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Air Resources Board

Alan C. Lloyd, Ph.D.
Chairman

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Gray Davis
Governor

November 29, 2001

Mail Out #MSC 01-17

TO: ALL OFF-ROAD COMPRESSION IGNITION ENGINE MANUFACTURERS AND
OTHER INTERESTED PARTIES

RE: REQUEST FOR INFORMATION ON THE DEVELOPMENT OF EMISSION
CONTROL TECHNOLOGIES CAPABLE OF MEETING TIER 2 AND TIER 3
OFF-ROAD COMPRESSION IGNITION EMISSIONS STANDARDS AND BEYOND

The Air Resources Board (ARB) is conducting an investigation into the development of emission control technologies capable of meeting California's Tier 2 and Tier 3 off-road compression ignition (diesel) standards. As such, diesel engine manufacturers are asked to provide ARB with all technical or logistical information in their possession that could better assist ARB in evaluating industry's capabilities and the feasibility of meeting upcoming implementation schedules. Specifically, ARB is interested in learning which control technologies are favored by manufacturers and why, the levels of emission reductions achievable by these technologies regarding product lines, the expected durability and maintenance requirements for these technologies, and the costs involved with their implementation. Of particular interest to ARB is the ability of these technologies to maintain emissions at, or below, required standards throughout the engine's useful life (durability period) and over the range of commercially available fuels including Federal non-road diesel and California diesel.

Furthermore, ARB requests that engine manufacturers provide all information related to the development of NOx and PM aftertreatment technologies for the off-road sector. This information will assist ARB in assessing the potential benefits of emerging technologies, and will provide significant direction regarding off-road regulatory development in the future. ARB estimates that air quality in much of California will still be in non-attainment of Federal ambient air quality standards even after the completed phase-in of Tier 2 and Tier 3 off-road diesel engine emissions standards. As such, further methods for reducing emissions from compression ignition engines must be considered for development and introduction into the marketplace. ARB believes that diesel engine exhaust aftertreatment technologies capable of performing at levels similar to those needed to meet 2007 model year on-road heavy-duty diesel engine standards will be a necessary constituent in achieving this goal.

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our Website: <http://www.arb.ca.gov>.

California Environmental Protection Agency

TO: ALL OFF-ROAD COMPRESSION IGNITION ENGINE MANUFACTURERS
NOVEMBER 29, 2001
Page 2

Specific examples of the information that ARB is requesting are listed in an attachment to this letter. We request that all submissions, at a minimum, address these examples. However, additional information illustrating proprietary techniques, perspectives, and concerns are also requested. Data may be provided in any format including, but not limited to, reports, tables, graphs, charts, and presentations. Summarized analyses and conclusions, where available, will be greatly appreciated. Please be sure to mark all material of a sensitive nature as confidential. Submissions not identified as confidential may become part of the public record, and thereafter referenced in agency publications or at ARB sponsored workshops and board hearings.

ARB appreciates your assistance in this investigation. Please submit all information to the following address by Monday, December 31, 2001:

Air Resources Board
9528 Telstar Avenue
Off-Road Controls Section, Annex II
El Monte, CA 91731
Attn: Jeffrey Lowry

If you have questions or need clarification with respect to any of the requests in this letter, please contact Ms. Jackie Lourenco, Manager, or Mr. Jeffrey Lowry, Staff Air Pollution Specialist, in the Off-Road Controls Section, at (626) 575-6676 and (626) 575-6841, respectively.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael W. Carter". The signature is fluid and cursive, with a large initial "M" and a long, sweeping underline.

Michael W. Carter, Chief
Emissions Research and Regulatory Development Branch

Attachment

INFORMATION REQUEST FOR OFF-ROAD EMISSIONS TECHNOLOGIES

Please respond to the following requests by December 31, 2001. Classified information should be clearly marked on each page with the identifier "CONFIDENTIAL."

Identification of Technologies:

- 1) Provide a comprehensive list of all emission control technologies currently employed by your off-road product lines. Indicate whether the technologies were developed in-house, or supplied by a vendor. Identify vendors by name.
- 2) Provide a list of emission control technologies that your off-road product lines have, or will incorporate to meet Tier II emissions standards. Indicate whether the technologies were developed in-house, or supplied by a vendor. Identify vendors by name.
- 3) Provide a list of emission control technologies that your off-road product lines have, or will incorporate to meet Tier III emissions standards. Indicate whether the technologies were developed in-house, or supplied by a vendor. Identify vendors by name.
- 4) Provide a list of exhaust aftertreatment control technologies for particulate matter, oxides of nitrogen, and hydrocarbons, that your organization has, or is currently investigating. Indicate whether the technologies were developed in-house, or supplied by a vendor. Identify vendors by name.

Description of Technologies:

- 5) Provide a detailed description of all the technologies referenced above regarding functionality, operating conditions (e.g., exhaust temperature range), applicability, physical dimensions, and ease of integration into existing design packages.
- 6) List and describe all powertrain and chassis design changes that were/are needed to accommodate each emissions control technology.
- 7) Provide a corresponding list of accessory components, substances, or procedures that are needed for these technologies to function properly (e.g., NOx sensor, urea, or periodic off-board regeneration).
- 8) Describe maintenance procedures for each technology (if any) and the frequency of required maintenance.
- 9) Provide itemized cost estimates for each technology and associated accessories including component cost, R&D, etc.

Emissions Performance:

- 10) For each technology identified, provide test results demonstrating the level of emissions reductions that can be achieved relative to the age of the engine when new and at the end of its useful life.
- 11) Identify all parameters that were used to optimize emissions performance (e.g., filter loading and size, exhaust temperature, proximity of filter in exhaust stream, etc.)
- 12) Provide test results illustrating emissions reductions when using federal non-road diesel fuel, California diesel fuel, and low sulfur blends such as ARCO EC-Diesel fuel. Identify the concentrations of sulfur and aromatics, and the cetane number for each of the fuels tested.
- 13) Provide test results illustrating emissions reductions during operation on the 8 Mode (Steady-State ISO 8178-4 C1), Federal Test Procedure (FTP), Non-Road FTP, and Not-To-Exceed (NTE) driving cycles.
- 14) Identify and quantify any synergistic side-effects (e.g., increased NO₂ formation) resulting from the use of these technologies.

Durability Effects:

- 15) Provide data and/or an engineering evaluation regarding the specific impacts that the emission control technologies would have on powertrain or chassis wear.
- 16) Quantify the effect (if any) that each technology would have on fuel consumption.
- 17) Quantify the effect (if any) that each technology would have on oil consumption or oil replacement intervals.
- 18) Provide engine tear down and oil analyses results and records for engines with the identified emission control technologies.

Logistical Information:

- 19) Identify the percentage of engines in your product lines, if any, that take advantage of Tier II implementation flexibility provisions. Identify the model year(s) which correspond to the applied percentages.
- 20) Identify concerns related to the implementation of emission control technologies studied by your organization.