UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUN 1 4 2013

OFFICE OF
AIR AND RADIATION

Mr. Daniel A. DeVito
Pilot Systems International
37500 Enterprise Court
Farmington Hills, Michigan 48331
ddevito@pilotsysintl.com

Subject: Freedom of Information Act request, EPA-HQ-2013-0005302

Dear Mr. DeVito:

This is in response to your Freedom of Information Act (FOIA) request submitted on April 9, 2013, seeing the following information:

> Eco Dual Group's Outside of Useful Life (OUL) Submission(s) to EPA for their Mixed Fuel Systems (designated to run on diesel/CNG or diesel/LNG) including, but not limited to Conversion Test Group BEDGE14.9ISX as listed in EPA's Outside Useful Life Alternative Fuel Conversion List summary table.

Attached is a copy of the information you requested. Please note that the correct test group name is BEDGH14.9ISX. There is no charge for this information as allowed under the provisions of the Freedom of Information Act, when such charges are less than $14.00.

You may appeal this response to the National Freedom of Information Officer, U.S. EPA, FOIA and Privacy Branch, 1200 Pennsylvania Avenue, N.W. (2822T), Washington, DC 20460 (U.S. Postal Service Only), FAX: (202) 566-2147, E-mail: hq.foia@epa.gov. Only items mailed through the United States Postal Service may be delivered to 1200 Pennsylvania Avenue, NW. If you are submitting your appeal via hand delivery, courier service or overnight delivery, you must address your correspondence to 1301 Constitution Avenue, N.W., Room 6416J, Washington, DC 20001. Your appeal must be made in writing, and it must be submitted no later than 30 calendar days from the date of this letter. The Agency will not consider appeals received after the 30 calendar day limit. The appeal letter should include the FOI number listed above. For quickest possible handling, the appeal letter and its envelope should be marked "Freedom of Information Act Appeal."

Sincerely,

Tanya Meekins

Tanya Meekins
FOIA Coordinator
Office of Transportation and Air Quality

Outside Useful Life Notification Package
Conversion of 2007-2009 Cummins ISX engines
New Conversion Engine Family: BEDGH14.9ISX

1 Contact Details

Douglas Thomson, Vice President, Government Relations and Marketing
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617-548-7420, doug.thomson@ecodualgroup.com

2 Summary

EcoDual Group, LLC (EDG) is applying for Clean Air Act exemption under the Outside Useful Life (OUL) program for its dual fuel aftermarket modification system that enables heavy duty diesel trucks to operate on a combination of diesel and natural gas. The system enables operation on up to 85% natural gas with the same power and torque performance as the OEM engine. The engine starts and idles on 100% diesel with no change from OEM operation. The engine automatically and immediately runs on 100% diesel if natural gas is not available. This application seeks CAA anti-tampering exemption for the EDG system when applied to the 2007-2009 Cummins ISX engine families on OUL vehicles. EDG further asserts that our testing has demonstrated the proper operation of our dual fuel system under the more restrictive 2007-2009 emissions levels and thus the system should also receive CAA exemption for application to all older, 2004-2006 Cummins ISX engine families as well. The EDG system design, enabling operation on a high percentage of inherently cleaner burning natural gas, has been clearly proven and would certainly improve the emissions of the older 2004-2006 engines.

3 Detailed System Description

The EDG dual fuel conversion system is described in detail, with citings and pictures of all components and their function, in the system Installation and Maintenance manual provided as Appendix C of the proprietary version of this submittal. A summary description of the system design and function is provided below.

The EDG conversion system operates by injecting natural gas into the air intake while simultaneously reducing the commensurate amount of diesel fuel injected into the cylinders. Key engine operational parameters from the engine's Electronic Control Unit (ECU) are read from the Controller Area Network (CAN) bus. Natural gas pressure and temperature are also sensed in our input line. This information comes to our dual fuel electronic controller (DFEC). This controller determines how much natural gas will be injected into the air intake by the natural gas injectors. This air has already passed through the turbocharger and the intercooler before the natural gas is injected. This is important for safety of operation. The injected air is combined with the engine gas recirculation system before entering the cylinders.

At start and idle, the engine always operates on 100% diesel. At maximum load, the engine will operate on up to 85% natural gas and 15% diesel. This mix is constantly adjusted by our proprietary control software to deliver torque and power unchanged from the OEM engine operation on 100% diesel. If the natural gas tank becomes empty, the system automatically reverts to normal 100% diesel operation with the diesel injector signals passed into the engine

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unmodified. If the dual fuel system fails for any reason, the system automatically reverts to normal 100% diesel operation.

