



Powertrain Fuels and Lubricants

The Powertrain, Fuels and Lubricants sessions focus on information in the area of properties, selection, processing, performance, use, and effects of fuels and lubricants related to spark ignition, diesel engines and associated drivelines, along with all combustion and emission considerations. In addition, sessions address design, development, and performance of powerplants except those specifically designed for aerospace vehicles and those engines specifically designed and in production quantities for production passenger automobiles.

PFL110 0-D and 1-D Modeling and Numerics Parts 1- 7

Separate sub-sessions cover zero-dimensional, one-dimensional, and quasi-dimensional models for simulation of SI and CI engines with respect to: engine breathing, boosting, and acoustics; SI combustion and emissions; CI combustion and emissions; fundamentals of engine thermodynamics; numerical modeling of gas dynamics; thermal management; mechanical and lubrication systems; system level models for controls; system level models for vehicle fuel economy and emissions predictions.

PFL120 Multi-Dimensional Engine Modeling

The session covers advances in the development and application of models and tools involved in multi-dimensional engine modeling: advances in chemical kinetics, combustion and spray modeling, turbulence, heat transfer, mesh generation, and approaches targeting improved computational efficiency. Papers employing multi-dimensional modeling to gain a deeper understanding of processes related to turbulent transport, transient phenomena, and chemically reacting, two-phase flows are also encouraged.

PFL130 Control System Design & Calibration

Separate sub-sessions cover powertrain control, calibration, and system-level optimization processes related to achieving stringent market fuel economy, emissions, performance, reliability, and quality demands. Topics include the control, calibration, and diagnostics of the engine, powertrain, and subsystems related to energy management in conventional and hybrid operation, considering the simultaneous optimization of hardware design parameters and control software calibration parameters.

PFL140 Fluid Flow Measurement & Analysis

The focus of this session is the measurement and analysis of in-cylinder and port flows in research and production engines. Topics may include: PIV, PTV, LDV, and fluorescent tracer measurements of velocity and turbulence characteristics and modeling analysis of engine flows.

PFL150 Diagnostic Development

This session focuses on engine combustion and flow diagnostic development and demonstration. Examples of diagnostics of interest include, but are not limited to: LIF, PLIF, absorption/emission spectroscopy, ion probes, pressure sensors, and extractive and exhaust gas composition sensors.

PFL160 Powertrain Thermal Management: Combustion Chamber, Battery Cooling, and Engine Cooling

This session considers modeling (zero-D, 1D, 2D, 3D CFD) and experimental papers on: combustion chamber, systems (lubrication, cooling, fuel, EGR); components (oil pumps, coolant pump, fuel injectors, compressors, turbines, turbochargers, torque converters, gear box, fans, bearings, valves, ports, manifolds, turbine housing); heat exchangers (radiators, oil coolers); aftertreatment (SCR, DOC, DOF, exhaust gas cooling); battery cooling (HEV, EV, motor/generator) and controls (passive and active).

PFL170 High Efficiency IC Engines Concepts

This session focuses on technologies such as advanced and partially mixed combustion, cooled EGR boosting, ignition and direct injection technologies, pressure boosting, intelligent combustion, thermal efficiency, fully variable valvetrains, and other new and developing technologies.

PFL180 Technological Developments in China

Technical presentation, review and investigation focusing on China market, including powertrain technology roadmap, regulation review, product development and localization, off road applications, new technology evaluation etc, covering both conventional and alternative powertrain and other vehicular component and system aspects.

PFL211 Basic SI Combustion Processes

This session focuses on basic SI combustion processes including studies of mixture formation, engine efficiency, flame propagation, and emissions formation. Papers cover both 4-stroke and 2-stroke engines characterized by 1) ignition by an external energy source that serves to control combustion phasing, and 2) a combustion rate that is limited by flame propagation.

PFL213 Abnormal SI Combustion (Knock)

This session addresses abnormal SI combustion processes with a focus on spark knock. Papers cover both 4-stroke and 2-stroke engines characterized by 1) ignition by an external energy source that serves to control combustion phasing, and 2) a combustion rate that is limited by flame propagation.

PFL214 Fuel / Additive Effects on SI Combustion Processes

This session focuses on the impact of conventional and alternative fuels as well as fuel additives on the operation, performance and emissions of SI engines. Papers focus on the impact of bio-derived fuels (ethanol, butanol and others) on engine design and performance as well as gasoline properties and additives, and their impact.

PFL215 SI Combustion Ignition

This session focuses on the SI combustion ignition process and advanced ignition systems. Papers cover both 4-stroke and 2-stroke engines characterized by 1) ignition by an external energy source that serves to control combustion phasing, and 2) a combustion rate that is limited by flame propagation.

