

**DETROIT DIESEL**

DEMAND PERFORMANCE™



**BLUETEC**®

EMISSIONS TECHNOLOGY

# SCR and Diesel Exhaust Fluid: FACT vs. Fiction

# SCR AND DEF: FACT vs. Fiction

Proponents of extreme EGR have spent a small fortune to convince the market that its in-cylinder system is superior to SCR. SCR/DEF Fact vs. Fiction is intended to provide factual information about the differences between SCR and extreme EGR engine technology used to meet 2010 EPA emissions standards. It also provides accurate information about diesel exhaust fluid (DEF) and how it is used with engines utilizing SCR technology.

**THE TRUTH ABOUT SCR**

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

Here you can find all of the latest information about Selective Catalytic Reduction emissions technology (SCR). Choose from the list of questions below to learn about SCR, the best option to bring your diesel engine up to post-EPA 2010 standards.

**COMMON SCR QUESTIONS**

- » What are the total costs of SCR?
- » With EPA 2010 engines, will I have to regenerate my SCR more often than I do now?
- » How will SCR maintenance intervals change?
- » How much weight does an SCR engine add to the truck?
- » What is Diesel Exhaust Fluid?
- » What will we see on an EPA 2010 engine?
- » What are the downtime risks of SCR going to be?
- » Why SCR?

**What is SCR?**

SCR is a simple, cost-effective NOx 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.

**FactsAboutSCR.com**

SCR, 1. Selective Catalytic Reduction: one of the most cost-effective and fuel-efficient vehicle emissions control technologies capable of reducing emissions to near-zero levels.

What is SCR? Performance Environment Public Health Impact Diesel Exhaust Fluid

Welcome to Facts About SCR

Thank you for visiting FactsAboutSCR.com where you can find the latest news and information on Selective Catalytic Reduction (SCR), a diesel emissions control technology that offers diesel fuel economy and operational advantages while optimizing engine efficiency and reducing criteria pollutants recognized by the Environmental Protection Agency (EPA) to near-zero levels.

SCR is one of the only emissions reduction technologies that is as good for business as it is for the environment, and the reach of SCR is broad. SCR technology was adopted by passenger car and light truck manufacturers serving the U.S. starting in 2008. Those manufacturers

**SCR Fuel Economy Offers Additional Advantages**

- Click to view a report by the EPA on fuel economy

**Latest Information from CARB**

- Click to see how these new developments will affect the diesel trucking industry

**Proven: Customers Report on BlueTec SCR**

- Click to watch video on North American customer experience with BlueTec SCR

**Simplicity: Diesel Exhaust Fluid Use**

**DETROIT DIESEL** DEMAND PERFORMANCE

ENGINES DRIVE TRAINS PARTS SUPPORT NETWORK EMISSIONS COMPANY SEARCH

**EPA 2010 SYSTEMS**

- » SCR And Fuel Economy
- » BlueTec SCR Technology
- » DEF Availability
- » SCR Experience
- » BlueTec FAQ

**EPA 2007 SYSTEMS**

Additional SCR Materials

SCR RSS FEEDS

- FactsAboutSCR.com

PDF DOWNLOADS

PROVEN FOR EPA 2010

**BlueTec® SCR is Here**

It's not just SCR, it's Detroit Diesel BlueTec® Emissions Technology. And it makes a difference.

**BLUETEC** EMISSIONS TECHNOLOGY

DEMAND SIMPLICITY DEMAND ECONOMY DEMAND EXPERIENCE

## The numbers don't lie:

- ▶ 90% of all engine manufacturers in North America are using SCR
- ▶ Over 600,000 SCR vehicles are running worldwide
- ▶ Over 70 million test and customer miles on SCR systems in North America
- ▶ Up to 5% better fuel economy being delivered to customers today using SCR

# FICTION:

DEF IS FLAMMABLE, HAZARDOUS, AND UNSAFE TO HANDLE

# FACT:

## MATERIAL SAFETY DATA SHEET (MSDS)

- ▶ **Hazards Identification:**  
"Urea Solution is not flammable"
- ▶ **First Aid Measures:**  
"Wash area thoroughly with soap and water"
- ▶ **Fire Fighting Measures:**  
"Urea solution is not flammable"
- ▶ **Transportation Information:**  
"Urea solution is not listed by any US or Canadian transportation authority as a hazardous material..."

