

# SAE 2015 Energy Saving and Emission Reduction Forum

## Technical Session Schedule

As of 11/10/2015 07:41 pm

Wednesday, November 4

### High Efficiency Combustion Systems and Emissions Reduction

**Session Code:** ESER1

**Room** Shanghai Ballroom

**Session Time:** ALL DAY

#### High Efficiency Combustion Systems

With the increased demands for fuel efficiency and fuel economy, the internal combustion engine (ICE) continues to be examined for design enhancements to improve these measures. Overall, the program will examine several technological advances required to maximize efficiency, including:

- o Advanced, low-temperature combustion techniques
- o Improved understanding and modeling of heat loss mechanisms
- o Electrification and intelligent control of accessory loads
- o Possible redesign of mechanical systems (e.g., variable stroke for fully expanded cycles)
- o High-efficiency turbo-machinery to extract exhaust energy and provide boost

#### Emissions Reduction

With a greater than 10 percent growth expected in the domestic passenger vehicle market, China now has the world's largest auto market; and emissions from transportation are growing rapidly as well. However, China is determined to reduce carbon dioxide emissions and boost fuel efficiency with manufacturing technologies without compromising safety, performance, reliability and cost. Session topics include:

- o Intelligent Combustion
- o Engine Downsizing and Pressure Boosting
- o Variable Valve Trains
- o Thermal Efficiencies, Including Waste Heat Recovery
- o Light, Medium and Heavy Duty Vehicle Content

<b>Time</b>	<b>Paper No.</b>	<b>Title</b>
<b>9:00 a.m.</b>	<b>ORAL ONLY</b>	<b>Welcome Speech</b> <i>Kai Zhao, Vice Chairman of China Association of Circular Energy</i>
<b>9:30 a.m.</b>	<b>ORAL ONLY</b>	<b>Driving the Future: Electric, Intelligent, Connected Vehicles</b> <i>Evolving customer expectations, rapid advances in technology, and growing concerns about the environment, energy, and urban congestion are driving profound change in today's auto industry. In response to these challenges, auto companies are increasing powertrain efficiency and vehicle electrification, introducing connected vehicle capabilities, and adding more intelligence to vehicle electronics, controls and safety systems. The convergence of these technologies will ultimately lead to self-driving vehicles and transform personal transportation. This presentation will provide a high-level overview on the future of personal mobility and discuss major opportunities and challenges in the new automotive environment.</i> <i>Gary Smyth, General Motors Global R &amp; D</i>

10:15 a.m.

ORAL ONLY

### **Next Generation Compression Ignition Engines and Future Fuel Opportunities**

*Gasoline compression ignition (GCI) combustion has become of increasing interest in recent years due to the potential for very high thermal efficiencies with significant reductions in many criteria pollutants. This interest is driven by significant advances in enabling technologies such as fuel injection systems, turbomachinery, valve actuation, sensors, and onboard computers.*

*The combination of these technologies and others has led to new real-time control opportunities which have led to GCI combustion being potentially viable for production applications. GCI combustion is not a new concept but has evolved over the past several decades. Earlier GCI research was focused primarily on homogeneous charge compression ignition (HCCI) combustion. More recent years have seen increasing interest in a continuous range of GCI combustion modes spanning fully homogeneous HCCI to partial fuel stratification modes to full stratification modes which are diesel-like in execution. This presentation will discuss the challenges and opportunities of a wide spectrum of GCI combustion modes and fuel selections under investigation by researchers with examples from multi-cylinder engine research at Oak Ridge National Laboratory.*

*Robert M. Wagner, Oak Ridge National Laboratory*

11:15 a.m.

