

Workshop Regarding Regulatory Fuels Activities

October 8, 2002

California Environmental Protection Agency



Air Resources Board

Agenda

- ◆ Introductions
- ◆ Evaluation of Diesel Engine Lubrication Oils and Diesel Fuel Lubrication Properties
- ◆ Proposed Amendments to the CaRFG3 Regulations
- ◆ Distribution of CaRFG to Retail Outlets
- ◆ Other Miscellaneous Changes for CaRFG3
- ◆ Presentations by Others
- ◆ Open Discussion
- ◆ Closing Remarks

**Evaluation of Diesel Engine
Lubrication Oils and Diesel Fuel
Lubrication Properties**

Sulfur Levels in Lubricating Oils

- ◆ Sulfur content of diesel engine lubricating oils range from 2,500 to 8,000 ppm
- ◆ Sulfur contributions to finished lubricating oils
 - Base stock: from essentially sulfur free up to 4,000 ppm
 - Additives: typically 2,500 ppm to 3,000 ppm sulfur
- ◆ Worst case estimate for sulfur contribution of lubricating oils to exhaust
 - 7 ppm maximum equivalent fuel sulfur contribution based on:
 - 8,000 ppm sulfur content in lubricating oil
 - nominal oil usage of 1 quart every 2,000 miles
 - heavy duty diesel engine fuel usage of 6 miles per gallon

APBF-DEC Lubricants Work Group

Phase 1 Testing

◆ Objective

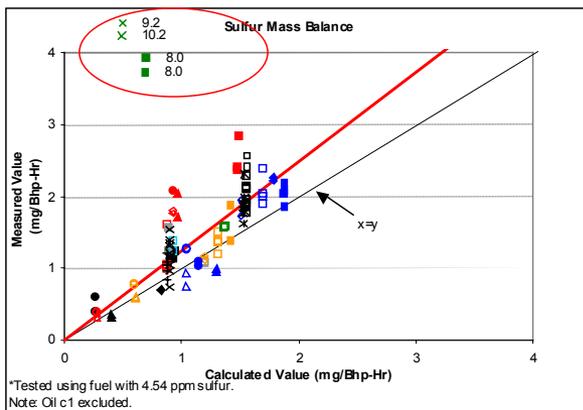
- Determine impact of lubricant properties and composition on engine-out/catalyst-in emissions
 - Part 1: Characterize effects of lubricant properties on engine out emissions
 - Part 2: Develop methods to accelerate exposures of emission control systems to lubricant-derived emissions

◆ Status:

- Part 1 testing completed
- Part 2 testing in progress

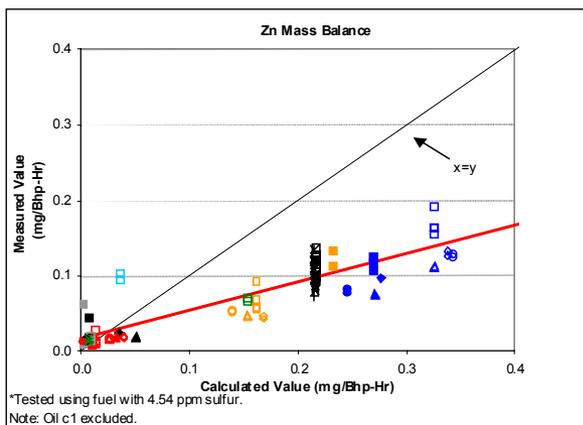
APBF-DEC Lubricants Work Group Phase 1 Testing (cont.)

Preliminary Phase 1, Part 1 Test Results



◆ Sulfur, zinc, phosphorous, and calcium emissions are proportional to their concentrations in the oils

– Exception: increased emissions for some oils suggest there is a formulation dependency



◆ Zinc and calcium emissions are lower than predicted from the measured oil consumption - i.e. recovery rate is significantly less than 100%

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Phase 1 Testing (cont.)

