

FEWER REGENERATIONS
SIMPLE RELIABLE
COST-EFFECTIVE
GOOD FOR YOUR BUSINESS

A GUIDE FOR MEDIUM-DUTY TRUCK OWNERS

**THE TRUTH
ABOUT SCR**

RETURN ON INVESTMENT
INCREASED FUEL ECONOMY
PROVEN
GOOD FOR THE ENVIRONMENT

SCR INFO

For more information
and to view a video recap
about SCR, please visit
www.truthaboutscr.com and
www.factsaboutscr.com.



DIESEL EXHAUST FLUID (DEF)

EVERYTHING YOU NEED TO KNOW ABOUT DEF



WHAT IS DEF?

- Diesel exhaust fluid (DEF) is an organic, nontoxic compound made of 32.5% urea and 67.5% de-ionized water.
- DEF is carefully regulated by the American Petroleum Institute.

WHERE CAN YOU GET IT, AND HOW WILL IT BE SOLD?

- DEF will be available through most dealers, distributors and major truck stops including:
 - Freightliner Trucks Dealers
 - Western Star Trucks Dealers
 - Detroit Diesel Distributors
 - Cummins Distributors
 - Mack Trucks Dealers
 - Peterbilt Trucks Dealers
 - Volvo Trucks Dealers
 - Hino Trucks Dealers
 - TravelCenters of America
 - Flying J Truck Stops
 - Love's Travel Stops
 - Petro Stopping Centers
 - Pilot Travel Centers
- DEF will be packaged in many ways including 2.5-gallon jugs, 275-gallon IBC, and bulk storage at truck stops and fleet locations.

HOW MANY MILES WILL A TANK OF DEF LAST?

- 2.5 gallons of DEF will yield over 800 miles of travel.
- You can drive from L.A. to Boston and back on less than a single 23-gallon tank of DEF (estimated usage rate is approximately 2% per gallon of fuel).

HOW DOES DEF IMPACT MAINTENANCE?

- DEF system maintenance is easy and is done at the same rate as normal maintenance.
- The DEF filter takes only a few minutes to change.

HOW WILL TEMPERATURES AFFECT DEF?

- Under temperatures below 12 degrees Fahrenheit at which DEF will freeze, trucks will be immediately operational throughout the DEF tank thawing process.
- There is no concern regarding thermal stress with the plastic DEF tank. Tanks have been extensively tested in a variety of extreme climates.
- DEF, when heated and maintained at a temperature above 120 degrees Fahrenheit, will very slowly start to form small amounts of ammonia. It would take over two years at this constant temperature to convert DEF into levels of household ammonia.

HOW MUCH WILL DEF COST?

- Estimated cost is about \$2.75 per gallon when pumped in bulk at truck stops or other retailers.

WHAT IF A DRIVER RUNS OUT OF DEF?

- Visual indicators in the cab—like fuel gauges—will provide an advanced low-level warning.
- If a driver runs out of DEF, the vehicle can continue to be driven with no derates until:
 1. Diesel refueling occurs with no increase in DEF level (refuels without filling DEF tank)
 2. Vehicle is stationary for more than one hour
 3. Vehicle has been shutdown or restarted
- Roadside assistance personnel will carry DEF.



BULK DEF DISPENSING UNIT

2/3 WATER

DEF is an organic, nontoxic compound made of 32.5% urea and 67.5% de-ionized water.

H₂O

LESS THAN 7 TIMES PER YEAR



That's the number of DEF fill-ups per year in an average medium-duty truck application.

* Based on 5,000 miles per year, 1,000 hours per year at idle, 8 miles per gallon at a 2% DEF to diesel consumption rate and a 6 gallon DEF tank



Q&A



The debate between SCR and In-Cylinder EGR has generated many questions ... and just as many inaccurate answers. Here's what research and testing show to be **TRUE**:

WILL SCR BE EXPENSIVE?

- There are costs associated with meeting the EPA guidelines, no matter what the solution.
- SCR products pay you back over the life of the vehicle in fuel economy, improved engine reliability, improved regeneration cycles, less downtime and maintained maintenance cycles.
- The costs for In-Cylinder EGR solutions may involve additional vehicle cooling and additional EGR and air handling system needs with potential for additional turbocharging capability and decreased engine life.

