kiesling** - *LEC GmbH,* **Markus Haltmeier** - *University of Innsbruck*

Aerosol Separation and Pressure Control of a Smart Crankcase Ventilation System
ICEF2022-90191
Track 1: Off-Road Systems
Niclas Nowak - *UT99 AG,* **Christian Sirtl** - *UT99 AG,* **Othmar Rymann** - *UT99 AG,* **Paul Flynn** - *UT99 AG,* **Christian Stieler** - *UT99 AG,* **Marc-Tran Heller** - *UT99 AG*

02-04 FUEL BLENDS
4:45PM–6:00PM **ILLINOIS CENTRAL**

Session Chair: **Valentin Soloiu** - *Georgia Southern University*
Session Chair: **Hunter Mack** - *University of Massachusetts Lowell*

The Potential of High-Octane Fuel Blend Stocks on Efficiency and Emissions of a Miller Cycle Hybrid Engine, ICEF2022-90197
Track 2: Fuels and Carbon Management
Xin Yu - *Aramco Americas Company,* **Andrew Baur** - *Aramco Americas Company,* **Alexander Voice** - *Aramco Americas Company*

Soot Emissions Characterization of Butyl-Acetate/diesel Blend in Heavy-Duty Engine Using Opacity, Size Distribution, and Mass Concentration Measurements
ICEF2022-90629
Track 2: Fuels and Carbon Management
Spencer Hall - *University of Alabama,* **Joshua Bittle** - *University of Alabama*

06-05 LOW CARBON FUEL COMBUSTION
4:45PM–6:00PM **BALTIMORE & OHIO**

Session Chair: **Le Zhao** - *Aramco Americas: Aramco Research Center - Detroit*

Numerical Investigation of Knocking Tendency in a Hydrogen Fueled Si Engine
ICEF2022-90681
Track 6: Modeling and Simulation
Hammam Aljabri - *King Abdullah University of Science and Technology,* **Xinlei Liu** - *King Abdullah University of Science and Technology,* **Moaz Allehaibi** - *King Abdullah University of Science and Technology and Umm AlQura University,* **Moez Ben Houidi** - *King Abdullah University of Science and Technology,* **Fahad Almatrafi** - *King Abdullah University of Science and Technology,* **Hong Im** - *King Abdullah University of Science and Technology*

Understanding Ammonia/Hydrogen Fuel Combustion Modeling in a Quiescent Environment,
ICEF2022-91185
Track 6: Modeling and Simulation
Amr Shaalan - *Stony Brook University,* **Mdnayer Nasim** - *University of Massachusetts Lowell,* **Hunter Mack** - *University of Massachusetts Lowell,* **Noah Van Dam** - *University of Massachusetts Lowell,* **Dimitris Assanis** - *Stony Brook University*

Accelerating Chemical Kinetics Calculations With Physics Informed Neural Networks
ICEF2022-90371
Track 6: Modeling and Simulation
Ahmed Almeldein - *Francis College of Engineering, University of Massachusetts Lowell,* **Noah Van Dam** - *Francis College of Engineering, University of Massachusetts Lowell*

TUESDAY, OCTOBER 18, 2022

05-02 COMPUTATIONAL SPRAY CHARACTERIZATION
9:30AM–11:35AM **NICKLE**

Session Chair: Joshua Bittle - *University of Alabama*

Study of Injector Geometry and Parcel Injection Location on Spray Simulation of the ECN Spray G Injector
ICEF2022-89279
Track 5: Fuel Injection and Sprays
Aman Kumar - *University of Massachusetts Lowell,* **Noah E Van Dam** - *University of Massachusetts Lowell*

Inducing Viscosity Effects Into Simple Spray Modeling for Flexible-Fuel Injection System of Diesel Engine
ICEF2022-89643
Track 5: Fuel Injection and Sprays
Long Liu - *Harbin Engineering University,* **Qihao Mei** - *Harbin Engineering University*

