

## Countdown 2010: A Special Report From Fleet Owner

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### A Fork in the Road



With 18 months to go before the EPA's 2010 emissions standards take effect, some real differences are beginning to emerge as engine makers start releasing details on how they intend to meet those standards. On one side, we have proponents of selective catalytic reduction (SCR) technology. On the other, we have those who say they'll go with current cooled exhaust gas recirculation (EGR) technology — just more of it.

Along with the different approaches are sometimes loud arguments about who has the superior technology, stirring up some confusion among fleets and other users. In this report, and in the following installments over the coming months, *Fleet Owner* will attempt to sidestep the rhetoric and provide you with an objective view of the pros and cons of each approach.

In brief, SCR is an aftertreatment approach that injects a urea-based fluid into the exhaust stream, turning unwanted NOx into nitrogen and water. Advantages should be better fuel economy than even current diesels, less active regeneration of diesel particulate filters (DPFs), and use of a proven technology already working in Europe and Asia. The main disadvantage is that it requires a second tank to hold the urea, which must be refilled periodically.

What's being called the "high cooled EGR" approach doesn't require urea or any additional fluids. It uses current technology to further suppress NOx creation in the combustion process and cleans up the resulting particulate matter (PM) in the DPF. While it avoids the weight, cost and nuisance of urea, there will most likely be a fuel economy penalty.

Which side has the right approach? Both, probably. In the end, it will depend on their execution and your application. [On the following pages](#), you can judge the arguments each engine maker offers for its choice, or choices. And in the coming months, we'll look to put some numbers and other quantifiable analysis behind those expectations.

### Caterpillar

**Caterpillar has not** made a formal announcement concerning its plans for compliance with the 2010 engine emissions standards. However, earlier this spring, Reuters ([www.reuters.com](http://www.reuters.com)) reported that the company was still considering 2010 alternatives, quoting Caterpillar CEO and chairman Jim Owens as saying, "I think it is important, personally, that we find a way to successfully play in the on-highway truck industry. ... We have an engine, we sell to all the OEMs, and we have contracts that go out to 2010. But beyond that we have to develop new product technology for the on-highway truck market, and we have to decide how we are going to market with that product. ... We could exit. We could partner. We could acquire."

The company has said that the solution for 2010 will be built off its ACERT Technology platform. ACERT was first introduced in 2003 and updated in 2007 with the addition of Clean Gas Induction — a proprietary process that draws off a small amount of non-combustible gas after it has passed the engine's aftertreatment system, cools it, blends it with more incoming cool air, and returns it to the combustion chamber — and a diesel particulate filter featuring Caterpillar's own Cat Regeneration System (CRS).

## Engines

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## Cummins

**According to** Cummins Inc., it continues to move down its dual track toward 2010: the company's medium-duty engines will rely on the addition of SCR aftertreatment systems to meet the new limits on NOx, while its heavy-duty engines will depend on enhanced EGR technology.

Steve Charlton, vp-heavy-duty engineering, stated at a recent media briefing that Cummins' non-SCR engines will comply with the 2010 emissions rules without resorting to the use of "banked" emissions credits via the EPA's averaging, banking and trading provisions. However, Cummins had previously told *Fleet Owner* that it and other engine makers have "consistently used the averaging banking and trading provisions in the [EPA] rules for many years and will continue to do so when it makes sense. In all cases, credits are discounted before they can be used."

According to the engine maker, prototypes of both its medium- and heavy-duty 2010 engines will enter field trials this month.

Cummins said its heavy-duty engines will use an "evolution" of its 2007 integrated solution, consisting of the next generation of the cooled EGR subsystem, a variable geometry (VG) turbocharger, advanced electronic controls, proven air handling, and the Cummins Particulate Filter to comply with NOx and PM standards. Its heavy-duty lineup for 2010 will include the ISX (15L) as well as 11.9L and 16L models.

Its medium-duty engines will also use "an evolution of the 2007 integrated solution," consisting of next-generation EGR, a VG turbocharger, advanced electronic controls, proven air handling, the Cummins Particulate Filter and the addition of oxides of nitrogen (NOx) aftertreatment. Engines in this range will include the ISB (6.7L), ISC (8.3L) and ISL (8.9L).