ORAL ONLY

### **Towards 60% Fuel Efficient Engine**

*The internal combustion engine has great potential for high fuel efficiency. The ideal otto and diesel cycles can easily achieve more than 70% thermodynamic efficiency. The problems come when those cycles should be implemented in a real engine. Extreme peak pressure during the cycle will call for a very robust engine structure that in turn will increase friction and hence reduce mechanical efficiency. A very high compression ratio also increase the surface to volume ratio and promote heat losses, taking away much of the benefits from the theoretical cycle.*

*The presentation will start with a standard SI engine and its efficiency as a function of load. Then a high compression ratio SI will be introduced and compared with the same engine operated in HCCI mode. The four efficiencies of SI as well as HCCI will be discussed and variations like HCCI with negative valve overlap and higher mean piston speed will be shown.*

*A next step is the results with Partially Premixed Combustion. With PPC the indicated efficiency was shown to be up to 57%, thus 10% up from the best HCCI engine of 47%. However, to get the very high efficiency a high dilution level is needed. This is a challenge for the gas management system and hence gas exchange and mechanical efficiencies can suffer.*

*The final part of the presentation is giving an engine concept that can enable the conditions for PPC combustion but with much improved gas exchange and mechanical efficiency. It enables an effective compression ratio in excess of 60:1 but with much less cylinder surface area. The concept also enables low friction and hence high mechanical efficiency. The basic concept will be explained and initial simulation results will be presented.*

*Bengt Johansson, Lund University*

- 11:45 a.m.**      **ORAL ONLY**      **Leveraging the Transformative Fusion of Sensing, Computing, and Control**
- From their origins in meeting emissions and fuel economy standards, embedded control systems are now proliferating across other areas such as improved safety, comfort and convenience, connectivity, and much more. To address the consequent increase in system and software complexity, automotive industry is using Model-Based Design to design, analyze and implement the software in product development. Now, we are ushering in a new era of transformation where automotive and consumer technologies are merging and the availability of low-cost sensing, computing, and control technologies is allowing the automotive industry to create new products and lines of business. This presentation will start off with current trends in Model-Based Design application for product development, then discuss how sensing, computing, and control are impacting the automotive industry, and how model-based methods can enable you to realize the new opportunities generated by this transformation.*
- Wensi Jin, MathWorks Inc.*
- 1:30 p.m.**      **ORAL ONLY**      **A Comparison Between Low Voltage, Low-cost Hybridization Solutions**
- Fuel economy and CO2 regulations world-wide demand for a strict but clear average fleet fuel reduction target in the coming decade. A massive uptake of light to mild hybridization is therefor required. In this presentation we compare existing and new 12V and 48V solutions on functionality, cost, performance and off course the fuel economy improvements. Special focus is given on new powerful solutions using combinations of 48V battery- and kinetic energy (flywheel) storage. It is shown that such low voltage dual storage solutions compete with high voltage full hybrid performances at a fraction of the cost.*
- Yu Yang, Punch Powertrain*
- 2:00 p.m.**      **ORAL ONLY**      **Recent Progress of the Upcoming China VI / 6 Emissions Regulations in China**
- The next generation of light-duty and heavy-duty emission regulations will be released for public comments by the end of this year or early next by the Ministry of Environmental Protection (MEP) of China, aiming to be implemented around 2020 timeframe. For light-duty vehicles, both criteria and evaporative emissions, as well as OBD requirements will be much enhanced than the Euro 6 regulation. The ζfuel neutral ruleζ will be applied for gasoline, diesel and alternative fueled vehicles. In heavy-duty segment, while diesel particulate filter (DPF) will be mandated for PM control, off-cycle NOx emissions, especially over low-speed urban driving cycle will be significantly tighten.*
- Reggie Zhan, Southwest Research Institute*