Application of Modal Decomposition Techniques to Characterize the Internal Nozzle Flow of a Medium-Duty Diesel Injector Operating With Gasoline-Like Fuels
ICEF2022-89520
Track 5: Fuel Injection and Sprays
Katherine J. Asztalos - *Argonne National Laboratory,* **Roberto Torelli** - *Argonne National Laboratory,* **Yuanjiang Pei** - *Aramco Americas: Aramco Research Center - Detroit,* **Yu Zhang** - *Aramco Americas: Aramco Research Center - Detroit,* **Feng Tao** - *Cummins, Inc. - Cummins Tech Center,* **Rajesh Garg** - *Cummins, Inc. - Cummins Tech Center,* **David Langenderfer** - *Cummins, Inc. - Cummins Tech Center,* **Chi Young Moon** - *Argonne National Laboratory,* **Brandon A. Sforzo** - *Argonne National Laboratory,* **Christopher F. Powell** - *Argonne National Laboratory*

Numerical Investigation of Spray Characteristics in a Direct-Injection Spark-Ignition Engine Under Cold Conditions
ICEF2022-90608
Track 5: Fuel Injection and Sprays
Krishna Kalvakala - *Argonne National Laboratory,* **Le Zhao** - *Aramco Americas: Aramco Research Center,* **Anqi Zhang** - *Aramco Americas: Aramco Research Center,* **Roberto Torelli** - *Argonne National Laboratory,* **Hengjie Guo** - *Argonne National Laboratory,* **Yuanjiang Pei** - *Aramco Americas: Aramco Research Center,* **Muhsin Ameen** - *Argonne National Laboratory,* **Joohan Kim** - *Argonne National Laboratory*

Phenomenological Model Development of Flash Boiling Spray for Multi-Hole Gasoline Direct Injection (GDI) Systems
ICEF2022-90966
Track 5: Fuel Injection and Sprays, **Akhil Ailaboina** - *Indian Institute of Technology Delhi,* **Kaushik Saha** - *Indian Institute of Technology Delhi*

The presenting author will not present in person during the conference. Attendees are encouraged to view the video on demand available on the conference app.

02-03 AVIATION AND ALCOHOL FUELS
9:30AM–11:35AM **CHESAPEAKE & OHIO**

Session Chair: **Hunter Mack** - *University of Massachusetts Lowell*
Session Chair: **Hailin Li** - *West Virginia University*

Combustion and Flame Characteristics of CI-ODH Byproduct Fuel Mixture With High CO2 Dilution
ICEF2022-89770
Track 2: Fuels and Carbon Management
Kaushik Nonavinakere Vinod - *North Carolina State University,* **Matt Gore** - *North Carolina State University,* **Tiegang Fang** - *North Carolina State University*

Comparing the Injection Strategy of Gasoline Compression Ignition vs. Alcohol Compression Ignition: A Partial Review and Experimental Comparison
ICEF2022-90624
Track 2: Fuels and Carbon Management
Brian Gainey - *Clemson University,* **Ziming Yan** - *Clemson University,* **John Gandolfo** - *Clemson University,* **Benjamin Lawler** - *Clemson University*

Investigations Into the Performance and Emissions Characteristics of FT Synthetic Aviation Fuel, Isoparaffinic Kerosene (IPK), in a Single-Cylinder Indirect Injection (IDI) Engine
ICEF2022-90999
Track 2: Fuels and Carbon Management
Valentin Soloiu - *Georgia Southern University,* **Amanda Weaver** - *Georgia Southern University,* **Lily Parker** - *Georgia Southern University,* **Richard Smith Iii** - *Georgia Southern University,* **Austin Brant** - *Georgia Southern University,* **Dillan Brock** - *Georgia Southern University,* **Marcel Ilie** - *Georgia Southern University*

Development of a Synthetic Surrogate for F-24 From Blends of Iso-Paraffinic Kerosene (IPK) and Fischer-Tropsch Synthetic Kerosene (S8) in a Constant Volume Combustion Chamber (CVCC)
ICEF2022-91028
Track 2: Fuels and Carbon Management
Valentin Soloiu - *Georgia Southern University,* **Lily Parker** - *Georgia Southern University,* **Richard Smith Iii** - *Georgia Southern University,* **Amanda Weaver** - *Georgia Southern University,* **Austin Brant** - *Georgia Southern University,* **Aidan Rowell** - *Georgia Southern University,* **Marcel Ilie - Georgia Southern University**

