

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-685

Relating to Exemptions under
Section 27156 of the Vehicle Code

Kingsway Hydrogen LLC
Kingsway Hydrogen Fuel Enhancement System

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 Kingsway Hydrogen Fuel Enhancement System hydrogen generator device, manufactured by Kingsway Hydrogen LLC (853 New Lincoln Road, Talladega, AL 35160), has been found not to reduce the effectiveness of the applicable vehicle pollution control systems, and therefore, the Kingsway Hydrogen Fuel Enhancement System is exempt from the prohibitions in Section 27156 of the Vehicle Code for installation on all 1985-2006 model year (MY) heavy-duty trucks equipped with diesel engines between 8.0 liters to 18.0 liters and 1985-2006 MY medium-duty trucks equipped with Cummins diesel engines between 5.9 liters to 8.0 liters.

The Kingsway Hydrogen Fuel Enhancement System device consists of a 5-quart water reservoir and a metal case containing the electrolysis generator cell, various electrical components, electrical wiring and connectors, and a polyethylene supply hose for the hydrogen gas.

This Executive Order is based on emission test results using Heavy-Duty Federal Test Procedure (FTP) Transient Cycle test and Euro III European Stationary Cycle (ESC) test submitted by Kingsway Hydrogen LLC with the Kingsway Hydrogen Fuel Enhancement System device.

If evidence provides the Air Resources Board with reasons to suspect that the Kingsway Hydrogen Fuel Enhancement System device will affect the durability of the emission control system, Kingsway Hydrogen LLC shall be required to submit durability data to show that the durability of the vehicle emission control system 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 Kingsway Hydrogen Fuel Enhancement System device do not recommend tuning the vehicles to specifications different from those of the vehicle manufacturer.

Changes made to the design or operating conditions of the Kingsway Hydrogen Fuel Enhancement System device, as exempt by the Air Resources Board, which adversely affect the performance of the vehicle's emission control system, shall invalidate this Executive Order.

Marketing of the Kingsway Hydrogen Fuel Enhancement System device 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 Kingsway Hydrogen Fuel Enhancement System device shall not be construed as exemption to sell, offer for sale, or advertise any component of the kit as an individual device.

This Executive Order shall not apply to any Kingsway Hydrogen Fuel Enhancement System device advertised, offered for sale, sold with, or installed on a motor 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 Kingsway Hydrogen Fuel Enhancement System device may have on any warranty either expressed or implied by the 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 KINGSWAY HYDROGEN LLC'S KINGSWAY HYDROGEN FUEL ENHANCEMENT SYSTEM DEVICE.

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 22nd day of February 2011.


Annette Hebert, Chief
Mobile Source Operations Division

EVALUATION SUMMARY

Manufacturer Name: Kingsway Hydrogen LLC

Name of Device: Kingsway Hydrogen Fuel Enhancement System

Background:

Kingsway Hydrogen LLC of 853 New Lincoln Road, Talladega, AL 35160 has applied for exemption from the prohibitions in Section 27156 of the California Vehicle Code for its Kingsway Hydrogen Fuel Enhancement System device. The device is designed for all 1985-2006 model year (MY) heavy-duty trucks equipped with diesel engines between 8.0 liters to 18.0 liters and 1985-2006 MY medium-duty trucks equipped with Cummins diesel engines between 5.9 liters to 8.0 liters.

Recommendation:

Grant exemption to Kingsway Hydrogen LLC as requested and issue Executive Order D-685.

Device Description:

The Kingsway Hydrogen Fuel Enhancement System device produces hydrogen through an electrolysis process by supplying water from a reservoir containing distilled water and an activator (potassium sulfate) to an electrolysis dry cell containing titanium metal plates that are supplied electricity from the vehicle's battery. The device consists of a metal case containing a 5-gallon water reservoir, an electrolysis dry cell (which contains the positive, negative, and neutral titanium metal plates), various electrical components, electrical wiring and connectors, and a polyethylene supply hose for the hydrogen gas.

Discussion/Basis for the Recommendation:

This exemption is based on the following emission tests conducted on two heavy-duty diesel engines with Kingsway Hydrogen LLC's Kingsway Hydrogen Fuel Enhancement System device installed:

1. FTP transient cycle test on a 1999 MY Mack E7 Series 11.9 liter diesel engine.
2. FTP transient cycle, Euro III ESC 13-mode steady-state, and NTE tests on a 2006 MY Cummins ISX Series 14.9 liter diesel engine.

The emission test results are shown below:

Hot-Start FTP Transient Cycle Emission Test
1999 MY Mack E7 Series 11.9 liter Diesel Engine
Engine Family XMKXH11.9E54

	FTP Transient Cycle Emissions (grams/bhp-hr)			
	HC	NOx	CO	PM
FTP baseline results for engine	0.20	4.71	1.17	0.077
FTP results w/Kingsway Hydrogen Fuel Enhancement System installed	0.19	4.83	1.07	0.074
Percentage change	-5.0%	+2.6%	-8.3%	-3.9%

**Hot-Start FTP Transient Cycle Emission Test
2006 MY Cummins ISX Series 14.9 liter Diesel Engine
Engine Family 6CEXH0912XAJ**

	FTP Transient Cycle Emissions (grams/bhp-hr)			
	NMHC	NMHC+NOx	CO	PM
FTP baseline results for engine	0.14	2.70	1.32	0.13
FTP results w/Kingsway Hydrogen Fuel Enhancement System installed	0.14	2.77	1.38	0.13
Percentage change	0%	+2.6%	+4.5%	0%

**Euro III ESC 13-Mode Steady-State Emission Test
2006 MY Cummins ISX Series 14.9 liter Diesel Engine
Engine Family 6CEXH0912XAJ**

	Euro III ESC Emissions (grams/bhp-hr)		
	NMHC+NOx	CO	PM
Euro III average baseline results for engine	2.18	0.87	0.092
Euro III results w/Kingsway Hydrogen Fuel Enhancement System installed	2.21	0.93	0.097
Percentage change	+1.4%	+6.9%	+5.4%

**NTE Emission Test
2006 MY Cummins ISX Series 14.9 liter Diesel Engine
Engine Family 6CEXH0912XAJ**

	NTE Emissions (grams/bhp-hr)		
	NMHC+NOx		
	Point 1	Point 2	Point 3
NTE baseline results for engine	3.50	2.46	7.65
NTE results w/Kingsway Hydrogen Fuel Enhancement System installed	2.87	1.35	8.29
Percentage change	-18.0%	-45.1%	+8.4%

- Notes: 1. NTE Point 1 is 90% Torque/38% RPM
 NTE Point 2 is 85% Torque/80% RPM
 NTE Point 3 is 60% Torque/55% RPM
 2. All testing was conducted at Olson-EcoLogic Engine Testing Laboratories in Fullerton, California

FTP transient cycle testing on the 1999 Mack E7 Series engine modified with the Kingsway Hydrogen Fuel Enhancement System device and FTP transient cycle testing, EURO III ESC, and NTE emission testing on the 2006 Cummins ISX Series engine modified with the Kingsway Hydrogen Fuel Enhancement System device showed that all comparative exhaust emission test results were no more than 10 percent above baseline exhaust emissions which is acceptable for exemption. Similar results are expected when Kingsway Hydrogen LLC's Kingsway Hydrogen Fuel Enhancement System device is used on the 1985-2006 model year (MY) heavy-duty trucks equipped with diesel engines between 8.0 liters to 18.0 liters and 1985-2006 MY medium-duty trucks equipped with Cummins diesel engines between 5.9 liters to 8.0 liters.