Material Safety Data Sheet

Urea  
Solution, AUS 32

MSDS Number 2047 (May 17, 2007) 6 Pages

**1. CHEMICAL PRODUCT and EMERGENCY TELEPHONE CONTACT**

Product Name:..... TerraCair™ Urea Solution, AUS 32  
 Chemical Family:..... Amide  
 Synonyms:..... Aqueous Urea Solution; Nitrogen Solution for SCR NO<sub>x</sub> Control Systems  
 Formula:..... CH<sub>4</sub>N<sub>2</sub>O + H<sub>2</sub>O  
 Product Use:..... SCR NO<sub>x</sub> Control

**EMERGENCY TELEPHONE NUMBER**  
 CHEMTREC (U.S.):..... 800-424-9300  
 CANUTEC (Canada):..... 613-996-6666

**2. COMPOSITION/INFORMATION ON INGREDIENTS**

Component Name	Typical Percentage by Weight	CAS Number
Urea	31.8 – 33.2%	57-13-6
Free Ammonia	0.2% max	7664-41-7
Biuret	0.3% max	108-19-0
Water	67.7 – 66.3%	7732-18-5

Component	Exposure Limits			
	TWA	STEL	PEL	IDLH
Ammonia	25 ppm	35 ppm	50 ppm	300 ppm
No limits established for urea solution or biuret				

**3. HAZARDS IDENTIFICATION**

**EMERGENCY OVERVIEW**

Colorless liquid. With slight ammonia (pungent) odor. Reacts with sodium hypochlorite or calcium hypochlorite to form the explosive nitrogen trichloride. When heated, urea releases ammonia and when heated to decomposition it emits toxic fumes of nitrogen oxides (NO<sub>x</sub>), ammonia, and cyanuric acid. Use water to control fires involving urea solution if water is compatible with burning material. Urea solution itself is non-flammable.

Page 1 of 6

# FICTION:

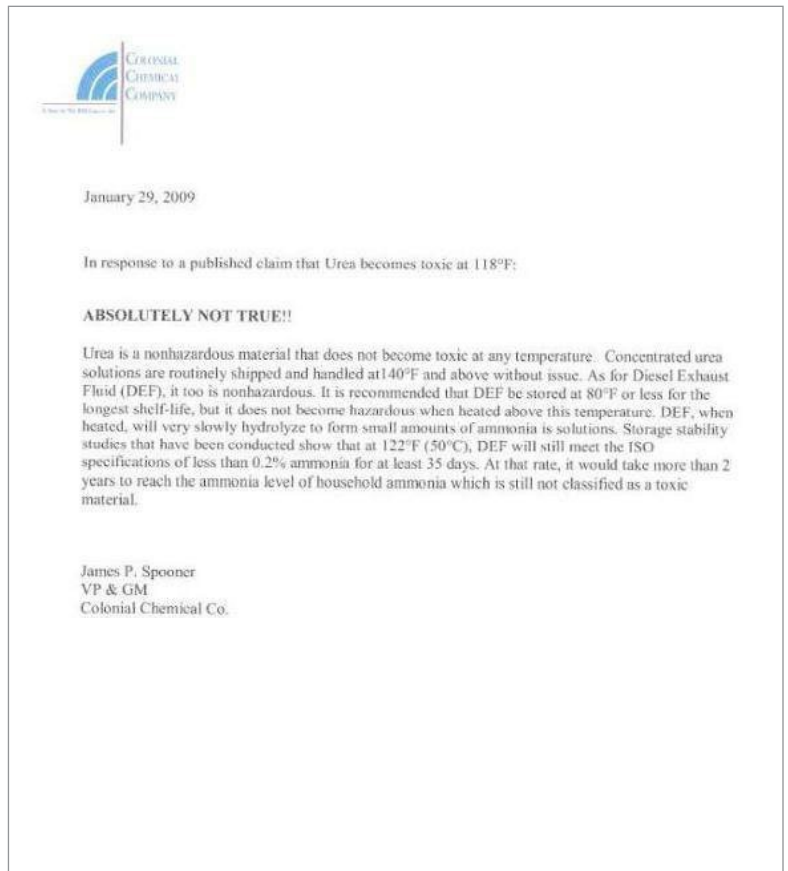
## UREA BECOMES TOXIC AT 118°F

# FACT:

“Urea does not become toxic at any temperature”