Combustion characteristics of F24 compared to Jet A in a Common Rail Direct Injection Research Compression Ignition Engine,
ICEF2022-91113
Track 2: Fuels and Carbon Management
Valentin Soloiu - *Georgia Southern University,* **Richard Collins Smith Iii** - *Georgia Southern University,* **Amanda Weaver** - *Georgia Southern University,* **Lily Parker** - *Georgia Southern University,* **Dillan Brock** - *Georgia Southern University,* **Aidan Rowell** - *Georgia Southern University,* **Marcel Ilie** - *Georgia Southern University*

03-03 COMPRESSION IGNITION STRATEGIES
9:30AM–11:35AM **MILWAUKEE**

Session Chair: **Cosmin Dumitrescu** - *West Virginia University*

Session Chair: **Gokul Vishwanathan** - *Propane Education and Research Council*

Impact of Ignition Assistant on Combustion of Cetane 30 and 35 Jet-Fuel Blends in a Compression-Ignition Engine at Moderate Load and Speed
ICEF2022-90704
Track 3: Advanced Combustion
Niranjan Miganakallu - *University of Wisconsin - Madison,* **Jacob Stafford** - *University of Wisconsin - Madison,* **Eri R. Amezcua** - *University of Wisconsin - Madison,* **Kenneth Kim** - *Combat Capabilities Development Command Army Research Laboratory,* **Chol-Bum Mike Kweon** - *Combat Capabilities Development Command Army Research Laboratory,* **David A. Rothamer** - *University of Wisconsin Madison*

Multi-Cylinder Hd Gasoline Compression Ignition Experimental Results on an Unmodified 13l Diesel Engine With Regular Grade Gasoline
ICEF2022-90763
Track 3: Advanced Combustion
Scott Curran - *ORNL*

Experimental Assessment of Gasoline Compression Ignition at Medium- to Full-Load in a Heavy Duty Multi Cylinder Diesel Engine
ICEF2022-90965
Track 3: Advanced Combustion
Rafael Lago Sari - *Aramco Americas,* Brock Merri - *Aramco Americas,* Jiwoong Park - *Aramco Americas,* Yuanjiang Pei - *Aramco Americas*, Yu Zhang - *Aramco Americas,* Michael Traver - *Aramco Americas*

Development of 2-Step Exhaust Rebreathing for a Low-Nox Light-Duty Gasoline Compression Ignition Engine
ICEF2022-91053
Track 3: Advanced Combustion
Praveen Kumar - *Aramco Americas,* Mark Sellnau - *Aramco Americas*

Experimental Study on Spark Assisted and Hot Surface Assisted Compression Ignition (SACI, HSACI) in a Naturally Aspirated Single-Cylinder Gas Engine
ICEF2022-89494
Track 3: Advanced Combustion
Joern Alexander Judith - *Karlsruhe University of Applied Sciences,* Maurice Kettner - *Karlsruhe University of Applied Sciences,* Danny Schwarz - *SenerTec Kraft-Waerme-Energiesysteme GmbH,* Markus Klaissle - *SenerTec Kraft-Waerme-Energiesysteme GmbH,* Thomas Koch - *Karlsruhe Institute of Technology*

06-03 PROPULSION TECHNOLOGY SYSTEM-LEVEL MODELING
9:30AM–11:35AM **BALTIMORE & OHIO**

Session Chair: **Yu Zhang** - *Aramco Americas*

Modeling the Liquid Properties of E10 Gasoline for Application in Hydraulic and Combustion System Simulations at High Injection Pressures – Validation With Experimental Measurements
ICEF2022-89518
Track 6: Modeling and Simulation
Tommy Tzanetakis - *Aramco Americas: Aramco Research Center - Detroit,* Ji-Woong Park - *Argonne National Laboratory,* Alexander K. Voice - *Aramco Americas: Aramco Research Center - Detroit*

An Integrated System-Level Analysis on Using Exhaust Rebreathing for Enhanced Thermal Management in a Heavy-Duty Diesel Engine
ICEF2022-91049
Track 7: Design, Lubrication, and Thermal Management
Praveen Kumar - *Aramco Americas*

Towards Meeting Future Light-Duty Engine Emissions Requirements Using a Simulation-Based Evaluation of Reduced Turbocharger and Manifold Thermal Inertia
ICEF2022-98883
Track 6: Modeling and Simulation
Shakti Saurabh - *Cummins Inc.*

Application of 48v Mild-Hybrid Technology for Meeting Ghg and Low Nox Emission Regulations for Mhd Applications
ICEF2022-98975
Track 6: Modeling and Simulation
Satyum Joshi - *FEV,* Dhanraj Fnu - *FEV North America*

