

Cummins 2010 Heavy-Duty & MidRange Products Customer Q & A

THE RIGHT PRODUCTS AND THE RIGHT TECHNOLOGY

1) Will Cummins Heavy-Duty base engines change for 2010?

In addition to the ISX15 for 2010, Cummins will introduce the brand new ISX11.9 engine which utilizes common architecture and common subsystems to the ISX15. The ISX11.9 is a “clean sheet” design providing a compact and lightweight engine which replaces the 11 liter ISM. Both of these heavy-duty engines will include the XPI common rail fuel system – which brings significant advantages over previous products in terms of fuel economy, performance and noise levels.

With the introduction of the XPI fuel system, there will be a new cylinder head configuration with a single camshaft design for the ISX15. Cummins will build on the existing cooled EGR system and Cummins Particulate Filter technology with the addition of the SCR system.

The ISX15 for 2010 will be a quantum step in fuel economy and performance from today’s industry-leading ISX, and the new ISX11.9 will establish a leadership position among the industry’s heavy-duty medium bore engines.

2) Will Cummins MidRange base engines change for 2010?

Changes for the ISB, ISC, and ISL engines for 2010 are minimal and are focused on improving reliability of today’s products. Cummins will build on the existing cooled EGR system and Cummins Particulate Filter technology with the addition of the SCR system.

All Cummins MidRange engines will deliver best-in-class fuel economy and performance.

3) Is Cummins approach different/better than other engine manufacturers?

Cummins capability allows for a complete package that includes a highly capable base engine coupled with the integration of our core technologies for fuel systems, air handling, filtration, electronic controls and exhaust aftertreatment for both particulate matter and oxides of nitrogen (NOx). Only Cummins has the key technologies in-house.

4) What exactly is Selective Catalytic Reduction (SCR)?

SCR technology uses a reactant called Diesel Exhaust Fluid and a catalytic converter to significantly reduce oxides of nitrogen (NOx) emissions.

5) What is Cummins experience with SCR?

SCR technology is not new to Cummins. In 2006, Cummins launched its MidRange engines certified to the Euro 4 standard using SCR for commercial vehicle applications in Europe. Cummins has built and shipped over 45,000 SCR engines to date. Cummins Emission Solutions has built and shipped over 200,000 SCR systems.

6) How does Cummins 2010 solution compare to an “in-cylinder” approach?

Fuel Economy is a significant advantage of Cummins 2010 technology. For our MidRange engines, our testing indicates a 5-9% advantage relative to an in-cylinder solution. Cummins heavy-duty products will deliver up to a 5% fuel economy improvement over our 2007 products, and our testing indicates that this improvement is even greater when compared to in-cylinder solutions.

There are many other customer benefits with Cummins 2010 technology:

Performance. Cummins Heavy-Duty and MidRange products will deliver the same power and torque as today’s products without increasing displacement. Our experience with in-cylinder technology confirms a deterioration of 50-100 hp in performance for the same displacement.

Throttle Response will be improved relative to today’s excellent products and much more responsive than a 2010 in-cylinder solution.

Driveability. The engine has a larger “sweet spot” for easier driveability producing optimum fuel economy and performance, substantially better than an in-cylinder solution.

Reliability. The new Cummins Aftertreatment System is much less complex than the in-cylinder approach, which will require significant changes to the EGR system, air handling system and vehicle cooling system. In addition, our experience with the in-cylinder approach showed significant impact to durability / engine life-to-overhaul due to internal engine condensation issues.

7) What is the value of the fuel economy improvement to a Cummins customer?

Assuming 6 mpg as the base case, at 120,000 miles per year and diesel fuel at \$4.00 per gallon, every 1% improvement in fuel economy is worth \$800 per truck per year. Therefore, for example, a 5% improvement would be worth \$4000 per truck per year.

8) What is the impact on maintenance intervals?

Engine maintenance intervals remain unchanged on the engine.

With the addition of the SCR system, a new DEF filter will need to be maintained, at a 200,000 mile interval.

9) Will there be any impact on the Diesel Particulate Filter operation?

Cummins will be able to achieve improvement in DPF passive regeneration capability, due to the NOx reduction capabilities of SCR. This will result in reduced need for manual stationary regens and contribute to the improved fuel economy.

10) Will there be any negative impact to performance (Horsepower and/or torque), durability or driveability?