2:30 p.m.	ORAL ONLY	<p><b>Fuel-ethers and Their Key Contribution to Enable Higher Vehicles Efficiency and Improved Air Quality</b></p> <p><i>Demand for fuel efficiency and fuel economy constantly increases world-wide. Internal combustion engines and fuels represent an integrated system, continuously examined for enhancements to improve these measures. Fuel ethers are blending components used precisely to enhance performance and provide cleaner, more sustainable gasoline. As clean replacements for toxic compounds, and enablers of improved air quality through a reduction of vehicle emissions of exhaust pollutants like VOCs and PM, fuel ethers enable a global path towards more sustainable, clean, efficient, and affordable mobility. . Thanks to their naturally high octane numbers they also contribute to economies of fuel, enhancing efficient combustion of petrol, while not causing engine damage or corrosion of parts and enabling the transition to higher compression ratio, more efficient engines. Fuel ethers help as well to fulfil CO2 emissions reduction goals by offering octane boosting properties that reduce the need to use more refinery energy-intensive fuel components. Ethers are also fully compatible with existing refinery infrastructure, fuel supply and distribution system. The presentation provides a concise, updated view on most relevant aspects.</i></p> <p>Clarence Woo, ACFA</p>
3:30 p.m.	ORAL ONLY	<p><b>Advanced Glazing Technologies Reduce Solar Load and Offer Lightweight Opportunities That Result In Lower Energy Consumption and Emissions</b></p> <p><i>With the widespread use of air conditioning in automobiles, managing the heat load in the vehicle is an extremely important factor. Reducing the heat load improves consumer comfort and reduces the energy required to maintain cabin temperature at a comfortable level. This energy reduction is then reflected in the lower greenhouse gas emissions for vehicles with internal combustion engines and improved driving range for the electric vehicles.</i></p> <p><i>Glazing has been an essential part of the automotive design. With consumers demanding a more open feel when they are in a car, the glazing area has increased dramatically over the past ten years. Cabin heat load is largely dependent on glazing area and glazing performance. This presentation will discuss the heat load reduction through glazing choices, and the impact on energy consumption based on the glazing chosen.</i></p> <p><i>Recent developments in lightweight technologies have provided opportunities to reduce weight by more than 20 Kg per vehicle. These technologies, combined with improved solar performance, can provide an even greater fuel economy benefit and reduce emissions further.</i></p> <p>Mukesh Rustagi, Pittsburgh Glass Works LLC</p>
4:00 p.m.	Panel	<p><b>High Efficiency Combustion Systems and Emissions Reduction Panel Discussion</b></p> <p><b>Moderators -</b> Jhoney Green, Robert M. Wagner, Oak Ridge</p> <p><b>Panelists -</b> National Laboratory Bengt Johansson, Lund University; Reggie Zhan, Southwest Research Institute;</p>
5:00 p.m.	ORAL ONLY	<p><b>Ford's journey in the application of Aluminium and lightweighting technologies to deliver the world's very first high volume mass production aluminum passenger vehicle.</b></p> <p>Michael Paradisis, Ford, China</p>

Thursday, November 5

## Lightweighting

Session Code: ESER2

Room Shanghai Ballroom

Session Time: ALL DAY

Lightweighting</p>

Regulations and resulting standards for reducing emissions and increasing fuel efficiencies are creating a need for OEMs to develop lighter vehicles to achieve these requirements. This Forum has been designed to provide automobile manufacturers and suppliers with the latest advances in manufacturing strategies, design and materials selection strategies to promote lighter weight, fuel efficient vehicles without sacrificing safety or performance.

