

PROSTAR BEATS THE COMPETITION IN FLUID ECONOMY

FREQUENTLY ASKED QUESTIONS





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General TMC Type IV Testing Methodology/Procedures

You used TMC Type IV testing – why is this considered the standard for this testing procedure?

The TMC Type IV test procedure is a long range (200-500 miles) fuel economy test conducted over public highways or interstates and utilizes the vehicle fuel tanks. The SAE Type III test is a shorter test (40 miles) and uses portable weigh tanks. The Type IV test is better able to capture the impact of exhaust regeneration fuel consumption due to the route length and the longer distance of the test allows for more accuracy in the final results as more test disturbances are taken out due to the length of the test.

Are there any other variables that affected the over-the-road test?

The two main variables in this testing were weather and traffic. During this testing, we did not encounter major changes to these variables. The driver and trailer variable are controlled by switching driver and trailer midway through each test segment.

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How many actual runs did you complete? Valid and invalid?

There were seven runs for each competitive vehicle completed using the tank fill procedure defined within TMC Type IV. The results are the average of three runs whose fluid economy fell within that fell within 2%.

What are the specs of all of the models used in the testing?

Specifications	International ProStar+	Freightliner Cascadia	Kenworth T660
Wheel Base	231"	237"	236"
Rails	5/16"x3.58"x10.125"	11/32" x 3.5x 10.187	5/16"x3.5x 10.625
Front Axle	Meritor 12.0k	Steertek 12.5K	DANA 12K
Front Susp	12k Taperleaf	12K Taperleaf	13.2K Air
Brakes	Bendix FWCS AD-IS Dyer 21.0 CPRSR	Wabco 6S/6M ABS AD-9 Dryer 15.9CFM CPRSR	Bendix 6S/6M AD-IS 18.7 CFM CPRSR
Steering	Std Sheppard HD-94	Std TRW THP-60	Std TRW TAS-65
Driveline	SPL 250XL	18T Merritor	SPL 250XL
Exhaust	Single Ver TP RSM N/A Blue Tank 23	Single Ver TP RSM Gal Blue Tank 20	Single Ver TP RSM Gal Blue Tank
Alternator	200 AMP	275 amp	160 AMP
Front End	Opt for Prostar + 122	Std for Cascadia	Std for T-660
Fifth Wheel	6.75"	6.75"	6.75"



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Clutch	Eaton 15.5"	Eaton 15.5"	Eaton 15.5"
Engine	MaxxForce 13L 295/75R22.5 Front 430 HP @ 1900 RPM 1550 LB/FT @ 1100	DD15 14.8L G372A Rear 455 HP @ 1800 RPM 1550 LB/FT @ 1100	Cummins ISX 15L 295/75R22.5 - 14PR 435 HP @ 1700 RPM 1450 LB/FT @ 1200
Transmission	Eaton FRO-16210C 10 spd w/OD	Eaton FRO-1521 10 spd w/OD	Eaton FRO - 1621 10 spd w/OD
Rear Axle	RT40-145 40k Tandem 3:42 Ratio	RT40 40K Tandem 3.58 Ratio	DANA DSP 40 3.55 Ratio
Rear Susp	40k Air Susp 52" Spacing	40K Air Susp 51" Spacing	40K Air Susp 52" Spacing
Fuel Tanks	Lt Tank 125 Gal Rt Tank 150 Gal	Dual 120 Gal	Dual 120 Gal
Cab	73" Sleeper	72" Sleeper	72" Sleeper
27/32	295/75R22.5 Front	G395 Front	295/75R22.5 - 16PR
Wheels/Tires	295/75R22.5 Front	G372A Rear	295/75R22.5 - 14PR

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You used TMC Type IV testing – why is this considered the standard for this testing procedure?

The vehicle specifications are as similar as possible, and represent a high volume of sales for each manufacturer. The specifications are also recommended as fuel efficient by each manufacturer.

Did you come away with any key learnings about how your product can improve?

We continue to learn from additional testing. The testing allows us to better understand the impact of aerodynamic drag, powertrain efficiency, and tire rolling resistance on vehicle fuel economy. We also find opportunities for improvement with each test. Another key take away from this testing is that "engine" only plays a minor role in the overall fuel economy of the vehicle. The driving behavior of the driver, effects of parasitics (tires/brakes/other drags), and aerodynamics also make huge impacts on the fuel economy.



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POWERED BY MAXXFORCE

Why did you utilize the DD15 with the MaxxForce 13. Wouldn't the different liter displacement skew the results?

We utilized the powertrain that our competitors position as their most fuel efficient model. For Detroit Diesel, that's the DD15, vs the DD13.

Kenworth has been claiming the T700 is their most aerodynamic vehicle. Why didn't you test against this?

We measured our competitor's production models. Once the T700 becomes available, we plan to conduct similar type testing so our customers are informed about the purchases they make.

How did the ProStar+ perform on diesel fuel consumed?

