



Preliminary
AGENDA

March 4, 2011

21st CRC REAL WORLD EMISSIONS WORKSHOP

Co-Sponsored by

California Air Resources Board
National Renewable Energy Laboratory
South Coast Air Quality Management District
US Environmental Protection Agency NRMRL
US Environmental Protection Agency OTAQ

Workshop Organizers

Mani Natarajan, Co-Chairman, Marathon Oil Company
Dominic DiCicco, Co-Chairman, Ford Motor Company
Alberto Ayala, California Air Resources Board
Brent Bailey, Coordinating Research Council
Richard Baldauf, US Environmental Protection Agency NRMRL
Kevin Black, Federal Highway Administration
Jorn Dinh Herner, California Air Resources Board
Rob R. Graze, Jr., Caterpillar, Inc. Technical Center
John Koupal, US Environmental Protection Agency OTAQ
Fred Minassian, South Coast Air Quality Management District
Chris Tennant, Coordinating Research Council

Hyatt Regency Mission Bay, San Diego, California
March 20-23, 2011

All sessions take place in Bayview Ballroom unless otherwise noted.

Sunday, March 20, 2011

4:30 PM to 6:00 PM **Registration in Bayview Ballroom Foyer**

6:00 PM to 7:00 PM **Welcome Reception on the south side Pool Deck**

Monday, March 21, 2011

7:30 AM to 8:30 AM **Registration in Bayview Ballroom Foyer**

Continental Breakfast in Pavilion

8:30 AM to 8:40 AM **Welcome from the Chairman: Mani Natarajan, Marathon Oil Company**

SESSION 1: Emission Rates & Inventory

8:40 AM to 8:45 AM *Introduction by Session Leader Fred Minassian, South Coast Air Quality Management District*

- 8:45 AM to 9:00 AM Trends in Heavy-Duty Truck Emissions in the South Coast Air Basin Brent Schuchmann University of Denver
- 9:00 AM to 9:15 AM The Occurrence of High-Emitting Light-Duty Vehicles in Three Neighborhoods of Los Angeles, CA Jorn Dinh Herner California Air Resources Board
- 9:15 AM to 9:30 AM Effects of Olefins Content on Exhaust Emissions: CRC Project E-83 Tom Durbin University of California Riverside
- 9:30 AM to 9:45 AM Statistical Method to Estimate Heavy-Duty Emissions Factors from On-ROAD (PEMS) Emissions Data Pierre Bonnel European Commission, Joint Research Centre
- 9:45 AM to 10:00 AM On Road Measurements Showing the Change in Emissions from Heavy-Duty Drayage Trucks Servicing the Ports of Los Angeles and Long Beach during 2009-2010. Kathleen Kozawa [presented by Jorn Herner] California Air Resources Board
- 10:00 AM to 10:20 AM General Discussion of Session 1



10:20 AM to 11:00 AM **Break: Poster Session and Demonstrations in Pavilion**

SESSION 2: Emission Control Measures

11:00 AM to 11:05 AM *Introduction by Session Leader Jorn Dinh Herner, California Air Resources Board*

- 11:05 AM to 11:20 AM Prospects for Low PM and Low Climate Impacts in Future Advanced Clean Cars for California Alberto Ayala California Air Resources Board
- 11:20 AM to 11:35 AM In-Use Assessment of a Fresh and Aged SCRT System Retrofitted on a MY1998 Class-8 Tractor Daniele Littera West Virginia University
- 11:35 AM to 11:50 AM ExHAUST: A Model-Based DPF Regeneration Strategy Vincenzo Mulone University of Rome Tor Vergata

11:50 AM to 1:20 PM **Lunch in Mission Ballroom**

- 1:20 PM to 1:35 PM Particle Emissions Reduction by In-Cylinder Blending of Gasoline and Diesel Fuel Teresa Barone Oak Ridge National Laboratory
- 1:35 PM to 1:50 PM Nanoscale Catalysts for DoD Ground Vehicle Fuel Economy Enhancement and Exhaust Emissions Reduction Hemanth Kappanna West Virginia University
- 1:50 PM to 2:10 PM General Discussion of Session 2

SESSION 3: Off Road

2:10 PM to 2:15 PM *Introduction by Session Leader Alberto Ayala, California Air Resources Board*