“...at 122°F, DEF will still meet ISO specifications of less than 0.2% ammonia for at least 35 days. At that rate it would take more than 2 years to reach the ammonia level of household ammonia which is still not classified as toxic”

*James Spooner  
VP & GM  
Colonial Chemical Company*





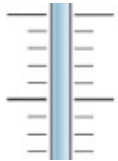
# FICTION:

DEF IS USELESS IN THE COLD BECAUSE IT FREEZES AT 12°F

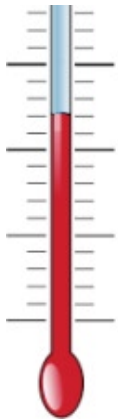
# FACT:

**EPA REQUIRES DEF FLOW WITHIN 70 MINUTES OF ENGINE START UP— DETROIT DIESEL TESTING HAS PROVEN DEF FLOW WITHIN EPA REQUIREMENTS**

Engine coolant is used to thaw DEF in tank. Engine will operate normally until DEF begins to flow



**DEF WILL START TO FREEZE AT 12°F**

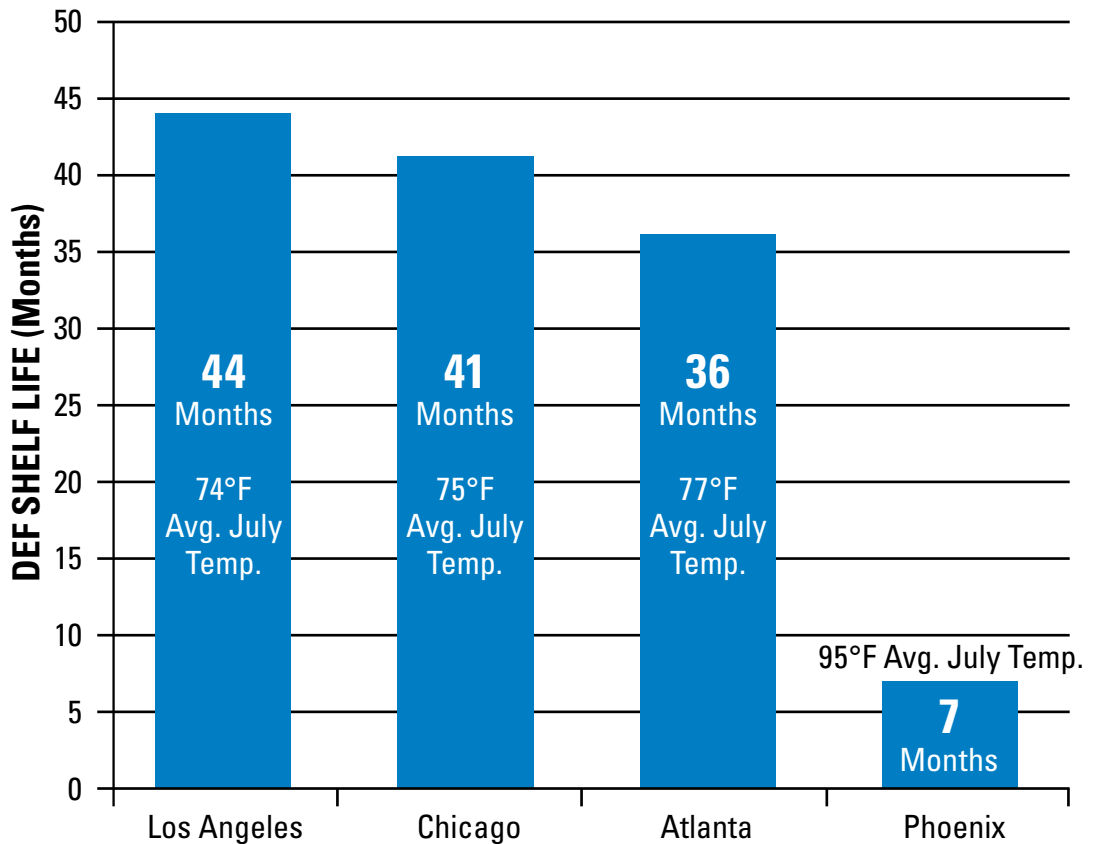


# FICTION:

AT 86°F DEF WILL ONLY LAST 1 MONTH

# FACT:

**DEF SHELF LIFE AT CONSTANT TEMPERATURE**  
(Average temperature during month of July)



Source:  
Terra Industries

# DEF FACT OR FICTION?


# FICTION:

DEF WILL COST BETWEEN \$17 AND \$34 PER GALLON

# FACT:

DEF PRICING IS DEPENDENT ON PACKAGING SIZE


**PURCHASED IN  
2 1/2 GALLON CONTAINER AT TRUCK STOP  
\$4.00 PER GALLON**

HOME FILL	ROAD FILL
	<ul style="list-style-type: none"> <li>• Truck stops</li> <li>• Engine distributors</li> <li>• Truck dealers</li> </ul>



**PURCHASED AT PUMP:  
\$2.79 PER GALLON**

**PURCHASED IN  
BULK FOR HOME TERMINAL  
\$2.61 PER GALLON**



12785 Emerson Drive Brighton, MI 48116  
(248) 486-3800  
Fax (248) 486-3810

**INVOICE**

Invoice Number: 669999  
Invoice Date: 9/9/2008  
Page: 1 OF 1  
Terms: Net 45 Days

SOLD TO: Haas TCM  
P.O. BOX 17750  
Encino CA 91416-7750

SHIP TO: Detroit Diesel Corporation  
Dock #7 Oil Stores  
13400 Outer Drive West  
Detroit MI 48239

Cust No.: 117581 04 Excelda Mfg

Request Date	Shipment #	Customer PO	Order No	Release #	Pull Signal	Carrier/Paid By