WHAT ARE EXPECTED REGENERATION CYCLES?

- SCR will have fewer regeneration cycles for 2010, with less manual stationary regenerations required. Improved regeneration rates mean less fuel burned and more time on the road.
- With In-Cylinder EGR solutions, regeneration cycles will occur more often, requiring additional downtime due to the likely increase in soot output.

WHAT IS THE IMPACT ON ENGINE MAINTENANCE?

- With SCR, engine maintenance intervals will remain the same as 2007, with one additional service point: the DEF filter.
- The DEF filter should only need to be changed every 200,000 miles and can be changed in minutes.
- With SCR, engine components last longer due to less heat generated and fewer contaminants. The result is longer overall engine life.
- For In-Cylinder EGR solutions, maintenance intervals remain the same.

WHAT ARE SCR'S BOTTOM-LINE ADVANTAGES?

- Through extensive testing, Cummins realized a 5-9% fuel economy advantage with SCR versus In-Cylinder EGR solutions. That's a significant savings over time.
- SCR offers better engine reliability, for less downtime.
- SCR also causes no additional wear on the engine.

WHAT ABOUT ENGINE POWER?

- There is significant loss of performance for an engine using In-Cylinder EGR—as much as 50-100 horsepower depending on platform.
- It will take a higher displacement In-Cylinder EGR engine to do the same work as an SCR engine.

HOW MUCH ADDITIONAL WEIGHT WILL BE ADDED WITH THE NEW ENGINE?

- Both SCR and In-Cylinder EGR solutions add weight.
- In SCR solutions, a good portion of the additional weight comes from DEF (9 pounds per gallon).
- In-Cylinder EGR requires additional weight in the form of cooling packages and additional engine hardware.

WILL DRIVERS NEED TO BE "RETRAINED" TO OPERATE THE SCR SYSTEM?

- No. It's as simple as reading and understanding a DEF gauge and filling a tank.

ARE THERE ANY BODY BUILDER CONSIDERATIONS FOR EITHER TECHNOLOGY?

- For medium-duty vehicles using SCR, there will be multiple packaging options that will address the placement of fuel/DEF/air tanks, exhaust and batteries.
- With In-Cylinder EGR there may be body builder issues as it relates to optional equipment interference with increased cooling capacity needs (such as FEPTO). With In-Cylinder solutions, there may be horsepower restrictions/reductions for given vocational applications.

SCR IS ROAD-PROVEN TECHNOLOGY WITH BOTTOM-LINE ADVANTAGES.

Today, the trucking industry believes SCR is the best EPA 2010 solution based on environmental advantages and payback to fleet owners. OEMs prefer SCR because it's proven—it's been around for years, with over 600,000 SCR equipped commercial vehicles in operation in Europe and tens of millions of SCR test miles run in the United States.

The Truth about SCR is clear: it's a simple and cost-effective system that will gain truck and fleet owners a payback not only in less maintenance, but increased fuel economy, better reliability and more uptime.

Best of all, SCR is a better solution for the planet. You can be proud to support SCR's environmental improvements. If you have questions or concerns about SCR technology or wish to stay up-to-date on SCR performance data, please visit: www.truthaboutscr.com and www.factsaboutscr.com.

