

# **Emissions 2013**

**Presentations & Proceedings**

**Proceedings Volume 73**

**Ypsilanti, Michigan, USA  
18-19 June 2013**

**Editors:**

**M. Nasim Uddin**

**Rafiq Uddin**

**ISBN: 978-1-62748-645-3  
ISSN: 1543-9658**

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2013) by Global Automotive Management Council (GAMC)  
All rights reserved.

Printed by Curran Associates, Inc. (2013)

For permission requests, please contact Global Automotive Management Council (GAMC)  
at the address below.

Global Automotive Management Council (GAMC)  
5305 Plymouth Road  
Ann Arbor, Michigan 48105

Phone: (734) 418-2365  
Fax: (734) 418-2356

[info@gamcinc.com](mailto:info@gamcinc.com)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2634  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

## **PLENARY & KEYNOTE: ISSUES AND SOLUTIONS ON VEHICLE EMISSIONS**

*Session Chair: Julian Giuliano*

<b>Characterization and Health-Effects Testing of Emissions from Modern Diesel Engines .....</b>	<b>1</b>
<i>Rashid Shaikh</i>	
<b>Paths to Improved Engine Emission Performance via Evolving Lubricant Technologies .....</b>	<b>14</b>
<i>Ewa A. Bardasz</i>	
<b>Clean Air Products at Tenneco.....</b>	<b>28</b>
<i>Ben Patel</i>	
<b>Experience and Development of John Deere Engine and Aftertreatment Solutions to Meet Tier 4 Emissions.....</b>	<b>46</b>
<i>Danan Dou</i>	

## **CARBON MANAGEMENT**

*Session Chair: Desikan Sundararajan*

<b>Keynote: Vehicular Emissions Review.....</b>	<b>57</b>
<i>Tim Johnson</i>	
<b>WRI's Chemoautotrophic (CAT™) Process: A Clean and Sustainable World Through Development and Deployment of a Green Technology for Carbon Emissions Capture and Re-Use.....</b>	<b>89</b>
<i>Alan E. Bland, Karen E. Wawrousek, Tengyan Zhang</i>	
<b>Carbon Capture in Vehicles: Mechanisms and Consumer Acceptance Issues .....</b>	<b>103</b>
<i>John M. Sullivan, Michael Sivak</i>	
<b>NCAT Pavement Test Track at Auburn University: Effect of Prototype CO<sub>2</sub> Reducer on Fuel Economy and Emissions.....</b>	<b>114</b>
<i>R. Buzz Powell, Bob Rosenthal</i>	

## **INDUSTRIAL, OFF-HIGHWAY & MARINE ENGINES & DRIVETRAINS**

*Session Co-Chairs: Tom Harris, Hank Sullivan*

<b>Using Surrogate Fuels to Explore the Impact of Biodiesel on Soot Nanostructure and Reactivity .....</b>	<b>125</b>
<i>Eduardo Barrientos, Chenxi Sun, André Boehman</i>	
<b>Dioxin, Furan, PCB, and PAH Emissions from Modern and Legacy Compression Ignition Engines.....</b>	<b>139</b>
<i>Christopher Laroo, Joseph McDonald, James Sanchez, Charles Schenk, Peter Smith</i>	
<b>Meeting Stricter Fuel Efficiency and Emissions Standards with the Opposed-Piston Engine .....</b>	<b>149</b>
<i>Larry Fromm</i>	
<b>Meeting Marine Regulations.....</b>	<b>160</b>
<i>Ginette Anderson</i>	
<b>HDD Aftertreatment Modeling Development and Applications.....</b>	<b>165</b>
<i>Weiyong Tang, Dennis Anderson, Fabien Rioult, Kevin Hallstrom</i>	
<b>Hydrocarbon Lean NO<sub>x</sub> Catalyst (HC LNC).....</b>	<b>178</b>
<i>Nick Morley</i>	

## **AUTOMOTIVE PROPULSION, FUELS & ADVANCED TECHNOLOGIES PART I**

*Session Co-Chairs: Tim Johnson, Robert Wagner*

<b>Dedicated EGR [D-EGR™]: A High Efficiency, Low Emissions Concept for SI Engines .....</b>	<b>189</b>
<i>Cary Henry</i>	
<b>Low Emissions and Rapid Light-Off Capability of a High Efficiency Opposed-Piston Two-Stroke.....</b>	<b>200</b>
<i>C.J. Kalebjian</i>	
<b>Engine Efficiency with Ethanol-Gasoline Blends .....</b>	<b>210</b>
<i>James E. Anderson, Travis Collings, Hosuk H. Jung, Thomas G. Leone, Charles E. Newman, Michael H. Shelby, Robert A. Stein, Timothy J. Wallington</i>	

## **SMALL ENGINES, REGULATORY, MOBILE & STATIONARY SOURCES**

*Session Co-Chairs: Julia Giuliano, Michael Major*

<b>Electronic Fuel Injection System Development and Implementation for the Propane Fueled Small Nonroad Engine Application</b> .....	219
<i>Martin Radue</i>	
<b>Performance, Durability and Fuel Consumption Effects of Fuel Ethanol Content in Small Nonroad Engines</b> .....	226
<i>Martin Radue</i>	
<b>Narrow Diameter Fuel Line Permeation Test Development</b> .....	235
<i>Mark Swanson</i>	
<b>Effects of Gasoline Sulfur Level on Emissions from the Tier 2 In-Use Fleet</b> .....	257
<i>Aron Butler, David Choi</i>	

## **AUTOMOTIVE PROPULSION, FUELS & ADVANCED TECHNOLOGIES PART II**

*Session Co-Chairs: Tim Johnson, Robert Wagner*

<b>Cold Start Considerations and Unique Emission Solutions for Future Legislation</b> .....	267
<i>Douglas Ball, David Moser</i>	
<b>Filtration of Ultrafine and Soot Particles from a Gasoline Direct Injection Vehicle</b> .....	277
<i>Tak Chan, Joseph Kubsh, Rasto Brezny, Eric Meloche, Debbie Rosenblatt</i>	
<b>Recent Developments of Gasoline Aftertreatment Systems</b> .....	284
<i>Kwangmo Koo</i>	
<b>Advanced Particulate Filter Technologies for Direct Injection Gasoline Engine Applications</b> .....	298
<i>Christian Bischof, T. Boger, N. Gunasekaran, R. Bhargava</i>	
<b>Author Index</b>	