



Air Resources Board



Linda S. Adams
Acting Secretary for
Environmental Protection

Mary D. Nichols, Chairman
9480 Telstar Avenue, Suite 4
El Monte, California 91731 • www.arb.ca.gov

Edmund G. Brown Jr.
Governor

April 12, 2011

Reference No.: 11-661-843

Mr. Kevin Brown
Marketing and Regulatory Affairs Manager
Engine Control Systems (ECS) Limited
83 Commerce Valley Drive East
Thornhill, Ontario
Canada L3T 7T3

Dear Mr. Brown:

Using the *Verification Procedure, Warranty, and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines* (Procedure), the Air Resources Board (ARB) staff reviewed your application for conditional verification of Purifilter™ for use with off-road diesel engines. Based on an evaluation of the data provided, and pursuant to the terms and conditions specified below, ARB hereby finds that Purifilter™ reduces emissions of diesel particulate matter (PM) consistent with a Level 3 Plus device (greater than or equal to an 85 percent reduction and meets the 2009 nitrogen dioxide emissions limit). ARB also finds that 33 percent of the durability demonstration period was satisfactorily completed using Purifilter™. Accordingly, ARB determines that the system merits conditional verification and, subject to the terms and conditions specified below, classifies ECS Limited's Purifilter™ as a Level 3 Plus system for heavy-duty off-road vehicles using engines from the engine families listed in Attachment 1.

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

- Purifilter™ is conditionally verified for a period not to exceed three years from October 20, 2008, the date of the original conditional verification letter. For the Purifilter™ to be considered for full verification, ECS must complete all remaining requirements as specified in the letter 08-661-380 within three years from October 20, 2008.
- Conditional verification is equivalent to verification for the purposes of satisfying the requirements of in-use emission control regulations.

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

- Only one filter can be installed per engine. For engines that are original engine manufacturer dual exhaust systems, including two exhaust manifolds, two mufflers, etc., no more than one filter can be installed per exhaust manifold.
- Each Purifilter™ can only be used to treat the exhaust from one engine.
- The engine must be originally manufactured from model year 1996 through 2008 having an engine family name listed in Attachment 1.
- The engine must have a maximum power output rating of at least 50 horsepower and at most 750 horsepower.
- The engine must be in its original certified configuration, except that the pre-existing oxidation catalyst from the original equipment manufacturer (OEM) may be removed if the Purifilter™ is installed. Should the Purifilter™ be removed, the oxidation catalyst from the OEM must be reinstalled, returning the engine to its original certified configuration.
- The engine must be certified 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.
- The engine must not employ exhaust gas recirculation.
- The application must have a duty cycle with an exhaust temperature profile greater than 280 degrees Celsius for at least 25 percent of the time for engines certified to an emissions level of 0.1 g/bhp-hr or less.
- The application must have a duty cycle with an exhaust temperature profile greater than 320 degrees Celsius for at least 25 percent of the time for engines certified to an emissions level greater than 0.1 g/bhp-hr and up to 0.2 g/bhp-hr.
- The engine may or may not have a pre-existing oxidation catalyst from the OEM.
- The engine must not have a pre-existing diesel particulate filter (DPF) from the OEM.
- The engine must be certified for off-road applications.
- The engine must be four-stroke.

- The engine can be turbocharged or naturally aspirated.
- The engine can be mechanically or electronically injected.
- The engine should be well maintained and not consume lubricating oil at a rate greater than that specified by the engine manufacturer.
- Lube oil, or other oil, should 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 (ppm) by weight
- The product must not be operated with fuel additives, as defined in Section 2701 of Title 13, of the California Code of Regulations (CCR), unless explicitly verified for use with fuel additive(s).
- The product must not be used with any other systems or engine modifications without ARB and manufacturer approval.
- The system must be installed with a backpressure monitor to notify 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.
- Swapping of the filter or any other system components among vehicles is not permitted for systems under manufacturer warranty. Spare filters may be used during cleaning of primary filters, but upon completion of cleaning the primary filter must be promptly re-installed on the vehicle. Primary filters can only be installed on the original installation vehicle. Spare filters will be labeled as seen in Attachment 3. Swapping of spare filters must comply with Section 2706, Title 13, CCR, and the policy document found here: <http://www.arb.ca.gov/diesel/verdev/swap/swap.htm>. Engines fitted with Purifilter™ must not be operated without all properly working components.*
- Purifilter™ in its entirety can be re-designated to other vehicles or equipment within a common ownership fleet only if authorized by ECS. Re-designations must be performed in accordance with Section 2706, Title 13, CCR, and the policy document found here: <http://www.arb.ca.gov/diesel/verdev/swap/swap.htm>.
- The other terms and conditions specified on the following page.

