

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-392-35

Relating to Exemptions under
Section 27156 of the Vehicle Code

Advanced Engine Management, Inc.
Water Injection System – Red Nozzle

Pursuant to the authority vested in the Air Resources Board by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-02-003;

IT IS ORDERED AND RESOLVED: That installation of the Water Injection System, manufactured by Advanced Engine Management, Inc. of 2205 126th Street, Unit A, Hawthorne, California 90250, has been found not to reduce the effectiveness of the applicable vehicle/engine pollution control systems, and therefore, the Water Injection System, part number 30-3111 with a red nozzle, is exempt from the prohibitions in Section 27156 of the Vehicle Code for installation on engines rated from 280 to 350 horsepower. The applicable engines and vehicles are listed in Attachment A.

The Water Injection System consists of a water tank and integral fluid level sensor, high pressure pump, check valve, injector assembly with nozzle, high pressure hose, injection controller, and mounting hardware.

This exemption applies to a 5-gallon tank which cannot hold any fluid other than water and a red injection nozzle rated at 550 cubic centimeters per minute.

No changes to the original engine/vehicle, such as disconnection, relocation, or modification of original temperature sensors or fuel calibration, are allowed with the use of the Water Injection System.

This Executive Order is granted based on emission testing Advanced Engine Management, Inc. conducted with the Water Injection System.

If evidence provides the Air Resources Board with reasons to suspect that the Water Injection System will affect the durability of the emission control system, Advanced Engine Management, Inc. shall be required to submit durability data to show that the durability of the vehicle/engine emission control systems is not, in fact, affected and/or that the add-on or modified parts demonstrate adequate durability.

This Executive Order is valid provided that installation instructions for the Water Injection System do not recommend tuning the engine/vehicle to specifications different from those of the engine/vehicle manufacturer.

Changes made to the design or operating conditions of the Water Injection System, as exempt by the Air Resources Board, which adversely affect the performance of the engine/vehicle emission control system, shall invalidate this Executive Order.

Marketing of the Water Injection System using identification other than that shown in this Executive Order or for an application other than that listed in this Executive Order shall be prohibited unless prior approval is obtained from the Air Resources Board.

Exemption of the Water Injection System shall not be construed as exemption to sell, offer for sale, or advertise any component of the system as an individual device.

This Executive Order shall not apply to any Water Injection System advertised, offered for sale, sold with, or installed on an engine/vehicle prior to or concurrent with transfer to an ultimate purchaser.

This Executive Order does not constitute any opinion as to the effect the use of the Water Injection System may have on any warranty either expressed or implied by the engine/vehicle manufacturer.

No claim of any kind, such as "Approved by the Air Resources Board," may be made with respect to the action taken herein in any advertising or other oral or written communication.

In addition to the foregoing, the Air Resources Board reserves the right in the future to review this Executive Order and the exemption provided herein to assure that the exempted add-on or modified part continues to meet the standards and procedures of California Code of Regulations, Title 13, Section 2222, et seq.

THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, APPROVAL, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF ADVANCED ENGINE MANAGEMENT, INC.'S WATER INJECTION SYSTEM.

Violation of any of the above conditions shall be grounds for revocation of this Executive Order. The Executive Order may be revoked only after a ten-day written notice of intention to revoke the Executive Order, in which period the holder of the Executive Order may request in writing a hearing to contest the proposed revocation. If a hearing is requested, it shall be held within ten days of receipt of the request, and the Executive Order may not be revoked until a determination is made after the hearing that grounds for revocation exist.

Executed at El Monte, California, this 27 day of September 2011.