4 On Board Diagnostics (OBD) Compliance

The OEM OBD system has been verified to be fully functional following installation of the EDG Dual Fuel system. This verification was conducted during the cross country dual fuel demonstration evaluation of the test vehicle as follows. The test vehicle was initially operated from Ventura, CA to Phoenix, AZ. On 10NOV2011, in Phoenix, the system was cleared all of the OBD fault codes and all trip monitors were reset. On 13DEC2011, at the Cummins maintenance facility in Amarillo, TX, after operation for 5757 miles, a full ECM image was taken to download all operational status information and verify proper operation of the vehicle with the EDG Dual Fuel System. That full 1400 line report is available for EPA review if desired. The salient points, which verify that the EDG system does not cause any emissions related trouble codes to occur, are provided below.

ECM Image

WorkOrder Name:	WO-20111213-114802
WorkOrder ID:	{3E05653F-A7C6-4C90-8FF3-0C3496B2DFF0}
Start Repair Date:	12/13/2011 11:48
Service Site:	amarillo
System Type:	ISX - CM871
Engine Serial Number:	79267847
Engine Make:	CMMNS
Engine Model:	6X3u07D1500000000
ECM Serial Number:	4014865
Vehicle ID:	763403N
Vehicle Make:	PETERBILT
Vehicle Model:	STA15
ECM Distance:	493297.2 mi
ECM Time (Key On Time):	13354:09:06 HH:MM:SS

Trip Since Last Reset

ECM Distance:	5757.2 mi
ECM Time:	227:07:23 HH:MM:SS

Fault Information

Fault Code	Fault Status	Fault Count	Lamp	Description
2215	Inactive	1	Amber	Fuel Pump Delivery Pressure
2448	Inactive	1	Maintenance	Coolant Level
1117	Inactive	3	None	Power Supply Lost With Ignition On

No emissions related MIL or diagnostic trouble codes occurred during the entire 5757 mile trip. Of the three minor faults recorded on the trip, they first two where both corrected during a stop at Cummins in Toledo, OH where the fuel filter was replaced along with other maintenance activities in preparation for the emissions testing. Cummins Amarillo advises that the low voltage indication can happen periodically and they did not recommend any maintenance.

5 System Durability

EcoDual Group, LLC is a small volume manufacturer introducing a new product line. As such, we will operate under US EPA assigned Deterioration Factors (DF). The multiplicative DF's for the CEXH0912XAK, XAL and XAM engine families are as follows:

NOx – 1.0	PM – 1.197
CO – 1.477	OMHCE – 1.257

6 Emissions Tests

EDG had mobile emissions testing conducted at an independent test laboratory. Testing was conducted using a Portable Emissions Measurement System (PEMS) The testing format involved a direct comparison of the truck emissions when operating in normal 100% diesel mode as compared to operation in dual fuel mode. The testing was conducted over a 100 mile test loop. The test vehicle was loaded to a GVW of 65,500lbs.

The test results are reported in the four page document that was provided to EPA as part of the proprietary submittal. In summary, this vehicle was certified based on three emissions levels: NOx+NMHC, PM and CO. The tests showed that he NOx+NMHC levels were lower in Dual Fuel than in 100% Diesel operation. The tests showed that the PM levels during both tests were 0.00g/bhp-hr. The tests showed that CO emissions were slightly higher in Dual Fuel operation (0.19g/bhp-hr) than in 100% Diesel operation (0.12g/bhp-hr).

Several things should be noted with respect to the one emissions measurement that showed an increase, the CO levels. First, the difference measured (0.07g/bhp-hr) is well below the accuracy margin established by the US EPA for PEMS in-use measurements (0.25g/bhp-hr). Thus, the two measurements must be considered identical. Second, these levels are far below the certification standard for CO, which is 15.5g/bhp-hr. Third, these measurements are also far below the CO emissions level that was acceptable to the US EPA for the Westport ISXG diesel/natural gas dual fuel engine (13.9g/bhp-hr).

7 Adjustable Operating Parameters and Other Adjustments

The EcoDual Dual Fuel system has no user adjustable operating parameters. The Dual Fuel Electronic Controller (DFEC) is a sealed electronics box. Wireless software updates can be performed by EcoDual Group if required. Access for updates is password protected to further prevent user access. In the vehicle dashboard, there are three Dual Fuel system components presented to the operator:

- Natural gas fuel gage showing fullness of tank
- Natural gas usage lamp indicating when dual fuel operation is ongoing
- Selector switch enabling manual shut off of the dual fuel system

8 EcoDual Group Installation, Adjustment and Maintenance Instructions

The Installation and Maintenance manual for the EcoDual Group Dual Fuel system was provided as a separate document in the proprietary submittal to the EPA.

