



Air Resources Board



Matthew Rodriguez
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

October 11, 2011

Reference No.: 11-661-792

Mr. Julian Imes
Donaldson Company, Incorporated
P.O. Box 1299
Minneapolis, Minnesota 55440-1299

Dear Mr. Imes:

Using the *Verification Procedure, Warranty, and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines* (Procedure), Air Resources Board (ARB) staff reviewed Donaldson Company, Incorporated's (Donaldson) application for conditional verification of the Non-Road Low NO₂ (also known as Nitrogen Dioxide) Filter (NR-LNF) system for use with off-road diesel engines. 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 NR-LNF system 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). The Executive Officer also finds that the NR-LNF system satisfactorily completed 33 percent of the durability demonstration period. Accordingly, the Executive Officer determines that the system merits conditional verification and, subject to the terms and conditions specified below, classifies Donaldson's NR-LNF system as a Level 3 plus system for off-road vehicles and portable equipment using engines from the engine families listed in Attachment 1.

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

- The NR-LNF system is conditionally verified for a period not to exceed one year from the date of this letter. For the NR-LNF system to be considered for full verification, Donaldson must complete all remaining requirements as specified in the letter Reference No. 11-661-791 within one year of the date of this letter.
- 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

- The engine must be originally manufactured from model year 1996 through 2010 and have an engine family name listed in Attachment 1.
- The application must have a duty cycle that adheres to one of the following exhaust temperature profiles, certified PM emissions levels, and certified oxides of nitrogen (NOx) levels as follows:
 1. Temperature Category 1 – results in a Weighted Average Temperature (WAT) that is 250 degrees Celsius or is greater than 245 degrees for at least 40 percent of the time and is certified to a PM emission level of less than or equal to 0.11 grams per brake horsepower-hour (g/bhp-hr) but greater than 0.01 g/bhp-hr and is certified to a NOx or non-methane hydrocarbon (NMHC) + NOx emission level of 3 g/bhp-hr or more, or
 2. Temperature Category 2 – results in a WAT that is 320 degrees Celsius or is greater than 340 degrees for at least 40 percent of the time and is certified to a PM emission level of 0.12 g/bhp-hr but less than or equal to 0.20 g/bhp-hr and is certified to a NOx or NMHC + NOx emission level of equal to or greater than 5 g/bhp-hr, or
 3. Temperature Category 3 - results in a WAT that is 362 degrees Celsius or is greater than 372 degrees for at least 40 percent of the time and is certified to a PM emission level of 0.12 g/bhp-hr but less than or equal to 0.20 g/bhp-hr and is certified to a NOx or NMHC + NOx emission level of greater than or equal to 3 g/bhp-hr but less than or equal to 4.99 g/bhp-hr.
- The engine displacement must be between 3 and 27 liters, inclusive.
- The engine must be in its original certified configuration.
- The engine must have a maximum power output rating of at least 100 horsepower and at most 600 horsepower.

The engine must not be certified as having exhaust gas recirculation.

- The engine may or may not have a pre-existing original equipment manufacturer (OEM) oxidation catalyst.

The engine must remain in its original certified configuration, except that if an OEM oxidation catalyst is present, it may be removed if the NR-LNF system is installed. Should the NR-LNF system be removed, the OEM oxidation catalyst must be re-installed, returning the engine to its original certified configuration.

- The engine must not be certified with a pre-existing OEM diesel particulate filter.
- The engine must be certified for off-road applications.
- More than one filter per engine may be installed, only if it is determined that the engine's exhaust flow rate at full rated power exceeds the requirements of the largest sized NR-LNF. If more than one filter is installed per engine, the following additional conditions must be met:
 1. A maximum of two filters are allowed per application.
 2. Each filter must be installed with an independent backpressure and driver notification system.
 3. Filters may only be installed in parallel.
 4. Both filters must be of the same size.
- The engine must have a four-stroke combustion cycle.
- The engine must be turbocharged.
- The engine may be mechanically or electronically 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 (ppm) by weight.
- The NR-LNF system 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 NR-LNF system must not be used with any other systems or engine modifications without ARB and manufacturer approval.
- The NR-LNF system must be installed with a backpressure monitor to notify the operator when the backpressure limit is reached, or if two NR-LNF's are used, with two independent backpressure monitors. The notification or notifications must occur and be clearly visible to the operator while the vehicle or equipment is in use.

- The application must not be a transport refrigeration unit, an auxiliary power unit, a rubber tired gantry crane, a marine, or a locomotive.
- The other terms and conditions specified below:

It is also ordered and resolved that installation of the NR-LNF system, manufactured by Donaldson Company, Incorporated of Post Office Box 1299, Minneapolis, Minnesota 55440-1299, has been found not to reduce the effectiveness of the applicable vehicle pollution control system, and therefore the NR-LNF system is exempt from the prohibitions in Sections 38390 and 38391 of the Vehicle Code for installation on off-road vehicles using engines listed in Attachment 1.

This exemption is only valid provided the engines meet the aforementioned conditions.

The NR-LNF system consists of a catalyzed flow-through filter, a catalyzed wall-flow diesel particulate filter, a backpressure and temperature monitor, and a driver notification module. The major components of the NR-LNF system are identified in Attachment 2. Schematics of the approved product and engine labels are shown in Attachment 3.

This conditional verification letter is valid provided that installation instructions for the NR-LNF system do not recommend tuning the vehicle to specifications different from those of the vehicle manufacturer.

No changes are permitted to the device. ARB must be notified, in writing, of any changes to any part of the NR-LNF system. Any changes to the device must be evaluated and approved in writing by ARB. Failure to do so invalidates this conditional verification.

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

Marketing of NR-LNF system using identification other than that shown in this conditional verification letter or for an application other than that listed in this conditional verification letter is prohibited, unless prior written 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 verification letter. Changes or modifications to the label or label placement are prohibited without prior written approval from ARB.

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This conditional verification does not apply to any NR-LNF 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 conditional verification letter must be provided to the ultimate purchaser at the time of sale.

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

CA/DON/2011/PM3+/N00/OF/DPF01.

As stated in the Procedure, Donaldson is responsible for recordkeeping requirements (Section 2702), honoring the 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 must 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 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 or equipment 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.

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.

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

Donaldson must ensure that the installation of the NR-LNF system conforms to all applicable industrial safety requirements.

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

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

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 email at sdaley@arb.ca.gov.

Sincerely,



Robert H. Cross, Chief
Mobile Source Control Division

Attachment 1: ARB-Approved Engine Families in Temperature Category 1 for the Donaldson NR-LNF Muffler System

Attachment 2: Parts List for the Donaldson NR-LNF Diesel Particulate Filter System

Attachment 3: Device and Engine Label for the Donaldson NR-LNF Muffler System and Replacement Label for the Donaldson NR-LNF Muffler System (used if original label was lost or damaged)

cc: Ms. Shawn Daley, Manager
Retrofit Assessment Section