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2010 Webinar Q&A

These questions were posed in response to the IC Bus 2010 Emissions webinar held February 2009. To view this webinar, click [here](#). To view more 2010 FAQs, click [here](#).

Q. Diesel engines have been around for more than a century. Is there a technical reason for not implementing this system ten, twenty, thirty years ago?

A. While the base diesel engine design goes way back, there have been significant new technologies which allow for reduced emissions through in-cylinder approaches like our MaxxForce® Advanced EGR. Examples include high-pressure common rail injection, advanced air management designs, low sulfur diesel fuel, and, certainly, increased computing power in on-board control modules that are now available but were unthinkable just a few years ago.

Q. Do these changes only affect heavy duty diesel engines or does it affect smaller, light duty engines also?

A. The EPA regulations affect all on-highway diesel engines, from passenger cars up through buses and trucks.

Q. Are the 2010 EPA requirements for new vehicles only or will current vehicles need to be retrofitted?

A. With the exception of California, where the state requires retrofitting of older vehicles, only new vehicles are impacted.

Q. Will Advanced EGR technology be available in heavy-duty transit buses (40' and larger)?

A. Navistar Engine Group is working to provide engines into this market. You may contact Kyle Howard at 708-865-3242 for additional information.

Q. Will the MaxxForce Advanced EGR engines be compatible with bio-diesel fuel?

A. All MaxxForce engines are compatible with bio-diesel blends up to B20.

Q. How has the CGI engine block impacted engine durability?

A. Compacted graphite iron (CGI) is an advanced casting technology which allows for a very strong yet lightweight engine block design. This helps to increase engine durability.



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Q. What engine manufacturers will use SCR for 2010 EPA requirements?

A. Navistar is the only engine manufacturer using Advanced EGR for the North American on-highway diesel market. All other on-highway diesel engine manufacturers will use SCR to comply with 2010 EPA emissions requirements.

Q. Why would other engine manufacturers opt for the SCR?

A. Navistar cannot speculate on why other engine manufacturers have chosen to use SCR. However, Navistar used EPA approved emission program to create emission credits from reduced emissions output over the past several years, allowing us to take a different path.

Q. On your emissions credits chart, what is the significance of the 0.50 g/bhphr maximum allowable line. Does that mean you can't use credits if the base engine doesn't at least get to the 0.50 limit?

A. Correct, 0.50 g/bhp-hr is the maximum allowable emissions output.

Q. Please explain how MaxxForce engines will reach more stringent emissions levels using emissions credits.

A. The EPA07 emissions standard requires engines to meet 0.20g NO_x in 2007, but allows a phase-in of that standard from 2007 through 2009. Engine manufacturers who get "greener sooner" are rewarded with a longer phase-in period through the use of emissions credits. That's right: the EPA awards emission credits for good behavior, meaning credits are good.

Here's how it works for engine manufacturers. If you have built all of your engines to an emission of 1.2g NO_x allowed since 2007, then you must drop straight down to the 0.20g NO_x level in 2010 because you did not earn any emission credits with the EPA. If, however, like Navistar, you elected to be greener sooner by producing engines with emissions below a 1.2g NO_x level, the EPA emission credits earned between 2007 and 2010 allow you to continue evolving your technology.

Q. How long will you be able to offer MaxxForce engines with Advanced EGR?

A. The evolution of our Advanced EGR technology will continue, and will remain our technology path for the future without the need for costly, complex SCR systems using urea.



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Q. What happens when IC Bus uses all of its emission credits?

A. It is our plan to phase in 0.20 g/bhp-hr engines near the end of our credit availability by evolving our Advanced EGR technology and not burdening our customers with urea.

Q. How close are you to being in compliance? What NOx emissions certification levels do the current Maxxforce 7, DT, 9, 10, 11, and 13 engines meet?

A. All MaxxForce engines will be fully compliant with 2010 EPA regulations. Manufacturer emissions certification documents can be found at either [EPA](#) or [CARB](#) websites.

Q. Is it true that Navistar asked for a delay in the implementation of 2010 emissions standards?

A. Actually, that is false. Navistar did, however, act on a groundswell of customer requests to seek governmental assistance in light of the global economic crisis which hit in 2008. This initiative was called Clean Diesel Choice and sought EPA approval to allow current EPA07 engines to be sold *alongside* 2010 engines beginning 1/1/10. Navistar joined this initiative to help advocate for customers who are seeking to upgrade buses and trucks to newer emissions levels from older equipment they currently run but might be unable to afford such purchases with 2010 engines.

