

**State of California
AIR RESOURCES BOARD**

EXECUTIVE ORDER DE-09-010-05

The diesel emission control strategy described herein qualifies as a potential compliance option for the Air Resources Board's (ARB) in-use diesel fleet rules.

Pursuant to the authority vested in ARB by the *Health and Safety Code*, Division 26, Part 5, Chapter 2; and pursuant to the authority vested in the undersigned by *Health and Safety Code* Sections 39515 and 39516 and Executive Order G-14-012;

Relating to Exemptions under Section 38395 of the *Vehicle Code*, and Verification under Sections 2700 to 2711 of Title 13 of the *California Code of Regulations* (CCR)

ESW Technologies Incorporated (ESWT)
ThermaCat™ System

ARB has reviewed ESWT's request for verification of the ThermaCat™ system. Based on an evaluation of the data provided, and pursuant to the terms and conditions specified below, the Executive Officer of ARB hereby finds that the ThermaCat™ system reduces emissions of diesel particulate matter (PM) consistent with a Level 3 device (greater than or equal to 85 percent reductions) (Title 13, CCR, Sections 2702 (f) and Section 2708) and is compliant with the 2009 nitrogen dioxide emissions limit. Accordingly, the Executive Officer determines that the system merits verification and, subject to the terms and conditions specified below, classifies the ThermaCat™ system as a Level 3 Plus system for off-road equipment, which includes portable equipment, that use certain diesel engines. Engines for which the ThermaCat™ system is verified, the verified parts list, the verified labels, swapping and re-designation information, and other product information can be found here:

<http://www.arb.ca.gov/diesel/verdev/companies/esw/thermacat.htm>

The aforementioned verification is subject to the following terms and conditions:

- The engine must be used in off-road equipment. The engine must not be in an on-road truck auxiliary power unit, transport refrigeration unit, gantry crane, stationary application, marine vessel, or locomotive.
- The application must have a duty cycle with an average temperature profile greater than 210 degrees Celsius for no less than 15 percent of the operating cycle.
- The engine must have a displacement of at least 5 liters and at most 15.2 liters.
- The engine must be rated to at least 100 horsepower (hp) and no more than 350 hp.

- The engine must not be certified as having exhaust gas recirculation (EGR).
- The engine must not have an internal EGR system.
- The engine must be certified for off-road applications at a PM emission level of at most 0.2 grams per brake horsepower-hour (g/bhp-hr), and greater than 0.01 g/bhp-hr.
- Only one filter may be installed per engine.
- The engine must be in its original certified configuration.
- The engine may or may not be certified to have an original equipment manufacturer (OEM) diesel oxidation catalyst (DOC).
- The engine must remain in its original certified configuration, except that if an OEM DOC is present, it may be removed if the ThermoCat™ system is installed. Should the ThermoCat™ system be removed, the OEM DOC must be re-installed, returning the engine to its original certified configuration.
- The engine must not be certified to have an OEM diesel particulate filter (DPF).
- The engine must not have a pre-existing OEM selective catalytic reduction system.
- The engine must have a four-stroke combustion cycle.
- The engine may be turbocharged or naturally aspirated.
- The engine can be electronically or mechanically controlled.
- The engine must be well maintained and not consume lubricating oil at a rate greater than that specified by the engine manufacturer.
- Lube oil, or other oil, must not be mixed with the fuel.
- The engine must be operated on fuel that has a sulfur content of no more than 15 parts per million by weight.
- The system must not be operated with fuel additives, as defined in Section 2701 of Title 13 of CCR, unless explicitly verified for use with the fuel additive(s).
- The system must not be used with any other systems or engine modifications without ARB and manufacturer written approval.

- The system must be installed with a backpressure monitor that notifies the operator when the backpressure limit is reached. The notification must occur and be clearly visible to the operator while the vehicle or equipment is in use.
- The other terms and conditions specified below.

It is also ordered and resolved that installation of the ThermaCat™ system, manufactured by ESW Technologies Incorporated of 200 Progress Drive, Montgomeryville, Pennsylvania 18936, has been found not to reduce the effectiveness of the applicable vehicle pollution control system, and therefore, the ThermaCat™ system is exempt from the prohibitions in Sections 38390 and 38391 of the *Vehicle Code* for installation on heavy-duty off-road vehicles. This exemption is only valid provided the engines meet the aforementioned conditions.

The ThermaCat™ system consists of the following major system components, listed in order from exhaust inlet to outlet as they are arranged within the exhaust system of the vehicle: one inlet module, one catalyzed wire mesh DOC filter, one catalyzed cordierite wall flow DPF, and one outlet module. The ThermaCat™ system also includes a backpressure sensor, two temperature sensors, and warning system. The major components of the ThermaCat™ system are identified in the parts list. The parts list and schematics of the approved product and engine labels are available on the website shown above.

The ThermaCat™ system is comprised of a single DOC and a single DPF designed to filter the exhaust from a single engine. ThermaCat™ systems with multiple DPFs and/or multiple DOCs, including designs with two or more filter components canned together or multiple individually canned filter components deployed in parallel or series (or any combination thereof), are not valid under this Executive Order. Channeling exhaust from a single engine through multiple ThermaCat™ systems, deployed in parallel or series or any combination thereof, is also not valid under this Executive Order.