Assessing the Potential of Next Generation Powertrain Technologies for Distribution Truck Applications
ICEF2022-90959
Track 6: Modeling and Simulation
Rafael Lago Sari - *Aramco Americas,* Yu Zhang - *Aramco Americas,* Nayan Engineer - *Aramco Americas*

01-01 COMBUSTION ANALYSIS
1:00PM–3:05PM **CHESAPEAKE & OHIO**

Session Chair: **Christopher Stoos** - *Southwest Research Institute*

Investigation of the Influence of Alternative Spark Plug Electrode Material on Ignition Behavior
ICEF2022-88217
Track 1: Off-Road Systems
Anton Tilz - *LEC GmbH,* Manuel Gruber - *Department Materials Science Lehrstuhl für Struktur- und Funktionskeramik Montanuniversität Leoben,* Walter Harrer - *Department Materials Science Lehrstuhl für Struktur- und Funktionskeramik Montanuniversität Leoben,* Michael Engelmayer - *LEC Graz,* Wolfgang Fimml - *Innio Jenbach,* Marc Klawitter - *Institute of Thermodynamics and Sustainable Propulsion Systems,* Andreas Wimmer - *Institute of Thermodynamics and Sustainable Propulsion Systems*

Numerical Modeling and Analysis of Energy-Assisted Compression Ignition of Varying Cetane Number Jet Fuels for High-Altitude Operation
ICEF2022-89329
Track 1: Off-Road Systems
Harsh Darshan Sapra - *University of Wisconsin-Madison,* **Randy Hessel** - *University of Wisconsin-Madison,* **Eri Amezcua Cuellar** - *University of Wisconsin-Madison,* **Jacob Stafford** - *University of Wisconsin-Madison,* **Niranjan Miganakallu** - *University of Wisconsin-Madison,* **David Rothamer** - *University of Wisconsin-Madison,* **Kenneth Kim** - *DEVCOM Army Research Laboratory,* **Chol-Bum M. Kweon** - *DEVCOM Army Research Laboratory,* **Sage Kokjohn** - *University of Wisconsin-Madison*

Combustion and Emission Performance of a Syngas-Diesel Dual-Fuel Generator
ICEF2022-90473
Track 1: Off-Road Systems
Aysegul Arslan - *National Research Council Canada and University of Manitoba,* **Shouvik Dev** - *National Research Council Canada,* **Amin Yousefi** - *National Research Council Canada,* **David Stevenson** - *National Research Council Canada,* **Brian Liko** - *National Research Council Canada,* **James Butler** - *National Research Council Canada,* **Hongsheng Guo** - *National Research Council Canada,* **Madjid Birouk** - *University of Manitoba*

Effects of Biogas Flow Rate and Composition on Combustion and Emissions of a Small Biogas-Diesel Dual-Fuel Generator
ICEF2022-90487
Track 1: Off-Road Systems
Roya Missaghian - *National Research Council Canada,* **Shouvik Dev** - *National Research Council Canada,* **David Stevenson** - *National Research Council Canada,* **Hongsheng Guo** - *National Research Council Canada*

06-02 LARGE ENGINE MODELING
1:00PM–3:05PM **BALTIMORE & OHIO**

Session Chair: **Muhsin Ameen** - *Argonne National Laboratory*

A CFD Study on Mixture Preparation and Combustion in a Heavy-Duty Locomotive Diesel Engine at High Load Condition
ICEF2022-90293
Track 6: Modeling and Simulation
Srinivasa Krishna Addepalli - *Argonne National Laboratory,* **Gina Magnotti** - *Argonne National Laboratory,* **Sibendu Som** - *Argonne National Laboratory,* **Pushkar Sheth** - *Wabtec Corporation,* **Vijayaselvan Jayakar** - *Wabtec Corporation,* **Adam Klingbeil** - *Wabtec Corporation,* **Thomas Lavertu** - *Wabtec Corporation*

Design Optimization of an Ethanol Heavy-Duty Engine Using Design of Experiments and Bayesian Optimization
ICEF2022-90257
Track 6: Modeling and Simulation
Bulut Tekgul - *Argonne National Laboratory,* **I-Han Liu** - *Argonne National Laboratory,* **Manohar Vittal** - *ClearFlame Engines,* **Robert Schanz** - *ClearFlame Engines,* **Julie Blumreiter** - *ClearFlame Engines,* **Bernard H. Johnson** - *ClearFlame Engines,* **Gina Magnotti** - *Argonne National Laboratory*