9/9/2008	817082	916733	894511			EXCD - Freight Pre-pay and Add
Qty Shipped	Item Number	Description	Net Price	U/M	Extended Price	
2	275AUS32	TerraCair - 275 Gallon Tote	719.6000	Each	1,439.20	

$\$719.60 / 275 = \$2.61 / \text{GALLON}$



# FICTION:

IF I RUN OUT OF DEF MY TRUCK WILL NOT START

# FACT:



The DEF gauge indicates the level of DEF in the tank and has a series of alerts when the tank is running low

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
NATIONAL VEHICLE AND FUEL EMISSIONS LABORATORY  
266 PLUMCRO  
ANN ARBOR, MICH

**SUBJECT: Certification Requirements for Heavy-Duty Diesel Engines Using Selective Catalyst Reduction (SCR) Technologies**

**Driver Inducement**

If indicators and warnings are not successful in notifying the driver of a low DEF tank, a stronger inducement strategy must be implemented. This strategy must include those specifically set forth in the EPA's performance degradation strategy that is sufficiently noticeable, intrusive, and annoying as to be sufficiently onerous to cause the driver to replenish the DEF tank and minimize any adverse emission impact. Each strategy (i) must be preceded by a period of lower-level inducement (which can last until the DEF tank is empty) or (ii) must begin before the DEF level is less than 2.5% tank capacity (collectively, "DEF Trigger") or (iii) for vehicles with 1.1 DEF tank size, must begin when the DEF tank is empty with deceleration, applied between peak torque engine speed and governor break point (see Figure 1), capped in at 1% per minute up to at least a 40% deceleration. To communicate to the driver why the shifting performance degradation has occurred, the DEF indicator will flash or a similar message will appear in the instrument cluster (hereinafter, collectively, "inducement notification.")