Time	Paper No.	Title
9:00 a.m.	ORAL ONLY	<p><b>Keynote: Vehicle Lightweighting: Teardown and Analysis of BMW's i3</b></p> <p><i>In late 2014, Munro &amp; Associates conducted the first extensive teardown, costing and benchmark study of the BMW i3 urban electric car to help manufacturers from a variety of industries understand the processes and costs involved in this revolutionary vehicle. During the proposed presentation, Sandy will discuss key findings from the five vehicle system reports, highlights of the production methods BMW used for the i3, as well as surprises and lessons learned from their teardown with the vehicle.</i></p> <p>Sandy Munro, Munro &amp; Associates</p>
10:15 a.m.	ORAL ONLY	<p><b>Development of MG GS: a SUV by SAIC MOTOR</b></p> <p><i>MG GS is the first SUV in the history of MG branded vehicles, which has been put to the market for half a year. In the presentation, Mr. Guohua Qiu will introduce the BIW lightweighting designs, including material selections, structure designs and manufacturing processes and some other details, with a target of high BIW performances.</i></p> <p>Guohua Qiu, SAIC</p>
11:15 a.m.	ORAL ONLY	<p><b>Innovative material innovation solution</b></p> <p><i>Design, process and materials are the three key aspects to reduce weight of the car, the innovative materials esp. The third generation advanced high steel sheets are developed in recent years, the status of 3rd Gen. AHSS development and application are introduced, and the new lightweighting solution for B pillar made by 3rd Gen. AHSS is described in detail.</i></p> <p>Li Wang, Baosteel Group Corp.</p>
11:45 a.m.	ORAL ONLY	<p><b>Application of Light-weighting Technology in Geely Automobile and Its Future</b></p> <p><i>This presentation will discuss the principle and method of light-weighting design, application in Geely and case study, as well as how to make full use of this technology in a project and its future prospect.</i></p> <p>Fei Xiong, Geely Auto</p>
1:30 p.m.	ORAL ONLY	<p><b>Mastering Innovation Through Lightweighting Leadership</b></p> <p><i>Faurecia is fully engaged in the energy saving and emission reduction for light vehicles and truck. The aim of the presentation will be to show different kind of technologies related to weight reduction, energy recovery, bio-materials and pollutant management which lead the Faurecia group to propose solutions allowing around 15g CO2 savings and significant pollution reductions to reach the future Chinese regulations.</i></p> <p>Qiong Wang, Faurecia</p>

- 2:00 p.m. ORAL ONLY** **Characterization of Material Mechanical Behavior Under Impact Loading and Application in Car Crash Design**  
Xinhua Lai, Tshua University; Bo Liu, Chongqing Changan Automobile Co., Ltd.
- 2:30 p.m. ORAL ONLY** **Magna/Ford MMLV Concept Vehicle - Design and Comparative LCA Study**  
*In response to the global automotive market changes, the US Department of Energy (DOE) co-funded Magna International and Ford Motor Company to engineer, prototype and test a new lightweight aluminum-intensive passenger vehicle, facilitating extensive use of advanced lightweight and high-strength materials. The Multi Material Lightweight Vehicle (MMLV) Mach I design achieved an overall 364 kg (23%) full vehicle mass reduction, enabling engine downsizing providing 16% reduction in Global Warming Potential and a 16% reduction in Primary Energy.*  
*This presentation communicates the results of a comparative life cycle assessment (LCA) study of the MMLV auto in accordance with International Organization for Standardization (ISO) standards. Content includes material selection/distribution, manufacturing process selection enabling of mass-induced fuel savings due to the lightweight auto parts and the down-sized powertrain.*  
Timothy W. Skszek, Magna International Inc.
- 3:30 p.m. ORAL ONLY** **Lightweight solution for you through innovation materials and design**  
Hans Mikota, Christoph Stapf, Georg Fischer Automotive Co., Ltd.
- 4:00 p.m. ORAL ONLY** **Profits of Lightweight Metal Castings Start In The Melt Shop**  
*Faster than any of the other foundry centers worldwide, Chinese foundries took advantages on the aluminum melting technology provided by the StrikoWestofen Group. In just six years, StrikoMelter aluminum melting furnaces with a total yearly capacity of 1,100,000 tons molten metal have been taken to operation in China and neighbour countries-With a clear upwards trends. The foundries report that highly efficient technology is not only turning into a crucial competitive factor but is also of great benefit to the environment. The savings on the natural gas and metal losses - compared to any other technology in the market- lead to significantly reduced until cost for castings which provides these foundries a large competitive edge. Furthermore the reduction in CO2 and dust emissions is an important step towards a 'green foundry' industry. The presentation features the specifics of the StrikoWestofen technology as well as concrete calculations what additional profits foundries gain when employing the technology.*  
Rainer Erdmann, Strikowestofen