An Experimental and Numerical Investigation to Improve the Efficiency of Combustion Systems for Heavy-Duty Applications
ICEF2022-87445
Track 6: Modeling and Simulation
Jaykumar Yadav - *Chair for Thermodynamics of Mobile Energy Systems, RWTH Aachen University,* **Stefan Pischinger** - *Chair for Thermodynamics of Mobile Energy Systems, RWTH Aachen University,* **Sascha Schönfeld** - *FEV Europe GmbH,* **Kai Deppenkemper** - *FEV Europe GmbH*

Numerical Optimization of Cold Operation Assisting Strategies in a Heavy-Duty Gasoline Compression Ignition Engine
ICEF2022-88788
Track 6: Modeling and Simulation
Le Zhao - *Aramco Americas: Aramco Research Center – Detroit,* **Yu Zhang** - *Aramco Americas: Aramco Research Center – Detroit,* **Yuanjiang Pei** - *Aramco Americas: Aramco Research Center – Detroit,* **Anqi Zhang** - *Aramco Americas: Aramco Research Center – Detroit,* **Muhsin Ameen** - *Argonne National Laboratory*

03-04 PRE-CHAMBERS AND NOVEL TECHNOLOGIES
1:00PM–3:05PM **MILWAUKEE**

Session Chair: **Cosmin Dumitrescu** - *West Virginia University*

Session Chair: **Gokul Vishwanathan** - *Propane Education and Research Council*

Direct Injection Strategy to Extend the Lean Limit of a Passive Pre-Chamber
ICEF2022-89021
Track 3: Advanced Combustion
Fahad Almatrafi - *King Abdullah University of Science and Technology,* **Kalim Uddeen** - *King Abdullah University of Science and Technology,* **Moez Ben Houidi** - *King Abdullah University of Science and Technology* **Emre Cenker** - *Transport Technology R&D, Saudi Aramco,* **James W. Turner** - *King Abdullah University of Science and Technology*

Investigation on the Effects of Passive Pre-Chamber Ignition System and Geometry on Engine Knock Intensity
ICEF2022-90594
Track 3: Advanced Combustion
Francesco Di Sabatino - *Sandia National Laboratories,* **Pablo Jose Martinez-Hernandiz** - *CMT Motores Termicos, Universitat Politècnica de València,* **Ricardo Novella Rosa** - *CMT Motores Termicos, Universitat Politècnica de València,* **Isaac Ekoto** - *Sandia National Laboratories*

Cooled Spray Technology for Particulate Reduction in a Heavy-Duty Engine
ICEF2022-90604
Track 3: Advanced Combustion
Adam Klingbeil - *Wabtec,* **Brett Heher** - *Wabtec Corporation,* **Manuel Flores** - *Wabtec Corporation,* **Antonio Triana Padilla** - *Wabtec Corporation,* **Thomas Lavertu** - *Wabtec Corportation,* **Tristen Tinar** - *Southwest Research Institute,* **Scott Ellis** - *Southwest Research Institute*

Exploring the Oxy-Fuel Combustion in Spark-Ignition Engines for Future Clean Powerplants
ICEF2022-89167
Track 3: Advanced Combustion
José Ramón Serrano - *CMT - Motores Térmicos,* **Jaime Martin** - *CMT - Motores Térmicos,* **Josep Gomez-Soriano** - *CMT - Motores Térmicos,* **Rodrigo Raggi** - *CMT - Motores Térmicos*

07-01 EFFICIENCY AND THERMAL MANAGEMENT
1:00PM–3:05PM **ILLINOIS CENTRAL**

Session Chair: **David Rutledge** - *Cummins Inc.*
Session Chair: **Ambikapathy Naganathan** - *Cummins*

Thermoelectric Exhaust Heat Recovery to Maximize Brake Thermal Efficiency of Advanced Diesel Engines: Modeling and Baseline Analysis
ICEF2022-90505
Track 7: Design, Lubrication, and Thermal Management
Ratnak Sok - *Waseda University,* **Jin Kusaka** - *Waseda University*