Q. How will MaxxForce engines compare to the LPG technology?

A. It is our belief that the superior energy content of diesel fuel will result in diesel remaining the engine of choice in commercial markets.

Q. What will be the NOx output (in g/bhp-hr) in 2010?

A. Our MaxxForce engines will be certified to comply with the EPA regulations below the maximum allowed NOx output of 0.50 g/bhp-hr, or lower.

Q. Have you seen a loss in durability in the engine, injectors, pistons for your 2010 compliant engines?

A. Durability levels will be maintained at our current high levels.



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Q. How will Advanced EGR impact issues related to EGR and maintenance?

A. EGR coolers, which all diesel engine manufacturers have now and will still have in 2010, are an evolving technology. EGR sub-system durability improved as we moved into EPA07 and will again be updated for EPA10.

Q. Does Advanced EGR result in higher fuel consumption compared to SCR systems? By how much?

A. With 2010 emissions requirements, it is misleading to talk only about fuel economy and we encourage you instead to consider the cost per mile. This is because SCR systems use urea, which has a cost associated per gallon. In addition, there is a lot being said about the gains or reductions in fuel economy resulting from 2010 technology. Using today's EPA07 engines as reference, our MaxxForce 7 and DT engines have an mpg advantage of 9 - 13% over the next leading mid-size bus diesel engine according to SAE Type II fuel economy testing. Our EPA10 engines are, therefore, starting from a very fuel efficient base, and will have the additional advantage of not consuming costly urea to meet emissions.

Q. Will your technology use the same DPF as current engines?

A. DPF size will depend on horsepower. We anticipate no change at low horsepower, and at high horsepower, we will use the existing DPF as found on our larger MaxxForce 9 and 10 engines.

Q. Can you adjust the engine control unit to inject less diesel for better fuel economy and less emissions?

A. Yes, that is part of the calibration and injection capability that will work to maintain mpg parity.

Q. What happens if the Advanced EGR system fails, will the engine derate or shut down?

A. Unlike SCR, which can lead to vehicle shut down if the urea system is not properly maintained, Advanced EGR would not derate or shut down. If a failure occurs with Advanced EGR, it would be treated the same as any other unscheduled maintenance. If the system is damaged, but still functional, there would be no de-rate strategy required as its functional capability would be intact.



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Q. How do you monitor NOx output?

A. The inherent design of Advanced EGR does not create the levels of NOx that require aftertreatment. The control of NOx emissions from Advanced EGR does not require additional sensors.

Q. How risky is your MaxxForce engine design going through major changes such as the larger radiator, dual turbochargers, dual EGR coolers, changes with fuel injectors, etc?

A. We made significant strategic investments and design changes going into the EPA07 engine launch which set the stage for 2010 EPA requirements using fundamentally the same base engine platform. Our Advanced EGR is an evolution of our proven, high quality MaxxForce engine family.

Q. Do you know of any performance issues with the use of SCR in Europe? If EGR is better why hasn't it been used before in Europe?

A. Navistar does not participate in the European commercial vehicle market, but we can learn from what other manufacturers are doing. Two European bus and truck OEMs (MAN and Scania) who have been manufacturing engines with SCR technology announced Fall 2008 that their new engine platforms will meet upcoming Euro V emissions levels without SCR.

Q. Will your Advanced EGR intercoolers be water-cooled or air-cooled?

A. The interstage cooler will use coolant circulated through a low temperature coolant circuit.

Q. With addition of urea to the emission control mix on SCR systems, what are the implications for maintenance of this system and resupply of urea to the system?

A. It is our understanding the urea system will have a serviceable filter. It will be critical for operators to use only pure, automotive grade urea for reliable performance of the system.



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Q. Will the on-board urea tanks be large enough to be filled only during oil changes?

A. While perhaps possible, sizing the urea tank to only be refilled during oil changes comes with inherent challenges. Consider a 15,000 mile oil change interval in an application that averages 7 mpg. With urea dosing rates of up to 5%, the size of the urea tank would need to be over 100 gallons. Such a large tank would require packaging tradeoffs on buses and coaches with wheel chair lifts, luggage boxes, and other chassis effects. Our information indicates tank sizes will range from 6 to 20 gallons.