1. **Disable after Fueling.** Once the DEF Trigger is achieved, after the primary or secondary fuel tank level rises a measurable amount, the vehicle will be limited to 5 mph with inducement notification.
2. **Disable after Parking.** Once the DEF Trigger is achieved, after the vehicle has been stationary for more than one hour, the vehicle will be limited to 5 mph with inducement notification. If the vehicle is not stationary for more than one hour after 24 hours of operation, the vehicle will be disabled after the vehicle has been stationary for a limited period of time (to be defined, e.g., 10 - 20 minutes).
3. **Disable after Restart.** Once the DEF Trigger is achieved, after the engine has been shut down, the vehicle will be limited to 5 mph with inducement notification.

**WHEN THE DEF TANK IS EMPTY**  
"...the vehicle will be limited to 5 mph with inducement notification"



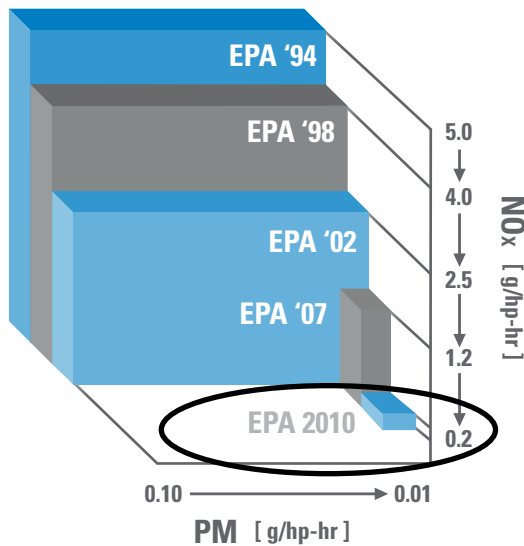
# FICTION:

EPA 2010 AND EURO 5 2008 ARE THE EQUIVALENT EMISSIONS LEVELS

# FACT:

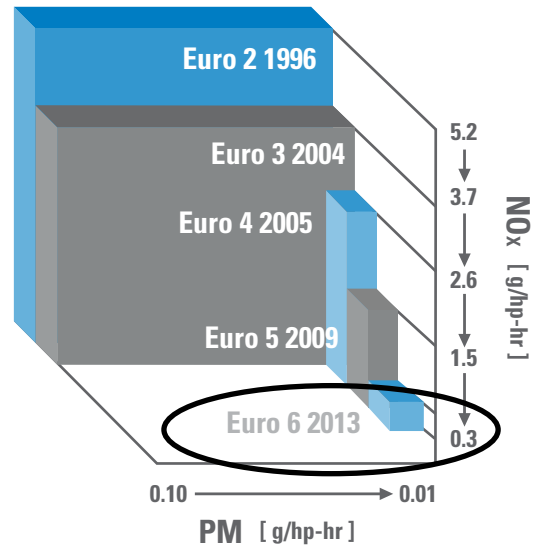
EVEN IN 2013 EUROPE WILL NOT BE REQUIRED TO MEET THE SAME LEVEL OF NO<sub>x</sub> EMISSIONS AS NORTH AMERICA IN 2010

NORTH AMERICA



NO<sub>x</sub>: 0.2 g/hp-hr  
PM: 0.01 g/hp-hr

EUROPE



NO<sub>x</sub>: 0.3 g/hp-hr  
PM: 0.01 g/hp-hr

# FICTION:

## EVEN EUROPE IS MOVING AWAY FROM SCR TECHNOLOGY

# FACT:

“Euro 6 (2013) limits are almost certainly going to require EGR and SCR to share the burden of NO<sub>x</sub> control...”

- Roadtransport.com

“It is generally accepted that a Euro 6 (2013) engine will combine both SCR and EGR technology.”