Development of a Liquid-Phase Lpg Delivery System for Direct Injection, Spark-Ignited Engines

ICEF2022-91081
}Track 7: Design, Lubrication, and Thermal Management
Tanmay Kar - *Colorado State University,* **Toluwalase Fosudo** - *Colorado State University,* **Bret Windom** - *Colorado State University,* **Daniel Olsen** - *Colorado State University,* **Jensen Hoke** - *Czero Inc,* **Jeff Rogers** - *Czero Inc*

04-03 NOVEL EMISSION CONTROL TECHNOLOGIES
1:00PM–3:05PM **NICKLE**

Session Chair: **Jaime Martín** - *Universitat Politècnica de València*
Session Chair: **Pedro Piqueras** - *Universitat Politècnica de València*

Low Co2, Ultralow Nox Heavy Duty Diesel Opposed Piston Engine Results
ICEF2022-90255
Track 4: Powertrain, Electrification, and Emissions Systems
Ashwin Salvi - *Achates Power, Inc.,* **Cj Kalebjian** - *Achates Power Inc.,* **Laurence Fromm** - *Achates Power, Inc.*

An Experimental Study on the Performance and Durability of Nanostructured Spark Plugs
ICEF2022-90609
Track 4: Powertrain, Electrification, and Emissions Systems
Md Nayer Nasim - *University of Massachusetts Lowell,* **Behlol Nawaz** - *University of Massachusetts Lowell,* **Oliver A. Dyakov** - *University of Massachusetts Lowell,* **J. Hunter Mack** - *University of Massachusetts Lowell*

Temperature Dependent Removal Efficiency of Crankcase Emission Control Devices
ICEF2022-92020
Track 4: Powertrain, Electrification, and Emissions Systems
Myles Hicks - *University of Minnesota,* **Daniel Potratz** - *Cummins Inc.,* **William Northrop** - *University of Minnesota,* **David Kittelson** - *University of Minnesota*

Schedule at a Glance

Sunday, October 16	Monday, October 17	Tuesday, October 18	Wednesday, October 19
Executive Committee Meeting - CLOSED 8:00AM–5:00PM Illinois Central, First Fl.	**Registration** 7:00AM–6:30PM Grand Hall Foyer, First Fl.	**Registration** 7:00AM–5:00PM Grand Hall Foyer, First Fl.	**Registration** 7:00AM–1:00PM Executive Office Alcove 1st Floor(Hotel Side)
Registration 2:00PM–6:30PM Grand Hall Foyer, First Fl.	**Exhibits** 7:00AM–5:30PM Grand Hall North & South, First Fl.	**Exhibits** 7:00 AM–5:30PM Grand Hall North & South, First Fl.	**Breakfast** 6:30AM–7:30AM **Lunch** 12:00PM–1:00PM Grand Central Station A-D First Fl.
Exhibits 5:00PM–6:30PM Grand Hall North & South, First Fl.	**Breakfast** 7:00AM–8:00AM Edison North, Second Fl.	**Breakfast & Early Career Networking** 7:00AM–8:00AM Edison North, Second Fl.	**Technical Tour (2) Cummins Facilities** 7:30AM–12:00PM Offsite
Welcome Reception & Poster Session 5:00PM–6:30PM Grand Hall Bar, First Fl.	**Keynote** **Educating the Next Generation of Engineers to Help Bring the ICE Forward** 8:00AM–9:15AM Grand Hall, First Fl.	**Keynote** **A Critical and Credible Pathway to Zero Emissions** 8:00AM–9:15AM Grand Hall, First Fl.	**Low Climate Impact Propulsion Technologies Symposium, Sponsored by Aramco Americas** 1:00PM–5:00PM Grand Central Station A-D 1st Floor
	Break 9:15AM–9:30 AM Grand Hall North & SouthFirst Fl.	**Break** 9:15–9:30 AM Grand Hall North & SouthFirst Fl.	**Reception Sponsored by Aramco Americas** 5:00PM- 6:30PM Grand Central Station A-D First Fl.
	Technical Sessions 9:30AM–11:35PM Chesapeake & Ohio Milwaukee Baltimore & Ohio Nickle Illinois Central (Speaker Ready)	**Technical Sessions (5)** 9:30AM–11:35AM Chesapeake & Ohio Milwaukee Baltimore & Ohio Nickle Illinois Central (Speaker Ready)	
	Lunch, Sponsored by Caterpillar Undergraduate Research Competition Winner Presentations 11:35AM–1:00PM Grand Hall, First Fl.	**Lunch Keynote** **The Diesel Engine without the Diesel Fuel: Driving Rapid Decarbonization in Heavy Duty Applications** 11:35AM–1:00PM Grand Hall, First Fl.	