Q. Will service intervals for oil changes or coolant be different with MaxxForce engines using Advanced EGR?

A. Oil drain and coolant change intervals will be unchanged for 2010. MaxxForce DT will remain at 15,000 miles, and the MaxxForce 7 will remain at 10,000 miles.

Q. How will the Advanced EGR system affect maintenance costs?

A. We anticipate no change as all maintenance intervals remain unchanged.

Q. Do you offer service training for customer technicians?

A. Though SCR engines will require your service technicians to undergo training for maintaining and servicing the aftertreatment system, the IC Bus Advanced EGR engines for 2010 require no new service training. (However, we conduct IC Bus University service training classes at various times throughout the year to provide our customers with comprehensive service training for our buses. Please contact John Thompson at (501) 505-2287 for more information on IC Bus University.)

Q. What MaxxForce engines will have On Board Diagnostic (OBD) in 2010?

A. OBD is a phase-in requirement. Our MaxxForce 11 and 13 will be our first engine family with OBD.

Q. Will the Advanced EGR engines be required to use synthetic engine oil?

A. Synthetic oil is not a requirement of Advanced EGR. In fact, the oil manufacturers have stated that CJ-4 will continue as they are seeing no need for further reformulation at this point.



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Q. How does the regen system currently create the heat necessary to burn soot?

A. During normal operation the system passively creates enough heat during a duty cycle to maintain an amount of heat within the DPF that is sufficient to burn off the soot. An active regen occurs when the system finds this must be supplemented by the addition of fuel to elevate the temperature of the DPF for the regen process to occur.

Q. How will prices increase for 2010 emissions?

A. Final pricing has not been announced, but expect Advanced EGR to be competitively priced with buses using SCR aftertreatment systems. Also, keep in mind, that regardless of the initial purchase price, we expect Advanced EGR to deliver a lower cost per mile.

Q. What effect do you expect SCR engines to have on resale value?

A. We believe that operators purchasing buses with SCR systems are taking on considerable resale value risk. SCR could become a "stranded technology" with declining interest, support, and parts availability driving resale values down over time.

Q. Is the EGR mounted lower on the new engines to help in keeping fluid in the cooler?

A. The DT EGR cooler will be located low on the engine.

Q. What exactly is urea, where will you purchase it, and are there any special handling requirements?

A. Urea is a component of Diesel Exhaust Fluid (DEF), a precise mixture of ammonia and distilled water. It is not as tame a substance as, say, washer fluid. If it were, you wouldn't have to have to consult a manual for how to deal with it. You see, the ISO standards organization, the same global group behind ISO 9000 standards, created a 16 page document prescribing the correct handling and storage procedures to go along with their 50 page document detailing the quality levels required to confirm vehicle-grade purity. You may purchase the ISO 22241-1, -2, and -3 standards [online](#).

Maintaining purity goes hand in hand with the size of the urea container you purchase. While urea will likely come in a variety of sizes including bulk containers, this opens up a different can of worms because of the complexity of storing it.



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Q. How do ambient temperature changes affect urea?

A. Urea can freeze and thaw and not lose effectiveness. It also begins to decompose into ammonia gas at 85° F.

Q. Why do urea tanks need to be heated and insulated?

A. Heating and insulating are required to protect against temperature extremes. It starts to freeze at +12° F, and starts to breakdown at +85° F.

Q. In addition to purchasing diesel fuel, will urea have to be bought or will it be added directly to diesel fuel?

A. Urea cannot be added to diesel fuel. Urea based systems are an aftertreatment device and require the urea fluid to be stored onboard in a separate tank and injected into the exhaust gas stream.

Q. Does the SCR system require a metering system in order to correctly provide the urea to the exhaust at the correct rate to manage emissions?

A. Yes.

Q. Approximately how much per year (based on 30,000 mi per year) would the cost of urea be per bus?

A. For IC Bus products using MaxxForce engines, the cost of purchasing and storing urea is zero as our Advanced EGR system avoids this complication of an additional fluid. For SCR systems using a dosing rate of 5% urea for every gallon of diesel and an average of 7 mpg, you would be purchasing over 210 gallons of urea for each bus. Now you need to find out how much a gallon of urea is selling for in your area.

Q. Won't there be some type of dispensing infrastructure required for large fleets?

A. Over time, we expect to see urea become available in bulk container sizes. However, we recommend that you purchase the ISO 22241 standards manuals to understand the storing and purity testing requirements that go with purchasing urea in bulk.