SIMPLE • PROVEN • INCREASED FUEL ECONOMY • RETURN ON INVESTMENT

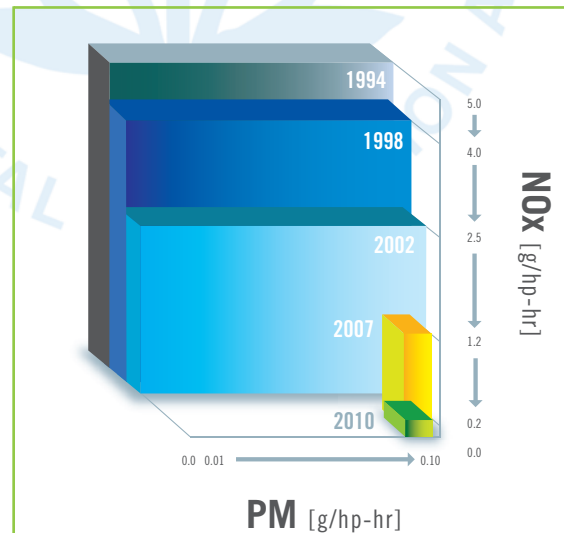
Selective Catalytic Reduction (SCR) is a simple, cost-effective NO_x reduction solution that delivers reduced maintenance, increased fuel economy and requires fewer regenerations. The SCR process represents proven, road-tested technology with significant advantages for the environment and your business.

MEETING THE CHALLENGE OF EPA 2010.

EPA 2010. That's shorthand for the final phase of the Environmental Protection Agency's plan to assure that medium-duty and heavy-duty trucks run cleaner by the year 2010. In fact, EPA 2010 standards require that NO_x levels from new trucks be reduced to almost zero.

Faced with strict and well-defined engine regulations, most of the trucking industry has worked hard to meet these important environmental mandates, while maintaining maximum fuel efficiency and engine performance.

Today there are two technologies the trucking industry is considering to meet EPA 2010 emissions standards: In-Cylinder Exhaust Gas Recirculation (EGR) and SCR. But which is the best technology for the environment and your business? This brochure describes both processes and addresses their pros and cons.



EPA Emissions Standards 1994 to 2010: EPA 2010 standards require engine emissions to meet a NO_x level of 0.2g/bhp-hr.



WHAT IS NO_x?

Oxides of Nitrogen (NO_x) is an exhaust element that contributes to acid rain, smog and greenhouse gas levels. This environmental pollutant is a byproduct of the high-temperature diesel combustion process. The hotter the combustion temperature, the more NO_x is created.

The SCR process uses a catalytic reaction to convert diesel NO_x emissions into benign nitrogen gas and water which are present in the air we breathe. In-Cylinder EGR lowers NO_x production by recycling higher levels of exhaust back through the engine to reduce the combustion temperature.



HOW SCR WORKS

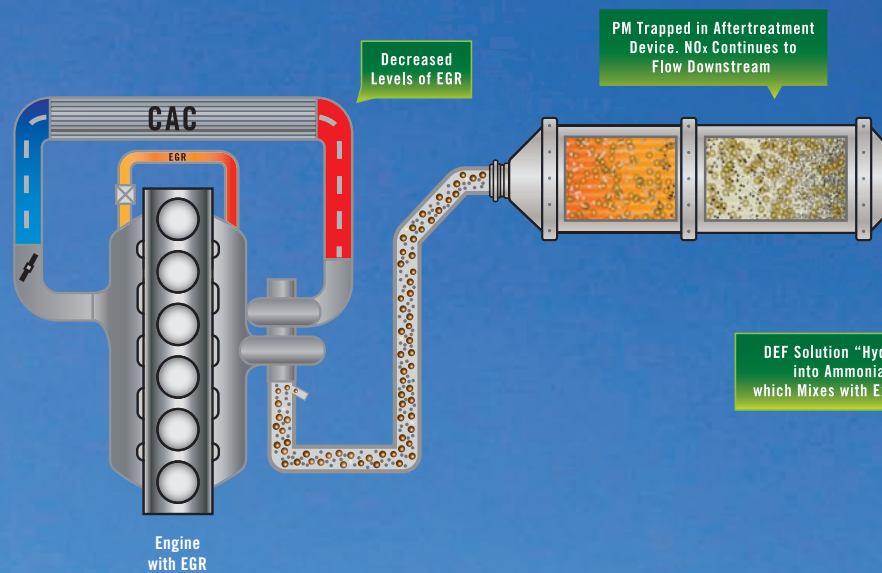


SCR is an exhaust aftertreatment that controls emissions downstream from the engine. SCR takes place after the combustion process, and utilizes diesel exhaust fluid (DEF) to reduce NO_x levels.