IT IS ALSO ORDERED AND RESOLVED: That installation of Purifilter™, manufactured by ECS Limited of 83 Commerce Valley Drive East, Thornhill, Ontario, Canada L3T 7T3, has been found not to reduce the effectiveness of the applicable vehicle pollution control system, and therefore, Purifilter™ is exempt from the prohibitions in Section 27156 of the Vehicle Code for installation on heavy-duty off-road vehicles using engines listed in Attachment 1. This exemption is only valid provided the engines meet the aforementioned conditions.

The Purifilter™ system must be installed as designed and the following major components must be installed in the following order in the exhaust tailpipe from upstream to downstream: one backpressure sampling probe and one thermocouple (these can be in reverse order or in the same cross-sectional area before the inlet section), one catalyzed DPF. The system must also be equipped with a backpressure monitor and data logger that notifies the operator in a clearly visible manner when the backpressure limits have been reached while the vehicle or equipment is in use. The major components of the Purifilter™ system are identified in Attachment 2. Schematics of the approved product and engine labels are shown in Attachment 3.

ARB estimates that Purifilter™ has no significant effect on average fuel economy.

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

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

No changes are permitted to the device. ARB must be notified, in writing, of any changes to any part of Purifilter™. Any changes to the device must be evaluated and approved by ARB. Failure to do so shall invalidate this conditional verification.

ECS must ensure that the installation of Purifilter™ conforms to all applicable industrial safety requirements.

Marketing of Purifilter™ using identification other than that shown in this conditional verification letter or for an application other than that listed in this conditional verification letter shall be prohibited unless prior approval is obtained from ARB.

Identification must include both device and engine labels consistent with the requirements of Title 13, CCR, Section 2706 and Attachment 3 of this conditional

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verification letter. Changes or modifications to the label or label placement are prohibited without prior written approval from ARB.

This conditional verification does not apply to any Purifilter™ advertised, offered for sale, sold with, or installed on a motor vehicle prior to or concurrent with transfer to an ultimate purchaser.

This conditional verification letter must be provided to the ultimate purchaser at the time of sale.

As specified in the Diesel Emissions Control Strategy Verification Procedure (Title 13, CCR, Section 2706(j)), ARB assigns each diesel emission control strategy a family name. The designated family name for the conditional verification as outlined above is:

CA/ECS/2008/PM3+/N00/OFF/DPF01.

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

This conditional verification is valid provided that the diesel fuel used in conjunction with the device complies with Title 13, CCR, Sections 2281 and 2282, 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 (ASTM) specification D6751 applicable for 15 ppm 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 conditional verification.

Proper engine maintenance is critical for the proper functioning of the diesel emission control strategy. The owner and/or operator 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.

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

Systems conditionally verified in this letter shall conform to all applicable California emissions regulations.

This conditional verification does not release ECS from complying with all other applicable regulations.

Violation of any of the above conditions shall be grounds for revocation of this conditional verification.

This conditional verification letter with Reference Number 11-661-843 hereby supersedes the conditional verification letter with Reference Number 10-661-420, dated March 1, 2010, and the original conditional verification letter with Reference Number 08-661-379 dated October 20, 2008.

Thank you for participating in ARB's diesel emission control strategy verification program. If you have any questions or comments, please contact Ms. Shawn Daley, Manager, at (626) 575-6972, or by e-mail at sdaley@arb.ca.gov.

Sincerely,



Robert H. Cross, Chief
Mobile Source Control Division

Attachment 1: ARB-Approved Engine Families for the ECS Purifier

Attachment 2: Part 1: Parts List for the Engine Control Systems Purifier Off-Road Applications
Part 2: Purifier Off-Road / Stamped Flange

Attachment 3: California Verification Labels for Purifier Off-Road

cc: Ms. Shawn Daley, Manager
Retrofit Assessment Section