Commenting on the different technological approaches and the ongoing industry debate over SCR, Jim Kelly, president of Cummins' global engine business, stated that it's "not about having a foot in each camp; we're not hedging our bets here... it's a case where one size does not fit all."

## Detroit Diesel Corp.

**Currently, Detroit Diesel Corp.** (DDC) has about 15 company-owned trucks on the road testing its SCR system for 2010 on long runs between Detroit, MI, and Portland, OR. Another 10 engines equipped with SCR technology are also running in test cells at its Redford, MI-based research facility. David Siler, director of marketing for DDC, says the plan is to add five trucks per month — a mix of day cab and sleeper tractors — to the test fleet through the end of 2008. "We're running these trucks 24 hours a day, stopping just to change drivers, refuel, replace filters and conduct other maintenance," he says.

What DDC is watching most closely in these tests, interestingly enough, isn't so much the performance and hardiness of the SCR components. Rather, it's the reliability and durability of the onboard diagnostic (OBD) sensor arrays mandated by the EPA to monitor the emissions levels produced by commercial trucks.

"These electronic systems are far more complicated as they are necessarily very sensitive, yet must withstand a harsh working environment," Siler says. "From our long experience with SCR in Europe, we know that technology very well."

By the fourth quarter of this year, Siler says DDC expects to place 50 demonstration trucks with eight to 10 customer fleets, a process that should take about five to six months to fully complete.

"These trucks will go into a wide range of different operations — cross-country TL, LTL, tanker fleets — and in as many different environments as we can, from the plains to the mountains, etc.," he notes. "Again, we're putting these trucks with fleets we know will generate a lot of miles with them."

The biggest challenges posed by SCR at this point is getting all the required technology into the available real estate on a truck, and it's not necessarily a huge challenge for every truck model either, Siler stresses. "Short wheelbase LTL tractors, for example, are going to pose the biggest challenge here," he says. "There's not a lot of room for the tank holding the DEF [diesel exhaust fluid, or urea] for starters."

## **Hino**

**Hino Motors Sales USA Inc.**, a Group Toyota company, has not yet made an official announcement concerning its plans for compliance with 2010 engine emissions standards. Such an announcement is expected shortly, according to George M. Daniels, vp-service operations for the company. "We have been looking at both SCR and EGR solutions," Daniels notes, "and evaluating the pros and cons of each. There will probably be an announcement in June."

"We have two SCR test units running in the U.S. now for evaluation," Daniels continues, "and we will be bringing others over this summer. We started cold weather testing up north this past fall and will be doing other tests, including hot weather testing in Death Valley, starting this spring. We are putting on as many miles as we can and will have test vehicles running in Los Angeles, Denver, Detroit, Texas and along the East Coast in a wide variety of applications."

The company's research, engineering and design work is all done in Japan, Daniels notes, although testing is done all over the world. "We have every confidence that we will be ready for 2010," he says. "We were early to the market with 2007-compliant vehicles because Japan was already using DPR [diesel particulate regeneration] systems and we are 90% ready for 2010 now."

The company offers three diesel engines rated from 175 to 260 hp. for its Class 4-7 conventional trucks. The first 2010-compliant Hino trucks will be model year 2011 vehicles, since the model year is always a year ahead of the calendar year.

## Isuzu

**While not currently** ready to disclose details of plans for 2010, Isuzu Commercial Truck of America wants to assure customers that its diesel engine lineup will definitely meet the stricter EPA emissions regulations. Isuzu engineers and testing labs (both here and in Japan) are in the process of bench-testing several systems including SCR. Todd Bloom, vp-fleet operations and marketing, says the company expects no delays.

"Our diesel engines will be absolutely in line with what's needed for 2010," Bloom reports. "Although the model designations may change slightly as we go to a new generation diesel, the basic configurations of the current Isuzu 4-cyl. 4HK1 and the 6-cyl. 6HK1 will not change dramatically.