Phase 1, Part 2 Testing

- ◆ Evaluating multiple techniques for accelerating the lubricant derived emissions effects on catalyst aging
 - Blending oil into the fuel
 - Preliminary results confirms those from Part 1 of Phase 1
 - Injecting oil into the exhaust
 - Testing initiated

APBF-DEC Lubricants Work Group

Phase 2 Testing

◆ Objective

- Evaluate impact of lubricant formulations on performance and durability of advanced diesel emission control systems
 - To include use of rapid catalyst aging protocol currently being developed

◆ Schedule:

- Testing to begin ~January 2003
- Testing to be complete ~ August 2003
- Data evaluation and reporting to be complete
December 2003

DASL/N-TCD Consortium

- ◆ Southwest Research Institute private consortium: Diesel Aftertreatment Sensitivity to Lubricants (DASL) / Non-Thermal Catalyst Deactivation (N-TCD)
- ◆ Seven industry members: Infineum, Caterpillar, ExxonMobil, Lubrizol, Chevron-Oronite, NGK, and Corning
- ◆ DASL effort:
 - Study the effects of oil combustion by-products on diesel emission control systems
 - Measure deactivation of emissions-control systems
- ◆ No public disclosure of progress at this time
 - See website for news: <http://www.swri.org/dasl/n-tcd/>

Related ASTM Activity

- ◆ Proposed category 10 (PC-10) initiated
 - For use with after treatment technology
 - Lower sulfur, phosphorous, and sulfated ash
 - Engine durability issues to be addressed
 - 2006 approval date planned
- ◆ Engine Manufacturer's Association's (EMA) oil requirements have been provided to ASTM
 - Requirements to be discussed at December meeting of ASTM Heavy Duty Engine Oil Classification Panel

Regulatory Development Process

- ◆ Consider possible diesel engine lubricating oil specifications
- ◆ Expected scope: limit sulfur/ash content of lubricating oil with recognition of appropriate levels to ensure engine protection
- ◆ Preparing survey directed to producers and marketers of California engine lubricating oils
 - Determine current levels of sulfur and ash in oils marketed in California
 - Determine oil components that contribute to sulfur and ash in oils marketed in California

Regulatory Development Process (cont.)

- ◆ Interim recommendations
 - Address early introduction of after treatment technology
 - Provide guidance to fleet operators on the use of existing engine oils with after treatment technology
 - Time frame: 2003

Regulatory Development Process (cont.)

- ◆ Formal specifications
 - Support 2007 exhaust emissions standards
 - Recognize industry voluntary specifications
 - Consider results from the APBF-DEC testing
 - Time frame: 2004

ASTM Moving Forward with Lubricity Standard

- ◆ ASTM preparing to ballot a diesel fuel lubricity specification at the subcommittee level
 - Based on original International Organization for Standardization (ISO) study
 - In line with California Governor's Task Force recommendation implemented by industry and successfully used in California since 1994
 - 3,100 gram minimum based on Scuffing Load Ball-on-Cylinder Lubricity Evaluator (SLBOCLE)
- ◆ Schedule:
 - Address any opposing votes to ballot at December ASTM meeting
 - Depending on results, may be able to ballot at subcommittee and committee level after December meeting
- ◆ Future work
 - Coordinating Research Council (CRC) to form Diesel Performance Group
 - Future projects may include lubricity research
 - ASTM standard to be updated when new data available

Proposed Amendments to the CaRFG3 Regulations

Public Hearing to Consider Amendments to CaRFG3 Regulations

- ◆ December 12, 2002, 9:00 a.m.
CalEPA Central Valley Auditorium
1001 “I” Street, Sacramento
- ◆ Draft of proposed regulatory text now available at:
<http://www.arb.ca.gov/cbg/meeting/2002/mtg2002.htm>
- ◆ Notice of public hearing and staff report will be available on October 25, 2002 at:
<http://www.arb.ca.gov/regact/mtberesid/mtberesid.htm>

Revisions of Prohibitions of MTBE and Other Oxygenates

CaRFG3 Basic Prohibition of MTBE

Approved at July Board Hearing

- ◆ Starting December 31, 2003, no California gasoline produced with the use of MTBE.
- ◆ Timetable for reducing residual MTBE levels revised to be consistent with delay of MTBE phase-out
 - Limits that must not be exceeded
 - Starting December 31, 2003: 0.3 volume %
 - Starting December 31, 2004: 0.15 volume %
 - Starting December 31, 2005: 0.05 volume %

Clarification of “Produced With the Use” of MTBE or Other Oxygenates Other than Ethanol

- ◆ New definition for “produced with the use of” as it applies to MTBE is incorporated into the revised MTBE prohibition provisions
- ◆ A separate definition of “produced with the use of” is used to clarify the meaning of this phrase as it applies to oxygenates other than MTBE and