9 General CAFC Issues Being Reviewed by US EPA

9.1 Tracking System Applicability

This conversion system can only be installed on engines of the families listed in this notification package and only when such engines have accumulated in excess of 435,000 miles, thus qualifying under the US EPA Outside Useful Life categorization. EDG will take multiple steps to ensure that the system can only be used in properly qualifying engines. These steps include the following:

1. EDG will provide a unique serial number for every system produced. These serial numbers will be incorporated into bar code labels on the EDG ECU using a process already in place for other EDG (Maxtrol) electronic controller products for other industries.
2. EDG will maintain a database matching the system serial number to the engine serial number, engine family number and truck VIN for every system installed. This database will also include the truck total mileage at the time of installation If system installation performed by non-EDG personnel who have been trained by EDG, those installers will be required to provide this data to EDG for inclusion in the database.
3. All EDG customers will be clearly notified that systems cannot be removed from the original engine on which they were installed and reinstalled on another engine without notification of EDG and provision of appropriate data to the EDG database. Customers will be notified that violation of this data reporting requirement will void the EDG product warranty and may subject the truck owner to EPA fines.

9.2 Turbocharger Overspeed at High Altitude

The Cnmmins ISX ECM monitors turbocharger speed. It also monitors barometric pressure. When the ECM detects higher than normal turbocharger speed, the ECM will initiate a fault light (FC2288) and automatically reduce the engine power to lower the turbocharger speed. Due to the design of the EDG system, the engine is automatically prevented from over-injecting natural gas in the event of an OEM ECU commanded fuel reduction. Thus, the ISX ECM automatic protective action in the case of turbocharger overspeed remains fully functional and unchanged.

9.3 Fault Code Actions

The EDG Dual Fuel system controller takes data from the OEM ECU CAN bns connection as part of normal operation. Through this connection, we monitor all fault indications. We also use this connection to monitor Aftertreatment 1 Diesel Oxidation Catalyst (DOC) Intake Gas temperature and other exhaust temperature locations. There are literally thousands of individual fault codes, diagnostic messages, diagnostic tronble codes and failure mode indicators. The OEM ECU processes all of this information and combines it to generate status lights, as necessary, to indicate Warning, Stop, Protect and Malfunction Indicator Light (MIL) - which is specifically for indication of emissions system problems.

The EDG system will make nse of the OEM ECU processing and thus take action based on the status light indications. We do not plan to disable the Dual Fuel system when the Warning light illuminates, since these are only advisories. In the case of MIL illumination or DOC over temperature detection, the EDG Dual fuel system will be immediately disahled. EDG also

disables the Dual Fuel system when the Stop or Protect indicator lights are illuminated. If they cease to be illuminated, the EDG system will return to normal operation.

9.4 Downhill Push Operation

As discussed above under turbocharger overspeed protection, the EDG controls approach automatically prevents over-injection of natural gas. In a downhill coast, when the diesel injection is minimal (on the order of idle operation) the natural gas usage drops to zero.

Outside Useful Life Notification Package – Addendum
Conversion of 2004-2009 Cummins ISM engines

10 Contact Details

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11 Summary

EcoDual Group, LLC (EDG) is applying for Clean Air Act exemption under the Outside Useful Life (OUL) program for its dual fuel aftermarket modification system that enables heavy duty diesel trucks to operate on a combination of diesel and natural gas. The system enables operation on up to 85% natural gas with the same power and torque performance as the OEM engine. The engine starts on 100% diesel with no change from OEM operation. The engine automatically and immediately runs on 100% diesel if natural gas is not available.

This application seeks CAA anti-tampering exemption for the EDG system when applied to the 2004-2009 Cummins ISM engine families on OUL vehicles. EDG asserts that our testing has demonstrated, and EPA has previously authorized, the proper operation of our dual fuel system on the larger Cummins ISX engine. The EDG system design, enabling operation on a high percentage of inherently cleaner burning natural gas, has been clearly proven and would certainly improve the emissions of the ISM engines of the same years.

12 Similarity of the ISX and ISM engines

The Cummins 3rd generation of electronics was introduced in 1997 under the IS management system. The Electronic Control Module (ECM) is the control center of the system. The ECM processes all of the inputs and sends commands to the fuel system, vehicle, and engine control devices. Because the ECM is the final pathway of integration for all vehicle management systems, it is called interact or IS for short. Cummins small medium and large bore engines received this new system after the CELECT system. Instead of the B, C, L, and M engines, their new names became the ISB, ISC, ISL, ISM, and ISX

The IS ECM coordinates the engine, accessories, ABS brakes, transmission and more to deliver the best possible performance, with the best possible fuel economy. The IS also includes advanced prognostics and diagnostics, with industry-standard datalinks for uploading and downloading of trip information and reconfiguring parameters.

This commonality in controls strategy and hardware substantially simplifies cross application of the EcoDual Dual Fuel conversion system from the ISX to the ISM. Further, it ensures that since proper OUL emissions performance was previously demonstrated through PEMS testing on the larger ISX engine, a repeat of this testing on the smaller ISM engine is not necessary.