"The biggest issue is going to be cost," Bloom says. "There was a major cost increase for all of us in 2007; likewise, going the next step to meet 2010 requirements, there's going to be another cost implication for customers. That becomes difficult on a medium-duty truck. That's one issue that will have to be addressed."

## Mack

**The technological leap** from EPA '04 emissions levels to '07 levels was huge, according to David McKenna, powertrain sales and marketing manager for Mack Trucks Inc. "Essentially we had to change everything on the truck but the Bulldog," he says. "But 2010 is strictly engine aftertreatment using a technology we know well — selective catalytic reduction."

While Mack shares a basic engine platform and engine manufacturing plant with Volvo Trucks North America, its traditional strength in the vocational truck market presents significantly different problems, so the company has already begun its own 2010 development program. "SCR presents the biggest challenge [in vocational trucks] because of the real estate on the frame required by the system," says McKenna.

Mack is currently running both its own test trucks with 2010 compliant engines as well as "a goodly number" in vocational fleet field tests, McKenna reports. Early results are promising because "we're seeing the expected improvement in fuel economy we've been counting on," he says. The additional cost for SCR's urea is only running about 1/3 a cent per mile, which is more than offset by fuel savings, explains McKenna. In fact, others involved in the Mack and Volvo engine development efforts estimate that for every \$1 spent on urea, fleets will save \$2 on diesel compared to non-SCR engines.

That's not to say 2010 isn't without challenges. The biggest is a new requirement for onboard diagnostics to monitor actual tailpipe emissions. "It's difficult because the amounts we have to measure and log are so minuscule that if a sensor is off by a fraction of a percent, we could get a false reading," says McKenna. "But we will meet the standard for 2010 completely."

## **Navistar**

**Navistar**, maker of International-brand trucks, is preparing to begin what it calls “captive truck tests” involving its 2010 MaxxForce engine platform, with International demonstration trucks equipped with 2010 test engines slated to be put in the hands of select customers beginning this winter.

“We’re not using SCR technology to meet the 2010 emissions standards, so our 2010 engine platform is only going to undergo very small changes from what we’re using to meet the 2007 regulations,” says John Cagney, MaxxForce director of design and development. “The changes are going to be very basic — a little bigger radiator package to offer more cooling capacity, that kind of thing.”

Satish Chandra, director of inline platforms for MaxxForce, notes that the engine maker has already completed concept validation in the laboratory and plans to finish design validation work for its 2010 engine models — testing form, fit and function — by midsummer.

Chandra says statistical validation testing of 2010 models in the laboratory should start by late summer — a series of highly aggressive tests that puts the engines under full loads 24/7 for weeks on end to gain lifetime durability and reliability data under extreme conditions.

“The field tests with trucks are really designed to see how the engines interact with the other components on the vehicle. We’ll have gained total life cycle engine performance data in the lab,” he says. “Field tests are critical for making sure we don’t have any unintended consequences.”

“Captive truck tests” using Navistar-owned equipment and drivers should begin some time this May, exposing MaxxForce’s 2010 grade engines to high altitude conditions, extreme heat, heavy stop-and-go environments, and eventually cold weather testing by winter.

“High altitude tests usually take place in Colorado, with hot weather testing in Texas, severe pickup and delivery operations in the congested Northeast, and finally winter tests in Minnesota,” says Chandra. “In field testing, it’s all about location and vocation.”

Once these company field tests are completed, select Navistar customers should get 2010-complaint test trucks by winter, Cagney adds. “Our internal field tests help us finalize the package, but then the customer field trials act as a safety net to see if we missed something — if drivers in the real world feel a difference in handling, or sense a vibration or noise,” he says. “It’s another filter for us, so we can gain another entirely different set of feedback.”

## **Nissan Diesel**

**Dave Trussell**, director of marketing for the U.S. arm of Nissan Diesel Japan, says his company is committed to using selective catalytic reduction technology so its diesel engines will comply with 2010 emissions standards. This is largely because it has been using SCR to comply with emissions regulations that went into effect in the company’s home country of Japan back in 2005. Nissan Diesel also plans to use the 2010 emissions reduction mandate as an opportunity to completely redesign its entire line of trucks, especially the cabs.