Schedule at a Glance

Sunday, October 16	Monday, October 17	Tuesday, October 18	Wednesday, October 19
	Technical Sessions 1:00PM–2:40PM Chesapeake & Ohio, Milwaukee, Baltimore & Ohio, Nickel, Illinois Central (Speaker Ready)	**Technical Sessions** 1:00PM–3:05PM Chesapeake & Ohio, Milwaukee, Baltimore & Ohio, Nickel, Illinois Central (Speaker Ready)	
	Break 2:40PM–3:00PM Grand Hall North & SouthFirst Fl.	**Break** 3:05PM–3:20PM Grand Hall North & SouthFirst Fl.	
	Panel Session **Moving Forward with the Internal Combustion Engine** 3:00PM–4:30PM Grand Hall, First Fl.	**Invited Lecture** **The Ever Evolving ICE** 3:20PM–4:20PM Grand Hall, First Fl.	
	Break 4:30PM–4:45PM Grand Hall North & South	**Break** 4:20PM–4:30PM Grand Hall North & South	
	Technical Sessions 4:45PM–6:00PM Chesapeake & Ohio, Milwaukee, Baltimore & Ohio, Nickel, Illinois Central (Speaker Ready)	**Associates Meeting** 4:30PM–5:30PM Edison South, Second Level	
	Awards Dinner Sponsored by Aramco Americas 6:30PM–9:30PM Grand Hall, First Fl.	**Technical Committee Meeting** 5:30PM -6:00PM Edison South, Second Level	
		100th Anniversary Networking Dinner Indianapolis Motor Speedway Museum (Transportation included) 6:30PM–10:00PM	

THE INTERNAL COMBUSTION ENGINE DIVISION – A BRIEF CENTENNIAL HISTORY

The American Society of Mechanical Engineers (ASME) was founded in 1880 to serve engineers practicing in the rapidly expanding field of mechanical engineering. Its founders considered the other national organizations – for civil engineering and mining engineering – as not broad enough to cover the diverse areas of mechanical engineering. But even ASME could not serve all disciplines, as others diversified into specialized societies, with a notable formation of a society for refrigeration engineers in 1904, with membership largely populated by ASME members. The nascent automobile industry was another actively growing area which ASME had to accommodate.

A driving force for creating an internal combustion engines subgroup within ASME was the foundation of the Society for Automotive Engineers in 1905. For the 1907 ASME annual meeting, Professor C.E. Lucke[i] organized a well-received, four-paper session on gas engines. He further coordinated a petition with 28 signatories to allow the formation of a professional section on gas power[ii], to extend the local section structure within ASME. ASME accommodated this request, with a charge that professional sections would rely on "broad local self-government", which is honored to the present.

In early 1908, ASME's first professional section — the Gas Power Section — was formed to coordinate efforts with internal combustion engines. The Section set precedents for the formation of other technical sections as well for the multi-track meeting format of modern ASME conferences[iii]. An administrative reorganization within ASME, however, led to the dissolution of the Section by 1914.

In 1921, with increasing interest after the First World War, the Gas Power Division was formed, and this Division evolved into the present-day Internal Combustion Engine Division over the next century. Even at that time the Division had a strong focus on papers and meetings. In 1924, the name was changed to the Oil and Gas Power Division. Also, that year, the first session of talks dedicated to internal combustion engines occurred during the ASME annual meeting. In 1927, after several years of holding joint meetings with other societies, the OGPD held its first stand-alone technical meeting on oil engines. In 1928, with the addition of exhibitors, the First National Meeting of the Oil and Gas Power Division was held. These annual national meetings continued for over half a century.

Other name changes followed to reflect the evolving prevalence of technologies. In 1965 the name was changed to the Diesel and Gas Engine Power Division, and in 1985 it became the Internal Combustion Engine Division, the name still in use almost 40 years later. Technical meetings continued on an annual basis, with the addition of the Fall Technical Conference in 1979. A Spring Technical Conference has been held intermittently since 1995. Several meeting series ran in coordination with other societies or divisions — the most notable of these was the Energy Sources Technology Conference and Exhibition series which was held 1977–1994.