With SCR, DEF is injected into the exhaust stream which reacts with the NO_x in the SCR catalyst, forming harmless nitrogen and water.

SCR allows the engine to function at higher and more optimal combustion temperatures, providing increased fuel efficiency and power.

To achieve the extremely low NO_x levels required by EPA 2010, most major engine manufacturers use an SCR process that also employs EGR. This proven method of combining EGR and SCR technologies applies the best of both technologies to efficiently reduce harmful emissions and provide better engine performance.



HOW IN-CYLINDER EGR WORKS

With In-Cylinder EGR, exhaust gas is cooled and recycled back through the engine. This reduces the amount of oxygen available for combustion, which in turn reduces the combustion temperature in the cylinder. A cooler combustion lowers NO_x production. However, the lower-temperature diesel combustion is less efficient, so it creates more particulate matter... and burns more fuel.

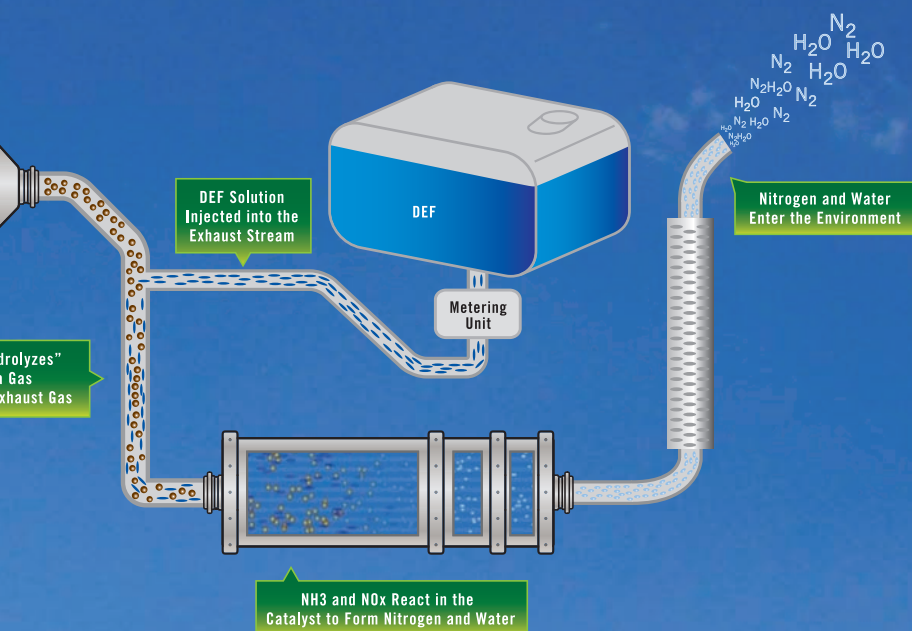


ALMOST 2 TO 1

That's the ratio of truck buyers who will likely consider the purchase of SCR technology to meet the 2010 EPA standards compared to those who will likely consider In-Cylinder EGR.

* SOURCE: Quixote Group Research—EPA 2010: A Baseline of Perceptions

2010 |



PROS AND CONS: A COMPARISON OF SCR AND IN-CYLINDER EGR ATTRIBUTES.

SCR

PROS:

- More optimized combustion
- Better fuel efficiency
- Increased power
- Less wear on the engine
- Reduced maintenance
- Requires fewer regenerations
- Highly reliable
- Yields harmless nitrogen and water

CONS:

- Adds weight
- DEF is an additional cost
- Chassis packaging

In-Cylinder EGR

PROS:

- Does not require DEF or other fluid
- No driver action required
- Chassis packaging

CONS:

- Adds weight
- Cooler, less optimized combustion
- Requires greater cooling capacity
- Decreased engine power
- Decreased fuel efficiency
- Decreased engine life
- Lower combustion efficiency creates more particulate matter

OVER 600,000

That's the number of SCR equipped commercial vehicles in operation in Europe.

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That's the number of Daimler Trucks North America SCR test miles that have been logged throughout the United States so far, and testing will continue resulting in tens of millions of test miles before 2010 engines are available for purchase. It's proven technology.

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