No changes are permitted to the system. ARB must be notified, in writing, of any changes to any part of the ThermaCat™ system. Any changes to the system must be evaluated and approved in writing by ARB. Failure to do so shall invalidate this Executive Order.

ESWT must provide each installer with the specific criteria used to determine the compatibility of the ThermaCat™ system with a candidate engine pursuant to Section 2706(t), Title 13, CCR.

ESWT must ensure that the installation of the ThermaCat™ system conforms to all applicable industrial safety requirements.

This Executive Order is valid provided that installation instructions for the ThermaCat™ system do not recommend tuning the vehicle to specifications different from those of the vehicle manufacturer.

Prior to sale of a ThermaCat™ system, ESWT must provide each prospective owner/purchaser of ThermaCat™ with a written estimate of the number of hours of vehicle operation that will typically elapse before regeneration is required. ESWT must also provide, in writing, the length of time of a typical regeneration event.

ESWT is responsible for ensuring the DPF is correctly sized for each engine.

Changes made to the design or operating conditions of the ThermaCat™ system, as exempted by ARB, which adversely affect the performance of the vehicle's pollution control system shall invalidate this Executive Order.

Marketing of the ThermaCat™ 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 written approval is obtained from ARB.

This Executive Order does not apply to any ThermaCat™ system advertised, offered for sale, sold with, or installed on a motor vehicle prior to or concurrent with transfer to an ultimate purchaser.

A copy of this this Executive Order must be provided to the ultimate purchaser at the time of sale.

As specified in Section 2706(j) (Title 13, CCR) of the *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines* (Procedure), ARB assigns each diesel emission control strategy a family name. The designated family name for the verification as outlined above is:

CA/ESW/2009/PM3+/N00/OF/DPF01

Additionally, as stated in the Procedure, ESWT is responsible for recordkeeping requirements (Section 2702), honoring the required warranty (Section 2707), and conducting in-use compliance testing (Section 2709).

Proper engine maintenance is critical for the proper functioning of the diesel emission control strategy. The owner of the vehicle on which the diesel emission control strategy is installed is strongly advised to adhere to all good engine maintenance practices. Failure to document proper engine maintenance, including keeping records of the engine's oil consumption, may be grounds for denial of a warranty claim.

Use of system parts or replacement parts not authorized by ESWT, may be grounds for denial of a warranty claim.

This Executive Order is valid provided that the diesel fuel used in conjunction with the device complies with Title 13, CCR, Sections 2281 and 2282, or U.S. EPA diesel fuel compliant with standards set forth in 40 CFR Part 80, provided the sulfur content of the fuel does not exceed 15 parts per million and if biodiesel is used, the biodiesel blend shall be 20 percent or less subject to the following conditions:

- The biodiesel portion of the blend complies with the American Society for Testing and Materials specification D6751 applicable for 15 parts per million sulfur content; and
- The diesel fuel portion of the blend complies with Title 13, CCR, Sections 2281 and 2282.

Other alternative diesel fuels such as, but not limited to, ethanol diesel blends and water emulsified diesel fuel are excluded from this Executive Order.

The ThermaCatTM system must not be located over any occupied space (e.g., driver or passenger compartments) or any other location deemed unacceptable by ESWT, and must not be installed in a way which would result in noncompliance with any applicable safety standards.

Systems verified under this Executive Order shall conform to all applicable California emissions regulations.

The terms and conditions of this Executive Order must be satisfied regardless of where the system is sold in order for the system to be considered verified.

Systems sold as verified, or which carry the ARB-approved label, must satisfy all the terms and conditions of this Executive Order.

This Executive Order does not release ESWT from complying with all other applicable regulations.

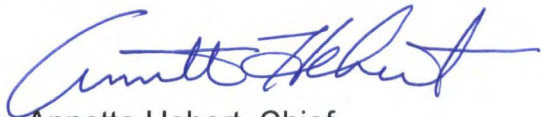
Violation of any of the above conditions shall be grounds for revocation of this Executive Order.

ARB reserves the right in the future to review this Executive Order and the exemption and verification provided herein to assure that the exempted and verified add-on or modified part continues to meet the standards and procedures of CCR, Title 13, Section 2222, et seq, and CCR, Title 13, Sections 2700 through 2711.

This Executive Order DE-09-010-05 hereby supersedes Executive Order DE-09-010-04 dated October 21, 2013, Executive Order DE-09-010-03 dated November 2, 2012,

Executive Order DE-09-010-02 dated December 21, 2010, Executive Order DE-09-010-01 dated September 17, 2009 and Executive Order DE-09-010 dated April 28, 2009.

Executed at El Monte, California, and effective this 21st day of February 2014.

A handwritten signature in blue ink, appearing to read "Annette Hebert", with a stylized, flowing script.

Annette Hebert, Chief
Emissions Compliance, Automotive Regulations and Science Division