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|----------------------|--|----------------|-------------------------------|
| ■ 2:15 PM to 2:30 PM | Demonstration of Fuel Switching on an Ocean-Going Vessel in the Gulf of Mexico | Louis Browning | ICF International |
| ■ 2:30 PM to 2:45 PM | Emissions from Ocean-going Vessels Reduced by Newest Engine Technology and Cleaner Burning Fuels | Mohammed Khan | Univ. of California Riverside |
| ■ 2:45 PM to 3:00 PM | Summary of In-Use Evaluations of Two Hybrid Applications | Kent Johnson | Univ. of California Riverside |

3:00 PM to 3:20 PM **Break: Poster Session and Demonstrations in Pavilion**



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|----------------------|---|---|--------------------------------|
| ■ 3:20 PM to 3:35 PM | Comparison of Emissions and Fuel Consumption Between Auxiliary Power Units and Heavy-Duty Diesel Trucks | Josias Zietsman | Texas Transportation Institute |
| ■ 3:35 PM to 3:50 PM | Comparison of Locomotive Engine Emissions from Dynamometer and Railyard Testing | Christopher Frey | No. Carolina State University |
| ■ 3:50 PM to 4:05 PM | Revisions to ARB's In-Use Off-Road Equipment Rule Inventory | Nicole Dolney
<i>[presented by Todd Sax]</i> | California Air Resources Board |
| ■ 4:05 PM to 4:25 PM | General Discussion of Session 3 | | |

4:25 PM **END OF DAY**

5:30 PM to 9:30 PM Evening event at San Diego Zoo



We will meet in front of the Hyatt lobby at 5:30 pm to board coaches to the zoo. The last bus will leave at 5:45 pm. The Zoo will not allow individual cars.

Tuesday, March 22, 2011

7:30 AM to 8:00 AM **Registration in Bayview Ballroom Foyer**
Continental Breakfast in Pavilion

8:00 AM to 8:50 AM **Keynote Speaker: Robert Sawyer, University of California at Berkeley**

SESSION 4: Portable PM Measurement

8:50 AM to 8:55 AM *Introduction by Session Leader Rob Graze, Caterpillar, Inc.*

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| ■ 8:55 AM to 9:10 AM | Pegasor Particle Sensor (PPS) for Raw Exhaust PM Measurement | Juha Tikkanen | Pegasor Oy |
| ■ 9:10 AM to 9:25 AM | Correlation between PM, Airborne Particle Mass, and Elemental Carbon for Low-Emitting Heavy-Duty Diesel Engines | Athanasios Mamakos | European Commission, Joint Research Centre |
| ■ 9:25 AM to 9:40 AM | Final Summary of PM Measurement Comparisons with UCR's MEL for In-Use Testing of Heavy-Duty Diesel Vehicles | Kent Johnson | University of California Riverside |

9:40 AM to 10:20 AM **Break: Poster Session and Demonstrations in Pavilion**



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|------------------------|--|----------------|--------------------------|
| ■ 10:20 AM to 10:35 AM | Investigation of New In-Line, Real-Time Exhaust PM Emissions Sensor with Respect to NTE In-Use Measurement Methodology | Marc Besch | West Virginia University |
| ■ 10:35 AM to 10:50 AM | The In-Use Measurement of Diesel PM Using Soot Concentration Augmented with a Gravimetric Reference | William Silvis | AVL North America |
| ■ 10:50 AM to 11:10 AM | General Discussion of Session 4 | | |

SESSION 5: Fuel Effects: Spark Ignition

11:10 AM to 11:15 AM *Introduction by Session Leader Dominic DiCicco, Ford Motor Company*

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|------------------------|---|----------------------|--------------------------------|
| ■ 11:15 AM to 11:30 AM | Study of the Effects of Mid-Level Ethanol-Blended Gasoline Fuels on Engine Durability | Henning Kleeberg | FEV, Inc. |
| ■ 11:30 AM to 11:45 AM | Reactive Organic Gases Profiles in Motorcycle Exhaust Powered by Ethanol Blended Gasolines (E15) | Jiun-Horng Tsai | National Cheng Kung University |
| ■ 11:45 AM to 12:00 PM | Chemical Speciation of Volatile, Semi-Volatile, and Particulate Emissions from Tier 2 Vehicles Operated on Low Level Ethanol Blends | Michael Christianson | US EPA |