Proposed Revisions: MTBE Prohibitions

- ◆ Do not change prohibition of adding MTBE in neat form either to gasoline or blendstocks used to produce gasoline at the refinery
- ◆ Proposed amendment to prohibit use of any gasoline blendstock that contains more than 0.6 volume percent MTBE when it is supplied to the refinery
- ◆ Imported finished gasoline would only be subject to the allowable residual levels of the CaRFG3 regulations

Clarification of Prohibitions of Other Specified Oxygenates

- ◆ Parallel the revised basic prohibitions of MTBE
 - As before, prohibited from adding any oxygenate other than ethanol and MTBE in neat form to gasoline or blendstocks used to produce gasoline at the California refinery
 - Clarify that use of any gasoline blendstock that contains more than 0.1 weight percent total oxygen from oxygenates other than ethanol and MTBE is prohibited
 - Clarify that imported finished gasoline would be subject to the total oxygen weight percent residual levels proposed in the CaRFG3 amendments

Proposed Amendments of MTBE Prohibitions

- ◆ Reduce de minimis levels in four steps instead of three and delay implementation dates for current levels
 - Initial 6-month phase with de minimis limit at 0.6 volume % (same as labeling requirement for non-MTBE gasoline)
 - The de minimis level of 0.3 volume % would be effective starting July 1, 2004 instead of Dec. 31, 2003
 - Allow 18 months instead of 12 months to reduce level from 0.3 to 0.15 vol.%
 - Final prohibition level of 0.05 vol.% effective 12 months later

Allowable Residual MTBE Levels for CaRFG3

Allowable Residual MTBE Levels (volume %)	Approved July, '02	To be proposed December, '02
0.60	--	Dec. 31, 2003
0.30	Dec. 31, 2003	July 1, 2004
0.15	Dec. 31, 2004	Dec. 31, 2005
0.05	Dec. 31, 2005	Dec. 31, 2006

Proposed Amendments of CaRFG3 Prohibitions of Oxygenates Other than MTBE and Ethanol

- ◆ Propose a schedule for specifications for total oxygen content in gasoline from all oxygenates listed in ASTM D 4815-99 other than MTBE and ethanol
 - Starting December 31, 2003, initial 6-month phase with allowable residual level of 0.1 wt.% for the combined oxygen concentration from all of the the prohibited oxygenates. (this oxygen level is equivalent to the initial MTBE de minimis level)
 - Starting July 1, 2004, the total oxygen concentration from all of the prohibited oxygenates cannot exceed 0.06 percent by weight

Oxygenates Other than MTBE and Ethanol

Methanol

Isopropanol

n-propanol

n-Butanol

iso-Butanol

sec-Butanol

tert-Butanol

tert-pentanol (tert-amylalcohol)

Ethyl tert-butylether (ETBE)

Diisopropylether (DIPE)

Tert-amylmethylether (TAME)

Proposed Documentation of Presence or Absence of Ethanol in Retail Gasoline

- ◆ Person delivering gasoline to a retail outlet provides documentation to the outlet operator at time of delivery
 - may be an invoice, bill of lading or other documentation
- ◆ Must state whether the gasoline does or does not contain ethanol

Distribution of CaRFG to Retail Outlets

Distribution of CaRFG to Retail Outlets

- ◆ The one-year postponement of the MTBE ban together with the early opt-in provisions will likely result in a one-year transition period with at least two types of oxygenated gasoline in the marketplace
- ◆ Federal regulations prohibit mixing of gasoline containing ethanol with non-ethanol gasoline during the RVP controlled season in federal RFG areas
- ◆ Distributors are concerned that situations may arise during the transition period where the available CaRFG is not the same kind as that required by the retail outlet

Distribution of CaRFG to Retail Outlets (cont.)

- ◆ ARB staff does not believe revisions to the regulations are necessary to address this concern
- ◆ The terminal transitions and protocol provisions of the CaRFG3 regulations can adequately address issues at the terminal
- ◆ In other cases of unavailability of the correct fuel to the distributors, the ARB and CEC staffs will work together to determine the supply situation and how relief can be provided, if the need arises, without compromising air quality benefits.

Other Miscellaneous Proposed Changes

Other Miscellaneous Proposed Changes

- ◆ Sunset the requirement for documentation of the presence of MTBE in the gasoline delivered to retail outlets after December 31, 2003
- ◆ Replace currently added provision for oxygenates in early opt-in CaRFG3
 - Require that early opt-in CaRFG3 meet limits of 0.60 volume percent for MTBE and 0.10 weight percent oxygen collectively from the specified oxygenates other than MTBE or ethanol

Presentations by Others

Open Discussion

Closing Remarks