"It's going to be a sweeping change, resulting in a brand new product," says Trussell. "The cabs we're operating with now have been out since 1994, so it's about time for a face-lift. And with aerodynamics for fuel economy and creature comforts for driver retention more critical than ever, the 2010 emissions mandates presented us with a great opportunity for a total truck makeover."

He says much of Nissan Diesel's road tests of SCR-equipped trucks headed for the U.S. market will take place in Japan, with several specific field tests conducted in several large urban U.S. areas in early 2009.

Nissan Diesel's FLENDs (Final Low Emission New Diesel System) technology combines ultra-high-pressure fuel injection with SCR, injecting urea — an ammonia compound — into the exhaust stream to reduce NOx. The typical tank size Nissan Diesel uses holds 30 liters (roughly 7.91 gal.) of urea, which the company says is sufficient for 1,000 kilometers (about 621 mi.) of travel.

Trussell says the location of the urea tank is the major technical challenge SCR poses for U.S. trucks. "That's a critical issue, especially for vocational customers, as the real estate on our trucks post-2007 is pretty tight," he says.

## **Paccar**

**The biggest news** on the Paccar MX engine front is word from the company that the U.S. production launch for its new proprietary engine line remains on target for 2009 — enabling it to supply EPA 2010-compliant engines to subsidiaries Kenworth and Peterbilt in time for the new regs.

The Paccar MX engines will be built at an engine plant under construction in Columbus, MI, that, according to Paccar, will complement the DAF engine factory Paccar operates in the Netherlands. The company said the first U.S.-built MX — a 12.9-liter diesel — is slated for release in late 2009.

Paccar also reported that its MX engines are being tested at the Paccar Technical Center, as well as in numerous Kenworth and Peterbilt customer fleets. A company spokesman said the number of test engines is being increased this year to ensure data is gained to be "extremely comfortable" with how the engines will perform in various applications.

Bob Christensen, Kenworth general manager, has stated the OEM is testing pre-production models of the Paccar MX 12.9-liter engine in T-800 tractors in its own rapid evaluation fleet, as well as in customer fleets, and expects to accumulate 20-million test miles. "We're testing the heavy-duty engine in a wide variety of applications, terrains and climate conditions," Christensen noted. "The engine test program includes test cell work, testing on the Paccar Technical Center track and road tests."

"Proprietary engines play a significant role in the sale of new trucks and in the aftermarket," said Paccar vp and Peterbilt general manager Bill Jackson, who noted that Pete is testing the 12.9-liter MX in its Model 388 tractors.

## **Volvo**

**Thirteen trucks with** emissions levels meeting the 2010 EPA requirements are currently undergoing fleet field tests, according to Ed Saxman, product manager-drivetrain for Volvo Trucks North America (VTNA). The trucks are powered by the 13L Volvo D13 engine and employ a combination of DPF, EGR and SCR technologies to meet the required levels.

VTNA is convinced that SCR is the right technology for 2010 because it will deliver better fuel economy, says Saxman. "It will allow us to run the engine more efficiently because we can control the NOx in the exhaust, not in the combustion process." Also having more NOx in the exhaust initially will allow for more passive regeneration in the DPF, contributing to fuel economy by cutting back on fuel consumed by active regeneration activity.

"SCR has also been proven around the world, and North America won't be the first market," Saxman says. Europe alone has about 150,000 trucks fitted with the NOx reduction technology, he points out.

In addition to its proprietary Volvo engines, VTNA also offers Cummins diesels in its trucks. Since Cummins intends to use high levels of cooled EGR without SCR in its heavy-duty engines, VTNA is also working with the company to build a test truck with a Cummins 2010 engine.

"It's still very early, but we have begun working with Cummins on a development program," Saxman says. Once the engine is installed in a chassis, it will be used to develop test data on cooling requirements, power characteristics and electronic control integration, he said.