12:00 PM to 1:30 PM

Lunch in Mission Ballroom

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| ■ 1:30 PM to 1:45 PM | Fuel and Technology Effects on Particulate Matter Emissions for Light-Duty Gasoline Vehicles | Sherry Zhang
<i>[presented by Wayne McMahon]</i> | California Air Resources Board |
| ■ 1:45 PM to 2:00 PM | Feasibility Analysis for the Conversion of Landfill Gas to Compressed Natural Gas to Fuel Refuse Trucks in India | Josias Zietsman | Texas Transportation Institute |
| ■ 2:00 PM to 2:15 PM | Effect of Natural Gas Fuel Composition on Vehicle Emissions and Performance | Tom Durbin | University of California Riverside |
| ■ 2:15 PM to 2:30 PM | Light-Duty Vehicle PM and VOC Speciated Emissions at Differing Ambient Temperatures with Ethanol Blend Gasoline | Tom Long | US EPA |
| ■ 2:30 PM to 2:50 PM | General Discussion of Session 5 | | |

2:50 PM to 3:10 PM

Break: Poster Session and Demonstrations in Pavilion



SESSION 6: Fuel Effects: Compression Ignition

3:10 PM to 3:15 PM *Introduction by Session Leader Mani Natarajan, Marathon Oil Company*

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| ■ 3:15 PM to 3:30 PM | Investigation of Biodiesel Emissions | Curt Robbins | Desert Research Institute |
| ■ 3:30 PM to 3:45 PM | Emissions from Heavy-Duty Engines Fueled with Biodiesel Blends | Nigel Clark | West Virginia University |
| ■ 3:45 PM to 4:00 PM | A Comparative Study of Four Heavy-Duty Diesel Trucks Equipped with Different Exhaust After Treatment Devices Using Various Biodiesel Blend Levels | Kwangsam Na
<i>[presented by Wayne McMahon]</i> | California Air Resources Board |
| ■ 4:00 PM to 4:15 PM | Comparative Levels of NH ₃ and Other Emissions from Heavy Heavy-Duty Trucks Fueled with Diesel and LNG | Kent Johnson | University of California Riverside |
| ■ 4:15 PM to 4:30 PM | First 3 Months Results of Fuel Formulation Variability and Chemistry Impact Study on Stability of Real Diesel Fuels | Oswin Galtier | SP3H |
| ■ 4:30 PM to 4:45 PM | Comparison of Tailpipe Emissions from Transportation Refrigeration Units Fueled with Biodiesel Blends and California Ultra Low Sulfur Diesel | Tin Dinh Truong
<i>[presented by Wayne McMahon]</i> | California Air Resources Board |
| 4:45 PM to 5:05 PM | General Discussion of Session 6 | | |

5:05 PM

END OF DAY

5:30 PM to 6:30 PM

Poster Exhibition and Reception in the Pavilion



Please join us in the Pavilion from 5:30 to 6:30 pm. Poster Exhibitors will be available to answer questions about their presentations. Refreshments will be served.

Wednesday, March 23, 2011

7:30 AM to 8:00 AM Registration in Bayview Ballroom Foyer
Continental Breakfast in Pavilion

SESSION 7: Emission Trends and Modeling

8:00 AM to 8:05 AM *Introduction by Session Leader John Koupal, US Environmental Protection Agency*

- 8:05 AM to 8:20 AM Estimating the Impact of the Recession on Truck and Bus Emissions in California Kathy Jaw *[presented by Todd Sax]* California Air Resources Board
- 8:20 AM to 8:35 AM MOVES2010a Model Project-Scale Emissions Estimates Michael Claggett Federal Highway Administration
- 8:35 AM to 8:50 AM Integration of MOVES and Activity-Based Travel Demand Model for Improved Transportation Emission Inventory Estimation Xun (Richard) Wang Cornell University
- 8:50 AM to 9:05 AM Fast Evolution of Vehicles Emissions from Roadways (FEVER): Understanding Emissions on the Sub-Grid Scale John Liggio *[presented by Greg Smallwood]* Environment Canada
- 9:05 AM to 9:20 AM Measuring Emission Impact Trends in Environmental Data Time-Series Karl Ropkins University of Leeds
- 9:20 AM to 9:40 AM General Discussion of Session 7