PFL216 Dilute SI Combustion

This session focuses on the dilute SI combustion processes including lean, stratified, and EGR operation. Papers cover both 4-stroke and 2-stroke engines characterized by 1) ignition by an external energy source that serves to control combustion phasing, and 2) a combustion rate that is limited by flame propagation.

PFL217 Abnormal SI Combustion (Preignition)

This session addresses abnormal SI combustion processes with a focus on preignition, including low-speed, stochastic preignition on boosted engines. Papers cover both 4-stroke and 2-stroke engines characterized by 1) ignition by an external energy source that serves to control combustion phasing, and 2) a combustion rate that is limited by flame propagation.

PFL220 Combustion in Compression-Ignition Engines

Classical diesel engine combustion with relatively short ignition delay, including papers dealing with low CR and high EGR calibrations. Papers describing experiments and test data, simulation results focused on applications, fuel/additive effects, combustion control, and mode change are invited and will be placed in appropriate sub-sessions. Papers with an emphasis on the modeling aspects of combustion are encouraged to be submitted into PFL110 or PFL120 modeling sessions.

PFL230 Homogeneous Charge Compression Ignition, HCCI

Classical HCCI combustion with temperature controlling combustion onset and only a modest effect of fuel injection. Papers describing experiments and test data, simulation results focused on applications, fuel/additive effects, combustion control, and mode change are invited and will be placed in appropriate sub-sessions. Papers with an emphasis on the modeling aspects of combustion are encouraged to be submitted into PFL 110 or PFL120 modeling sessions.

PFL250 Partially Premixed Compression Ignition, PPCI

Mixed mode with auto ignition but inhomogeneous charge. Injection-controlled but with EOI before SOC. Papers describing experiments and test data, simulation results focused on applications, fuel/additive effects, combustion control, and PPC injection strategies are invited and will be placed in appropriate sub-sessions. Papers with an emphasis on the modeling aspects of combustion are encouraged to be submitted into PFL110 or PFL120 modeling sessions.

PFL260 Dual Fuel Combustion

Mixed mode using more than one fuel not fully mixed before combustion. Most often with auto ignition of spray injected late. Papers describing experiments and test data, simulation results focused on applications, fuel/additive effects, and RCCI (Reactivity-Controlled Compression Ignition) are invited and will be placed in appropriate sub-sessions. Papers with an emphasis on the modeling aspects of combustion are encouraged to be submitted into PFL110 or PFL120 modeling sessions.

PFL270 Combustion in Gaseous-Fueled Engines

This session focuses on fuel injection, combustion, controls, performance and emissions of SI engines fueled with gaseous fuels such as methane, natural gas (NG), biogas, producer gas, coke oven gas, hydrogen, or hydrogen-NG blends. Papers on Diesel-NG or diesel-hydrogen dual-fuel engines will also be accepted in this session.

PFL280 Combustion Control and Optimization

This session covers engine combustion control and optimization techniques. Topics include engine combustion diagnostics as specialized for control, control methodologies and algorithms, optimization, related combustion sensing, etc.

PFL290 Cold Start and Transients

This session focuses on both SI and CI combustion and mixture preparation during cold start and transient engine operation. Example topics include engine performance, emissions, control strategies and calibrations for cold start and transient operation impact on NO_x, PM, HC, CO, and CO₂ emissions; also including the impact of variable valve timing, spark, and turbocharger controls.

PFL310 Fuel and Additive Effects on Engine Systems

Topics include the effects of fuel and additives on deposit formation, intake system cleanliness, friction, wear, corrosion, and elastomer compatibility. Also covered are effects of fuel specification on drivability, on evaporative emissions, and on the relationship between emissions and drive cycle.

PFL320 Fuel Injection and Sprays

This session is devoted to experimental and computational work in the area of fuel injection systems and sprays. Topics include: spray characterization, cavitation, multi-phase jet modeling, CFD models for spray processes, wall films and impingement, hydraulic circuit analysis, and dissolved gas effects. Studies of both gasoline and diesel fuel sprays and fuel injection equipment are encouraged.

PFL330 Alternative and Advanced Fuels

This session includes four papers related to spark-ignition engines and their fuels and five papers related to the processes of compression ignition combustion of different fuels.

PFL340 Automotive Gasoline Engine Lubricants

The industry continues to work on understanding the interaction of lubricating fluids with engine hardware in order to improve vehicle efficiency, durability, and performance. The Engine Lubricants Session presents a variety of papers dealing with advances in engine oils and their relationship to improved hardware performance.