Annette Hebert, Chief
Mobile Source Operations Division

ADVANCED ENGINE MANAGEMENT, INC.
WATER INJECTION SYSTEM – D-392-35

Attachment A

Advanced Engine Management, Inc.			
Water Injection System*	Model Year	Model	Engine
30-3111 (Red Nozzle)	2001-2010	Chevrolet Silverado HD, Kodiak, Express; GMC Sierra HD, Topkick, Savanna; HUMMER H-1 Alpha	6.6L Duramax diesel
	1994-2003	Ford F-series pickup, Excursion, E-series van	7.3L Powerstroke diesel
	2003-2007	Ford F-series pickup, Excursion	6.0L Powerstroke diesel
	2003-2010	Ford E-series van	6.0L Powerstroke diesel
	2008-2010	Ford F-series pickup	6.4L Powerstroke diesel
	2003-2007	Dodge Ram pickup	5.9L Cummins diesel
	2008-2010	Dodge Ram pickup	6.7L Cummins diesel

* This exemption applies to Water Injection System using the following parts:

1. 5-gallon tank holding water only
2. Red injection nozzle rated at 550 cubic centimeters per minute (35-4516-R)
3. Injection controller (35-4513EO Rev A.hex)

EVALUATION SUMMARY

Manufacturer Name: Advanced Engine Management, Inc.

Name of Device: Water Injection System, part number 30-3111

Background:

Advanced Engine Management, Inc. (AEM) of 2205 126th Street, Unit A, Hawthorne, California 90250 has requested exemption from the prohibitions in Section 27156 of the California Vehicle Code for its Water Injection System. It is designed for Dodge, Ford, and GM medium-duty trucks equipped with 1999 through 2010 model-year Cummins, Navistar, International, and General Motors diesel engines. The engines/vehicles are certified to Tier-1/LEV/ULEV (engine) and LEV II LEV/ULEV (chassis) exhaust emission standards. The vehicles are also subject to On-Board Diagnostic II (OBD II) system regulations.

Recommendation:

Grant exemption to AEM as requested and issue Executive Order D-392-35. The covered parts, engines, and vehicles are listed in Attachment A.

Device Description:

AEM's Water Injection System is designed to increase horsepower and torque by increasing the charge air density. This is accomplished by introducing water mists into the intake air charge after it has been compressed by the turbocharger, decreasing the intake air temperature. The system consists of a 5-gallon water tank with integral fluid level sensor, high pressure pump, check valve, injector assembly with nozzle, high pressure hose (nylon), injection controller, and mounting hardware. Water injection is controlled by an electronic control system that regulates the water pump speed in direct proportion to positive manifold pressure or boost levels. Water injection calibration is not adjustable.

The system uses a red nozzle rated at 550 cubic centimeters per minute (cc/min) and injection controller calibration 35-4513EO Rev A.hex. Water injection starts at six pounds per square inch (psi) of boost and progressively increases, peaking at 20 psi of boost. The injection nozzle is placed in the charge pipe downstream of the intercooler outlet and mass air flow sensor in a location that promotes best distribution of water mists to all cylinders. On engines with exhaust gas recirculation systems, the nozzle is placed just upstream of the valve.

The system includes a test button that is used to manually activate the pump and verify system integrity. Water injection using the test button is only possible when the engine is turned off. AEM recommends periodic injector nozzle cleaning. No changes to the original engine/vehicle settings or emission control systems are allowed.

Discussion/Basis for the Recommendation:

This exemption is based on exhaust emission testing AEM conducted with its Water Injection System on a 2008 Ford F-350 medium-duty diesel truck. The Ford truck was selected for exhaust emission testing after AEM provided intake manifold temperature data which showed the greatest temperature change in the Ford truck. Exhaust emission test results are presented below:

	SFTP US06 (grams/mile)				
	NMHC	NOx	CO	PM	NMHC+NOx
Baseline	0.005	1.881	0.0	0.0023	1.886
Modified	0.005	1.689	0.0	0.0021	1.694

Notes:

Test laboratory – Automotive Testing and Development Services, Inc. in Ontario, California

Test engine – engine family 8NVXH06.4AGC (on vehicle test group 8FMXA06.4AGC); ~45,000 miles

Testing with the injection system turned off (baseline) and on (modified) showed no adverse emission impact from using the Water Injection System. The system also had no adverse impact on the vehicle's OBD II system. Similar results are expected when the Water Injection System is used on any of the engines/vehicles included in the exemption.