- Automotive World



MAN BROCHURE BEFORE

Engine model	D2066	D2676	D2868
Design	R6	R6	V8
Capacity	10,5 l	12,4 l	16,2 l

Euro 4 or Euro 5	Euro 5		
	Euro 4 EGR	Euro 5 EGR	Euro 5 SCR
<b>D2066</b>			
265 kW (360 hp), 1 800 Nm	x	x	x
294 kW (400 hp), 1 900 Nm	x	x	x
324 kW (440 hp), 2 100 Nm	x		x
<b>D2676</b>			
324 kW (440 hp), 2 100 Nm		x	
353 kW (480 hp), 2 300 Nm	x		x
397 kW (540 hp), 2 500 Nm			x
<b>D2868</b>			
500 kW (680 hp), 2 700 Nm*			x
500 kW (680 hp), 3 000 Nm**			x

MAN BROCHURE AFTER

Engine model	D2066	D2676	D2868
Design	R6	R6	V8
Capacity	10,5 l	12,4 l	16,2 l

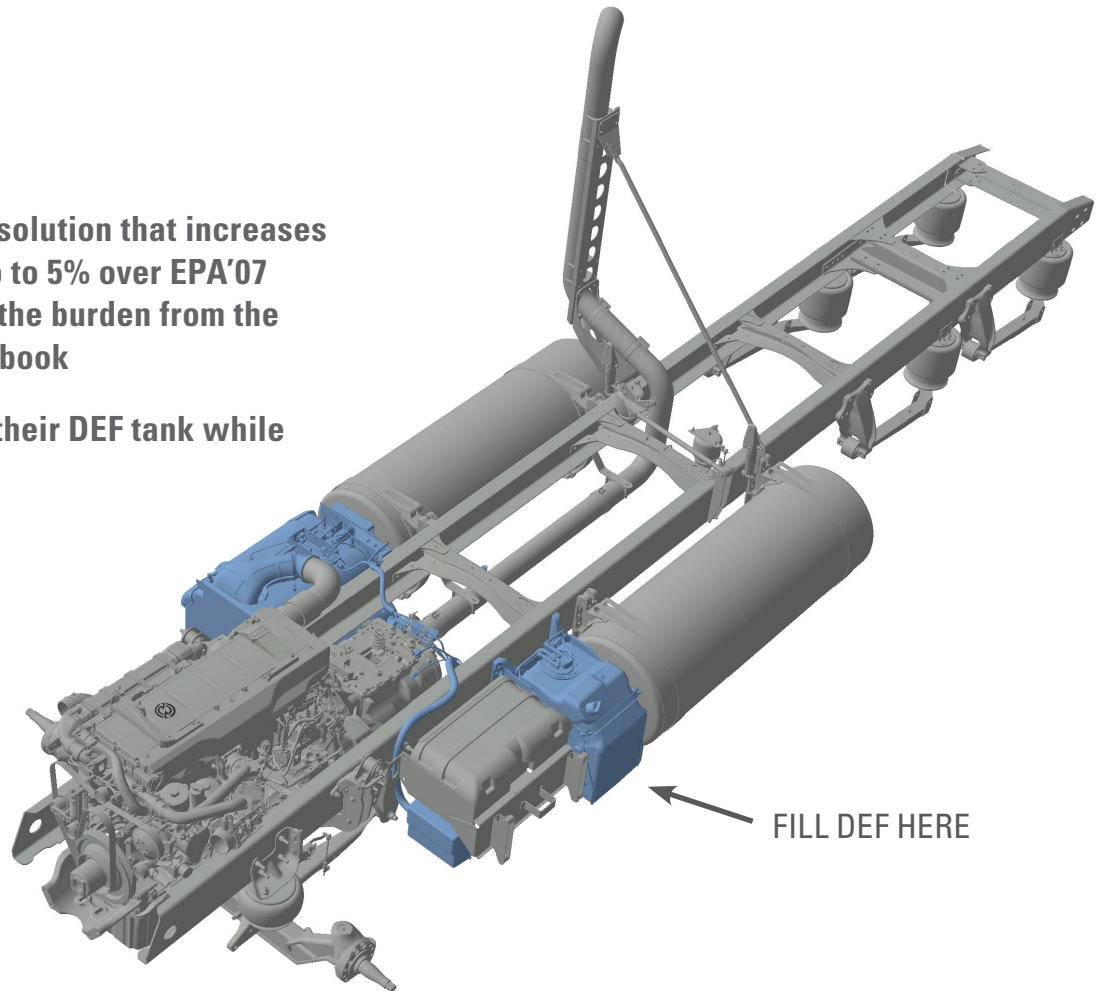
Euro 5 or EEV	Euro 5	
	SCR	EEV SCR
<b>D2066</b>		
265 kW (360 hp), 1 800 Nm	x	x
294 kW (400 hp), 1 900 Nm	x	x
324 kW (440 hp), 2 100 Nm	x	x
<b>D2676</b>		
353 kW (480 hp), 2 300 Nm	x	x
397 kW (540 hp), 2 500 Nm	x	
<b>D2868</b>		
500 kW (680 hp), 2 700 Nm*	x	x
500 kW (680 hp), 3 000 Nm**	x	