PFL350 Heavy Duty Diesel Lubricants

This session reviews advancements in heavy-duty engine oil technology and test methodology, focusing on achieving future emissions, durability and fuel efficiency expectations both in North America and Europe.

PFL360 Driveline Lubricants

In the industry, there is continuing work on understanding the interaction of lubricating fluids with driveline hardware and on improving the fluids used in these applications. In this session are presented a variety of papers dealing with different applications where the interaction of driveline fluids with equipment is important.

PFL370 Holistic Session on Fuel Consumption and Fuel Economy

The focus of this session is the performance of integrated vehicle systems and the influence of driving styles and drive cycles on fuel consumption/economy. This will include how integration of vehicle components such as the powertrain, parasitics, accessories, mass elements, aerodynamics, tires, brakes, and hubs affect the overall vehicle energy and energy conversion efficiency.

PFL410 Exhaust Emissions Control - New Developments

Papers are invited on novel technology concepts and the integration of these concepts and/or existing technologies into new emission control systems or new strategies for cleaning engine exhaust. Example topics include new types of catalysts, absorbers or filters, and innovative integration of various catalytic, adsorbing or filtering components to improve exhaust emissions. Related developments in sensors, control systems, thermal management or waste heat recovery will also be considered.

PFL421 System Integration And Durability

This session encompasses studies in the area of exhaust aftertreatment integration and durability. Topics of interest include detailed studies on the caveats of aftertreatment system design, integration and performance. Other topics of interest include studies documenting the challenges and solutions related to durability and robustness of catalytic solutions.

PFL422 Advanced Catalysts and Substrates

Presentations in this session cover the systems engineering experiences required to achieve ultra-low emission levels on gasoline light-duty vehicles. Emission system component topics for this session include the development of advanced three-way catalysts, the development of NO_x control strategies for gasoline lean burn engines, the application of high cell density substrates to advanced emission systems and the integration of these components into full vehicle emission systems.

PFL423 Advances in Particulate Filter Substrates

This session has one presentation on an advanced DOC for the diesel particulate filter (DPF). The remaining talks cover the DPF technology from new substrate designs to studying the ash deposition and ash morphology followed by two presentations investigating biodiesel effect on emissions and in combination with the DPF.

PFL424 Advances in Nox Reduction Technology

These sessions will focus on 'Advances in NO_x Reduction Technology'. The topics covered will include: new materials for Lean NO_x Traps (LNT) and Selective Catalytic Reduction (SCR); system integration and durability; advances in NO_x catalyst substrates, novel reductants and mixing designs.

PFL425 On-board Measurement and Control

This technical session will focus on internal combustion engine emissions measurement and control. Papers and presentations will cover topics that discuss varying methods of emissions control and data acquisition during operation of vehicles and engines. Topics will also include various advanced analysis techniques to determine emissions levels and reduce emissions.

PFL426 Meeting the ARB Low Emission Standard

Papers on the following exhaust emissions control topics will be considered: System integration and durability, advances in catalyst substrates, advances in particulate filter substrates, advances in NO_x reduction technology, and on-board measurement and control.

PFL430 Emission Control Modeling

Papers cover exhaust aftertreatment system models, as well as their validation and application. Technologies encompassed include DOC, HC Trap, DPF, GPF, LNT, TWC, SCR, SCRF, ammonia oxidation catalysts, hybrid or combined catalysts, urea-water solution spray dynamics, and mixture non-uniformity. Modeling aspects range from fundamental, 3D models of individual components to system level simulation, optimization, variation, degradation, and control.

PFL440 Emissions Measurement and Testing

Sub-sessions cover emissions measuring techniques and testing regimes. This includes new analysis techniques and the novel application of existing techniques, the comparison of existing and proposed testing regimes with real world experience, including modeling.

PFL450 Particle Emissions from Combustion Sources

This session focuses on particle emissions from combustion engines, including measurement and testing methods, and the effects of changes in fuel composition. Papers are also invited on the topics of the environmental and health effects of elemental carbon and organic carbon that constitutes solid cored particles plus the environmental and health effects of secondary organic aerosol emissions. This includes particulate emissions from both gasoline and diesel engines.

PFL460 Gaseous Engine Emissions

Papers are invited for this session on the general topics of combustion engine gaseous emissions (regulated and non-regulated). This includes papers discussing well-to-wheels CO₂ production for alternative technologies, fuel economy and all greenhouse gas emission research with their primary focus on engine, emissions, fuels, control or related components or sub-components within. It also includes hydrocarbon species and specific NO_x species production over aftertreatment devices as a result of changes in fuel specification and the inclusion of bio-derived components and consideration of secondary emissions production (slip) as a result of aftertreatment.