On diesel consumption alone, the International ProStar+ with MaxxForce Advanced EGR is nearly equal, with a slight variance of +/- 1% versus the competitive liquid urea SCR vehicles tested. However, the more accurate measurement based on today's 2010 emissions-compliant vehicles is fluid economy, where ProStar+ excels nearly 1% - 2.5% over competitive liquid urea SCR models.

How does the ProStar+ compare against other 2010 emissions products beyond Freightliner/Cascadia and Kenworth/T660?

We tested ProStar+ against vehicles we felt and those that were positioned to be the closest in overall fuel economy.

What are your next steps for testing?

As the marketplace evolves, we will continue to test our technology against our competitors to ensure we provide customers all the resources needed in order to make an educated decision. This also insures that we're continuing to deliver products that help our customers operate at their best, through best-in-class fluid economy.

What were the NOx levels of the engines tested?

Although NOx levels are not a measure within TMC Type IV testing, the NOx levels were measured before testing began. Each performed within 2010 emissions standards.



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General TMC Type IV Testing Methodology/Procedures

What other features/products are you offering customers to help them save fuel and be more efficient?

We offer customers optional extended chassis skirts to optimize airflow from tractor to trailer. For daycab configurations, we offer a new aero package to maximize fuel efficiency.

SCR powered vehicles that require liquid urea are claiming 3-5% better fuel economy. What should I believe?

Liquid urea SCR-powered manufacturers are currently making claims of 3%, 5%, and up to 10% better fuel economy. Some claims are compared to their own 2007 emissions-compliant engines, whereas others are compared to all engines within the industry. Navistar feels a more accurate measurement of performance is not engine-to-engine, but truck and engine working together because aerodynamics contributes 50% to fuel economy and rolling resistance 32% and powertrain the smallest factor at 18%.

And now with 2010 emissions, the rules have changed and measurement needs to be revisited. Until now, comparisons of Class 8 trucks began with fuel economy. But today, different trucks offer different solutions for 2010 emissions, and fuel economy doesn't tell the whole story. The competitors' trucks are requiring a liquid urea SCR solution to operate the vehicle, and like diesel fuel, liquid urea costs money. That's why the new standard of comparison for Class 8 trucks is fluid economy. Fluid economy is a measurement of diesel fuel plus liquid urea consumed. This measurement will provide a more accurate representation of fluid economy and customers' operating costs. And based on results of testing, International ProStar+ beats competitive liquid urea SCR vehicles nearly 1% to 2.5%.

When can I get a ProStar+ with MaxxForce Advanced EGR?

You can order ProStar+ with MaxxForce Advanced EGR. Engine production started in June-July time frame, the vehicles will be released to customers in the August 2010 timeframe. As of today we have more than 10.6M miles

What is the status of the MaxxForce15?

The MaxxForce15 development remains on track, with the targeted production date late 2010. We have early build units running in customer hands, and a wider test unit distribution scheduled for this fall. Overall performance has been extremely favorable thus far.



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Fluid Economy

What is fluid economy?

Fluid economy is a combination of diesel fuel + liquid urea SCR consumed.

MaxxForce Advanced EGR

For those vehicles that use biodiesel fuel is anything with the 2010 MaxxForce Advanced EGR affected?

MaxxForce Advanced EGR 2010 technology engines are compatible with biodiesel blends that conform with ASTM standards just as previous generation engines were. Navistar currently has published guidelines for customers to use up to B20.

What mounting requirements will I need to consider for Advanced EGR?

With the MaxxForce Advanced EGR, there will be no additional hardware on the chassis and there will be minimal additional body builder chassis packaging requirements.

Is there a payload penalty with MaxxForce Advanced EGR?

Because MaxxForce Advanced EGR handles emissions reduction inside the engine, there's no new equipment or new fluid tanks adding weight to the chassis. This means customers do not have to reduce their payload.

If Advanced EGR is a simpler solution, then why does it cost almost as much as the more complex liquid urea SCR technology?

While MaxxForce Advanced EGR does not require added equipment onto the vehicle, we have invested engineering resources into our 2010 solution. MaxxForce engines have gone through significant redesign and optimization of fuel injection systems and combustion bowls. In addition, redesigned cooling packages and larger interstage air coolers have required more extensive engineering investment. Finally, our products have required considerable engine electronic calibration refinements. Though we have given our best effort to minimize costs related to the design and development to ensure prices are as manageable as possible for our customers, we unfortunately must increase our prices to remain competitive in the marketplace.



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Does Advanced EGR affect engine reliability and durability?

While other OEMs had to work to re-engineer their engines to include liquid urea SCR technology, Navistar didn't. In fact, the MaxxForce Advanced EGR is based upon the technology solution we brought to market in 2007. This approach means customers do not have to rely on unproven technology.

Is it hard to maintain vehicles with MaxxForce Advanced EGR?

MaxxForce Advanced EGR does not require the use of liquid urea and therefore requires no additional training to learn or new fluids to deal with. It is just like operating and driving the vehicle customers drive today.

Are engine operating temperatures higher with MaxxForce Advanced EGR?

Not at all. Cooling capacity has been sized to keep operating temperatures at optimum levels, just like customers are used to. Cooling loads have increased over the years with power increases, air-conditioning, and stringent emissions regulations. Cooling capacity has always kept pace and will continue to do so.