9:40 AM to 10:20 AM **Break: Poster Session and Demonstrations in Pavilion**



SESSION 8: Measurement Methods

10:20 AM to 10:25 AM *Introduction by Session Leader Kevin Black, Federal Highway Administration*

- 10:25 AM to 10:40 AM Measurement of Diesel Solid Nanoparticle Emissions Using a Catalytic Stripper for Comparison to Europe's PMP Protocol Heejung Jung University of California Riverside
- 10:40 AM to 10:55 AM Comparison of Off Road Diesel Engine Emission Measurements by ISO8178 and NRTC Protocols Michael Naylor Olson Ecologic Engine Testing Labs
- 10:55 AM to 11:10 AM Cycle Dependence of Fuel Efficiency and Emissions for Articulated Transit Buses Nigel Clark West Virginia University
- 11:10 AM to 11:25 AM Use of Real World Measurements to Recreate Results from Standard Driving Cycles Gonçalo Gonçalves Technical University of Lisbon
- 11:25 AM to 11:40 AM In-Use Measurement and Prediction of Activity, Energy Use, and Emissions of a Plug-In Hybrid Electric Vehicle Christopher Frey No. Carolina State University
- 11:40 AM to 11:55 AM Characterization and Mitigation of Measurement Issues Related to Ammonia in Engine Exhaust Imad Khalek Southwest Research Institute
- 11:55 AM to 12:10 PM Characterizing Emissions from Tier II Vehicles - The Detroit Pilot Study Carl Fulper US EPA
- 12:10 PM to 12:30 PM General Discussion of Session 8

12:30 PM to 2:00 PM **Lunch in Mission Ballroom**

SESSION 9: Particulate Matter Characterization

2:00 PM to 2:05 PM *Introduction by Session Leader Rich Baldauf, US Environmental Protection Agency*

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| ■ 2:05 PM to 2:20 PM | A Comparison of Total Mass, Particle Size Distribution and Particle Number Emissions of Light-Duty Vehicles Tested at Haagen-Smit Laboratory from 2009 to 2010 | Mang Zhang
<i>[presented by Wayne McMahon]</i> | California Air Resources Board |
| ■ 2:20 PM to 2:35 PM | Fine Particle Emissions from Light-Duty Vehicles: Primary Emissions and Secondary Aerosol Formation | Allen Robinson | Carnegie Mellon University |
| ■ 2:35 PM to 2:50 PM | A Brief Report on Global Harmonization of PM and Particle Number Test Procedures under a New UNECE Effort | Alberto Ayala | California Air Resources Board |
| ■ 2:50 PM to 3:05 PM | Fast Evolution of Vehicle Emissions from Roadways (FEVER): Non-Volatile Particulate Emissions | Greg Smallwood | NRC Institute for Chemical Process & Environmental Tech. |
| ■ 3:05 PM to 3:20 PM | Collaborative Lubricating Oil Study on Emissions (CLOSE) Project: Medium- and Heavy-Duty Vehicle Results | Kevin Whitney | Southwest Research Institute |
| ■ 3:20 PM to 3:35 PM | New Technology Diesel Exhaust (NTDE) is Very Different from Traditional Diesel Exhaust (TDE) | Tom Hesterberg | Navistar, Inc. |
| ■ 3:35 PM to 3:50 PM | Characterization of Unregulated Emissions, Particulate Matter Toxicity, Ammonia and Ultrafine Nanoparticle Emissions from a 2010 Compliant Heavy-Duty Natural Gas Vehicle | Arvind Thiruvengadam | West Virginia University |
| ■ 3:50 PM to 4:05 PM | Particle Emissions from a Soot-Free Engine | David Kittelson | University of Minnesota |
| 4:05 PM to 4:25 PM | General Discussion of Session 9 | | |