There will be no negative impact on durability, performance or driveability with the 2010 products. In fact, the ISX15 will deliver stronger performance, faster throttle response, a larger “sweet spot” in its cruise operating range, and best-in-class driveability and reliability.

Just like today, drivers will love the performance of Cummins 2010 products.

CUMMINS AFTERTREATMENT SYSTEM

1) What makes up the Cummins Aftertreatment System?

There are four major components:

**Selective Catalytic Reduction (SCR)
Catalyst**

Decomposition Reactor



DEF Dosing Valve

Cummins Particulate Filter

2) What is DEF (Diesel Exhaust Fluid)?

DEF is a 32.5% strength urea water solution.

3) How much DEF will be required?

DEF consumption is expected to be approximately 2% of fuel consumption dependent on vehicle operation – duty cycle, geography, ratings, etc.

4) What size DEF tank is required on a vehicle?

The vehicle manufacturer/OEM will determine exact tank size and location on the vehicle. However, Cummins will be providing installation recommendations to the OEMs on tank size selections.

For example, in Europe, vehicle SCR tank sizes are typically 15 – 20 gallons.

5) What happens if the vehicle runs out of DEF?

Vehicles in 2010 that will use DEF will have two indicators on the dash that will alert the driver to quantity of DEF on board. One, there will be a new DEF gauge very similar to a fuel gauge today that will indicate level of DEF (i.e. full, half, quarter, etc.) Second, there will be a new DEF low level warning lamp that will illuminate when less than 10% of DEF is in the tank.

If the vehicle is operated such that one would run completely out of DEF the vehicle **will not be shut-down**; however, power will be reduced enough to encourage the operator to refill the DEF tank. Once the tank has been refilled the engine will resume normal power levels.

Diesel Exhaust Fluid - Properties and Handling Guidelines

1) Does DEF freeze?

Yes. DEF will begin to freeze at 11° F. The SCR system is designed to provide heating for the DEF tank and supply lines which will reduce the melting time for frozen DEF.

2) How do I keep the DEF from freezing? What happens if the DEF freezes in the tank on the vehicle?

During vehicle operation, The SCR system is designed to provide heating for the DEF tank and supply lines.

If DEF freezes when the vehicle is shut down, start up and normal operation of the vehicle will not be inhibited. The SCR heating system is designed to quickly return the DEF to liquid form and the operation of the vehicle will not be impacted.

3) Does DEF smell?

DEF may have a slightly pungent odor similar to that of ammonia.

4) Should I be concerned about handling DEF?

No. DEF is a non-toxic, non-polluting, and non-flammable substance. DEF is safe to handle and store and poses no serious risk to humans, animals, equipment or the environment when handled properly.

5) Will DEF be available for customers to purchase?

Yes, DEF will be readily available for customers to purchase. Cummins is working closely with industry partners to ensure that DEF is readily available. Much like our European experience with urea availability, we do not expect this to be an issue.

Cummins Filtration has experience supplying and marketing urea for stationary applications for the past several years. Customers will be able to purchase DEF through the entire Cummins distributor and dealer network, as well as through many other industry sources.

ENVIRONMENTAL & REGULATORY

1) What is the EPA 2010 emission standard?

The EPA 2010 emissions standards are: 0.2g/HP-hr NOx and 0.01 g/HP-hr Particulate Matter.

2) Will Cummins have products ready to meet the 2010 emission standards?

Cummins will deliver a complete lineup of certified and compliant on-highway engine products to meet the 2010 emission standards. The lineup will include Cummins ISX15, ISX11.9, ISL9, ISC8.3 and ISB6.7 engines.

3) Does Cummins have a comment on the EPA letter regarding their concerns with copper in catalysts?

We have received the letter from the EPA. This was not a surprise to us; we have had discussions with the EPA previously on this subject. We are cooperating with the EPA on their request for testing and resulting data. The EPA is working on a test methodology, and an independent research firm will be conducting their tests. In accordance with this guidance letter, we will be conducting our own tests, and will provide the data to EPA.

We are confident that Copper Zeolite based catalyst is the best technology available for meeting the 2010 EPA standards and providing the best possible fuel efficiency for our customers. Copper Zeolite provides a much higher NOx conversion efficiency than Iron Zeolite - therefore providing better fuel economy benefits.

Cummins firmly believes that test results will indicate that copper-zeolite catalysts will pose no harmful effects when applied properly.