What type of testing did Navistar implement for MaxxForce Advanced EGR? Did Navistar put any test vehicles in customers' hands?

We tested more than 60 engineering test vehicles with 2010-compliant engines logging over 10 million miles of driving in real-world conditions. Since MaxxForce Advanced EGR did not require significant changes to vehicle hardware and testing mainly involved engine calibration refinements, we believe the benefit of road testing by our own engineering team outweighed the learning obtained from customer field test units. We certainly understand the need for other manufacturers to have customer field-tests based on the dramatic changes required in their vehicle technology to meet 2010 regulations. The significant redesign of their engines and the extensive aftertreatment equipment needed for their liquid urea SCR systems likely requires these manufacturers to exert much more effort in validation.

LIQUID UREA SCR

Other OEMs have told me that liquid urea SCR will enable improvements in fuel economy. Navistar is telling me that fuel economy will likely remain the same in their vehicles. Isn't this a good reason to choose liquid urea SCR?

This is a claim that is unproven and unknown. OEMs have not been able to test vehicle versus vehicle fuel economy benefits until very recently because competitive vehicles have not been available. All OEMs are anticipating fuel economy improvements with the 2010 certified engines, but it is still unknown which engine will have the lead over the other at this moment in time. Fuel consumption is only one part of a vehicle's total operating cost. With liquid urea SCR, at least 2-4 gallons of liquid urea will be required for every 100 gallons



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of diesel fuel burned. So, even with a small gain in fuel economy with liquid urea SCR technology, we expect our Advanced EGR solution to be competitive.

Are there cold weather issues with liquid urea based SCR technology?

Liquid urea freezes into a non-usable state at 12 degrees Fahrenheit. However, when it is thawed it is usable. Liquid urea based SCR vehicles will require heated and insulated liquid urea tanks and the liquid urea filling station infrastructure will also need heat capability, inside storage and/or heated lines to fuel islands. SCR engine manufacturers claim vehicles outside in very cold weather will start and move away even with frozen liquid urea. They claim an electric heater at the line from the tank will thaw liquid urea quickly enough to provide adequate liquid urea supply as needed. U.S. EPA allows thawing of the liquid urea, but if it does not begin controlling NOX, the driver is warned of the liquid urea problem and the engine will begin torque derating in addition to other engine control measures (speed limiting).

Does liquid urea SCR provide a lower operating cost?

While it is too early to tell, we believe liquid urea SCR does not yield a lower operating cost; in fact, liquid urea SCR will likely result in higher operating costs when customers consider the need to purchase liquid urea. Add in the cost of extra maintenance.

Isn't adding a liquid urea SCR catalyst just like adding another DPF?

The catalyst itself is only a minor portion of a liquid urea SCR system. A 10-15 gallon liquid urea tank complete with insulation and heater, and a doser system to meter and inject liquid urea are also in the picture. Taken together, liquid urea SCR system components will take up more space than a 100 gallon fuel tank and will add 200 lbs. – 300 lbs. weight. Packaging will be a critical challenge, particularly on vehicles requiring clean cab-to-axle space for body mounting.

COMPETITIVE COMPARISONS

What are the main differences between Advanced EGR and liquid urea SCR?

With MaxxForce Advanced EGR there are no extra fluids to buy, store or deal with. And there is no new training needed. Liquid urea SCR requires all of the above.

I have heard quite a bit about SCR technology with regards to 2010 emissions. Isn't SCR a more realistic and pragmatic way of meeting these requirements?

We believe liquid urea based SCR technology is a temporary approach to U.S. emissions requirements and that customers have a better choice with our MaxxForce Advanced EGR solution. Liquid urea based SCR puts the burden of compliance largely on the driver of the vehicle because that vehicle must have an adequate supply of liquid urea at all times. There are also additional cost-of-operation issues such as the cost of an additional operating fluid (liquid urea), driver and service training costs and reduced payload due to the



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additional weight of SCR components and liquid urea. The path we are following will meet 2010 requirements by using advances that build on the technologies we are using today – passive and proven technologies such as advanced fuel injection, air management, electronic controls and proprietary combustion technology which do not require the driver to maintain emissions compliance, unlike liquid urea based SCR.

What will be the impact on the residual value of a used vehicle (liquid urea based SCR vs. Advanced EGR)? We believe the demand for used vehicles with SCR technology will certainly fall, given these vehicles offer higher operating costs and more hassle to the drivers and maintainers. We expect vehicles featuring MaxxFace Advanced EGR will have a much higher residual value. Why? We believe the solution to reducing emissions in 2010 and beyond lies in EGR technology.

CARB Workshop

I read news this morning about third party testing conducted the operation of liquid urea SCR systems?

Yes, we did conduct third party testing on the operation of liquid urea SCR systems, but this is not the forum to discuss the results of that testing. For more information on that initiative and for information on how to participate in tomorrow's workshop please go to:

<http://www.arb.ca.gov/msprog/mailouts/mso1003/mso1003.pdf>