4:25 PM to 4:50 PM **OPEN DISCUSSION - Mani Natarajan, Chairman**

4:50 PM **END OF WORKSHOP**

Posters

On-Road Multi-Species Remote Sensing Measurements of Vehicle Emissions on Sherman Way in Van Nuys California	Gary Bishop	University of Denver
Results on "Drayage" Heavy-Duty Vehicles Testing Within the Port of Houston Area Using Remote Sensing Devices (RSD), PEMS and PAMS Equipment	Carl Fulper	US EPA
Reducing Particulate Emissions: New Challenges for Spark Ignition Engines with Direct Injection	Victor Saenz-Vota	IAV Automotive Engineering, Inc.
Construction Activity, Emissions, and Air Quality Impacts: Real-World Observations from an Arizona Road-Widening Case Study	Stephen Reid	Sonoma Technology Inc.
Calibration of Real Time Aerosol Instrumentation for PEMS Applications	Athanasios Mamakos	European Commission, Joint Research Centre
In-Use Compliance Measurement Equipment for Heavy-Duty Non-Road Application	Manfred Linke	AVL
Preliminary Investigation of the Correlation of In-Use Diesel Engine PM Emission Rate and Opacity Measurement	John Karim <i>[presented by Wayne McMahon]</i>	California Air Resources Board
Update of Gasoline and Diesel I/M Programs	Antonio Multari	MAHA Maschinenbau Haldenwang GmbH
Characterization of Fuels to Enable Advanced Combustion in a Light-Duty Compression Ignition Engine	Ross Ryskamp	West Virginia University
Mathematical Prediction of Real World Evaporative Emissions	Sam Reddy	Evaporative Emissions Consulting Inc.
The Use of a Secure GPS Travel Activity Data Center for Vehicle Emissions Modeling and Air Quality Inventory Analyses	Matthew Thornton	NREL
Implications of the MOVES2010 Model on Mobile Source Emissions Estimates	Michael Claggett	Federal Highway Administration
Development of Integrated Bus Information System for Evaluation of Emissions and Fuel Economy of Transit Buses	Jun Tu	West Virginia University
Activity-Based Approach to Determine Emission Benefits of a Hybrid Tugboat	Maryam Hajbabaei	University of California Riverside
Development of a Portable Laboratory for On-Road Measurement of Hybrid Electric and Battery Electric Vehicles	Gonçalo Duarte	Technical University of Lisbon
In-Cylinder Combustion Techniques to Identify Advanced Combustion	Benjamin Shade	West Virginia University
Development of CE-CERT's Alternative Transportation Fuels Research Center of Excellence	Tom Durbin	University of California Riverside
Real-Time and Filter-Based Black Carbon Measurements for Vehicle Emissions	Shishan Hu <i>[presented by Alberto Ayala]</i>	California Air Resources Board
Real-Time Particulate Matter Emissions from Heavy-Duty Vehicles Tested on Different Biodiesel Blends	Subhasis Biswas <i>[presented by Wayne McMahon]</i>	California Air Resources Board
Emission Comparison of In-Use Diesel, B5 and B20 from an Off-Road Diesel Generator	Shida Tang	New York State DEC
Quantification of Gases in Plumes by Remote Sensing	J. Stewart Hager	HEAT, LLC
Capabilities, Limitations and Sensitivity of New In-Line, Real-Time Exhaust PM Emissions Sensor	Daniel Carder	West Virginia University

Portable Emissions Measure on a Marine Application	Saeed Abolhasani	Emisstar
Effect of Urea Concentration on NO _x Emissions Control by an SCR After-Treatment System	Danielle Littera	West Virginia University
Evaluation and Assessment of the Correlation between PM Index and PM Emissions for Gasoline Vehicles	John Qiang Fan <i>[presented by Alberto Ayala]</i>	California Air Resources Board

Demonstrations

AVL M.O.V.E. On-Board Gaseous and PM Measurement Equipment	Sigfried Roeck	AVL
AVL Smart Sampler Partial Flow PM System with Add-On Sampling for PN Counting	P. J. Pankratz	AVL
AVL DiTEST Integrated Portable Gaseous & Smoke Measurement Instruments	Sigfried Roeck	AVL
BG-3 System with New Laser Technology	Del Pier	Sierra Instruments
Process Metrix	Donald Holve	Process Metrix
Update of Gasoline and Diesel I/M Programs	Antonio Multari	MAHA Maschinenbau Haldenwang GmbH
Sensors, Inc.	Robert L. Wilson David Booker Andrew Reading Atul Shah	Sensors, Inc.
Emisstar, Inc.	Michael Block Saeed Abolhasani Kathleen McAndrews Eric Persson	Emisstar, Inc.
Dekati, Ltd.	Tyler Beck	Particle Instruments LLC
Pegasor Ltd.	Tyler Beck	Particle Instruments LLC