# FICTION:

SCR PLACES BURDEN OF COMPLIANCE ON CUSTOMER

# FACT:

- ▶ SCR is a long term solution that increases fuel economy by up to 5% over EPA'07 engines, removing the burden from the customers' pocket book
- ▶ Customers can fill their DEF tank while they pump diesel



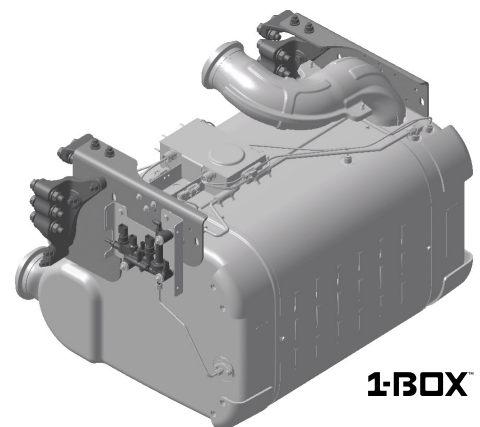
# FICTION:

PACKAGING OF SCR SYSTEM WILL BE COMPLICATED

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# FACT:

BLUETEC **1-BOX**™ EMISSIONS PACKAGE INSTALLATION



# FICTION:

## SCR IS NOT A LONG TERM SOLUTION

# FACT:

## SCR REDUCES FUEL CONSUMPTION WHICH IS DIRECTLY TIED TO CO<sub>2</sub> EMISSIONS

### EPA Set to Classify Greenhouse Gas a Danger, Possibly Setting Stage for New Regulations

By Michele Fuetsch  
Staff Reporter

The Environmental Protection Agency is poised to declare that greenhouse gas emissions endanger the public's health and welfare — a move that could accelerate government rulemaking related to air quality.

Legally, after EPA makes an "endangerment finding, they're under obligation to protect health and welfare," said Glen Kedzie, environmental affairs counsel for American Trucking Associations.

Frank O'Donnell, president of Clean Air Watch, said an endangerment finding opens "the way for the EPA to begin thinking about the two biggest sources of emissions: coal burning and transportation."

According to a statement from the federal agency, a document

sent March 20 to the White House Office of Management and Budget for review was a "proposed" endangerment finding.

If, however, OMB approves the proposal and EPA Administrator Lisa Jackson signs it, the finding could set in motion a scenario under which the agency, not Congress, sets greenhouse gas emission standards for everything from cars and trucks to oil refineries and coal-powered utilities.

News of the EPA finding puts pressure on Congress to address legislatively greenhouse gas emissions linked to climate change, said Kedzie and others.

"It's an important step, and it's going to intensify the pressure on Congress to act sooner or later," Kedzie said of the finding.

Environmentalists and leaders in various industries, including trucking, prefer that Congress rather than

EPA develop any emission standards.

"I think there would be fewer lawsuits if it was done by Congress, and I think [it] would mean we'd have progress quicker," O'Donnell said.

For trucking, the most important issue in emission standards is consistency, ATAS Kedzie said.

"We can't end up with a patchwork of different greenhouse gas requirements established across the country, whether that's state requirements or regional requirements," he said.

EPA's move to issue a finding represents a significant reversal of the Bush administration's policy on climate change.

The Supreme Court in 2007 said the agency had the authority to tackle greenhouse gas emissions and ordered it to determine whether carbon dioxide and other

(See EPA, p. 31)

Transport Topics