Awards have been an important part of the Division to recognize professional service or leadership. The first of such was the OGPD Citation, instituted in 1947, with Prof. Lucke being the first honoree for his pioneering work in internal combustion engines and in organizing within ASME. Citations were awarded irregularly until 1970. Starting in 1967, the ASME Internal Combustion Engine Award was inaugurated. Additionally, several service citations were established — Outstanding Service and the Meritorious Service in 1968. In 1983, the Soichiro Honda Lecture series was established, in conjunction with the ASME Soichiro Honda Medal. In 1984, the R.S. Woodbury Award was initiated, and in 2022, the Engine Impact Award. The first speaker awards were given in 1947, and the first student paper competition was held in 1990.

During its first century, the Division has changed with the times to serve its community of members, both professionally and technically. This spirit of change and anticipation of society's future needs is reflected in this year's rebranding to the ICE Forward conference, moving onward into the Division's second century.

—by Charles Finney, compiled from various sources

[i] Charles Edward Lucke (1876–1951) of Columbia University.
[ii] "Section on Gas Power Engineering" (1908). Proceedings of the American Society of Mechanical Engineers 80(1): 8–9.
[iii] See SINCLAIR Bruce (1980). A Centennial History of the American Society of Mechanical Engineers: 1880–1980. ASME Press. ISBN: 9780802023803; DOI:10.1115/1.H0175P. Available as an e-book from ASME.

Cummins Engines On Display at ICE Forward

X15 Performance Series (EPA 2021)

Originally introduced in 2001, the 500+ HP X15 has been called the “flagship” of Cummins engines with over 2.5 million manufactured to date. Optimized for heavy-haul, premium linehaul, and performance-oriented customers in mind, the current X15 Performance Series was introduced in 2021 to meet EPA and Greenhouse Gas Phase 2 requirements while providing a 2% fuel economy improvement over the previous production version. Earlier this year, Cummins debuted a hydrogen-fueled X15 with full production expected in 2027.

L9 Performance Series (Stage V)

Cummins L9 is a 400+ HP medium-duty engine with heavy-duty components and performance characteristics. Its EGR-free architecture reduces complexity, improves reliability, and minimizes cooling system space claim. Multiple component options, such as rear or front engine power take-offs, allow for easier installation by OEMs and easier maintenance for equipment users. Although this variant is optimized for off-road applications (agriculture, construction, mining, etc.), other L9 versions such as the Performance Series (2021) which meets EPA 2021 standard are available for on-road applications such as school and transit buses and medium-duty trucks, while yet others are optimized for genset applications.

QSF2.8 (Tier 4 Final/Stage IV)

The 2.8-liter QSF delivers performance at 74 hp (55 kW) of larger 3.6L engines in a size envelope similar to 2.2-liter engines delivering 49 hp (37 kW). High Pressure Common Rail (HPCR) fuel injection, together with full-authority electronic controls and a Cummins wastegated turbocharger, combine to deliver a peak torque of 221 lb-ft (300 N•m) while enabling the QSF2.8 to meet Tier 4 Final/Stage IV emissions using only cooled Exhaust Gas Recirculation (EGR) and Cummins totally passive “fit and forget” Diesel Oxidation Catalyst (DOC). Innovative use of composite materials, together with a sculptured cast-iron block, limits engine weight to just 507 lb (230 kg) giving the QSF2.8-powered equipment a significant weight advantage.

B6.7 (EPA 2021)

The Cummins B6.7 is one of the most dependable and durable medium-duty engines available. It has been tested and proven with more than 13 million engines produced over nearly 40 years and billions of miles driven. Although a Diesel production engine is shown here, the B6.7 on display at ICEF 2022 will be a propane-fueled development engine, part of Cummins’ new fuel agnostic strategy. This new version will provide diesel-like performance and durability, uptime, and low total cost of ownership with power expected ratings between 280–360 hp and 600–860 lb-ft of torque. The production B6.7 Propane will be suited for many applications, including medium-duty truck, vocational, school bus, and terminal tractor markets, making it a low-emissions solution designed to meet or exceed EPA and CARB regulations in 2024 and beyond.

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