PFL510 New CI & SI Engines and Components

This session covers topics regarding new CI and SI engines and components. This includes analytical, experimental, and computational studies covering hardware development as well as design and analysis techniques.

PFL520 Engine Boosting Systems

This session will cover conceptual, modeling and experimental studies relating to advanced turbochargers/superchargers and advanced boosting systems to achieve increased power density, better fuel economy, and reduced emissions.

PFL530 CI & SI Power Cylinder Systems

This session covers the Power Cylinder: piston, piston rings, piston pins, and connecting rods. The papers include information on reducing friction and increasing fuel economy, improving durability by understanding wear, and decreasing oil consumption and blow-by.

PFL550 Powertrain NVH

This session sets out to reflect the recent advances on the research, development and practices of Powertrain NVH treatment. The technical papers are of interest to powertrain system designers, testing specialists, NVH experts, and other individuals who evaluate and develop technologies to control powertrain NVH. The coverage includes: engine, engine subsystem and components noise and vibration; powertrain systems noise measurement and instrumentation; powertrain systems noise analysis.

PFL560 Powertrain Actuators and Sensors

Topics cover actuator and sensor mechanisms, devices, and systems; and the impact and control of such actuation and sensing systems on Powertrain thermodynamics, combustion, fuel economy, emissions, and performance.

PFL570 Valvetrain, including VVA

The design, development, and testing of Valve Train and Variable Valve Actuation mechanisms, devices, and systems; and the impact and control of such systems on thermodynamics, combustion, fuel economy, emissions, noise and vibration, and performance.

PFL580 Engine Block, Cylinder Heads, Oil & Water Pumps, Intake & Exhaust Systems

This session describes the design, modeling and performance validation of cylinder heads, lubrication systems and pumps, coolant systems and pumps, intake manifolds, exhaust manifolds, crankshaft and bearing systems and engine block structures.

PFL610 Transmission Systems/Drive Unit

This session deals with the automotive transmissions of different types. It includes development of new transmission concepts, transmission enhancements and the advancement of the state of the art of transmission system design & integration with the objective of improving the transmission efficiency, NVH, durability and shift pleaseability.

PFL620 All Wheel Drive

This Session includes papers on a high efficiency rear drive unit, an on demand dry sump rear drive module with PTU disconnect and power distribution models for a multi-wheeled vehicle.

PFL630 IVT / CVT

This Session includes papers on IVT/CVT systems and related topics.

PFL640 Driveline Controls

This session covers transmission and driveline controls. Session will cover topics related to controls hardware, controls software, and controls integration.

PFL650 Launch Devices

This Session includes papers on torque converter, launch devices and modeling.

PFL660 Driveline NVH

This session addresses transmission noise, vibration, rattle issues and design solutions.

PFL670 Driveline Components/Subsystems

This session includes papers on the full array of transmission and driveline related components.

PFL680 Driveline Modeling

This session covers transmission and driveline modeling, including topics related to transmission hardware, software, and system integration.

PFL710 Advanced Hybrid and Electric Vehicle Powertrains

This session covers new production and near-production hybrid powertrains, hybrid architecture, and testing.

PFL720 Advanced Fuel Cell Vehicle Applications

This session covers fuel cell advances from vehicle manufacturers in the first stage of series production FCEVs. In addition, there are modeling studies and evaluation of components mainly in PEM fuel cell systems, hydrogen storage and hydrogen fueling.

PFL730 Advanced Battery Technologies

The success of HEV's, PHEV's & EV's is highly dependent on their batteries. This session focuses on advanced battery technologies, including, but not limited to: advanced materials and cell chemistries, battery management systems and controls, modeling, testing, diagnosis and health monitoring, safety, reliability, durability, battery charging, battery economics/cost reduction, and system integration/optimization. These topics can be addressed at the cell, module, pack or vehicle levels.

PFL740 Electric Motor & Power Electronics

Power electronics and electric motors are essential for improving vehicle efficiency through drivetrain electrification. Technologies that support high efficiency, high power density, and low cost motors and power modules are required for the success of vehicle electrification.

PFL750 Controls for Hybrids and Electric Powertrains

This session covers powertrain control processes related to achieving stringent market fuel economy, emissions, performance, reliability, and quality demands of hybrid and electric powertrains. Topics include the control, calibration, and diagnostics of the engine, powertrain, and supporting electromechanical subsystems related to energy management.

PFL760 Advanced Vehicle Technology Competitions

The EcoCAR 4 student vehicle competition, sponsored by General Motors and the U.S. Department of Energy, tasks university teams with designing, implementing and refining advanced technology powertrains into a conventional Chevrolet Camaro. This session presents yearly results from teams in the competition, highlighting the entire EcoCAR vehicle development process and team accomplishments.