

# Selective Catalytic Reduction System



*The new clean diesel system involves three pieces: cleaner diesel fuel, lower-emitting diesel engines and advanced emissions control devices. Selective Catalytic Reduction (SCR) is one of the latest technologies designed to further reduce emissions of nitrogen oxides and to meet stringent new air quality regulations.*

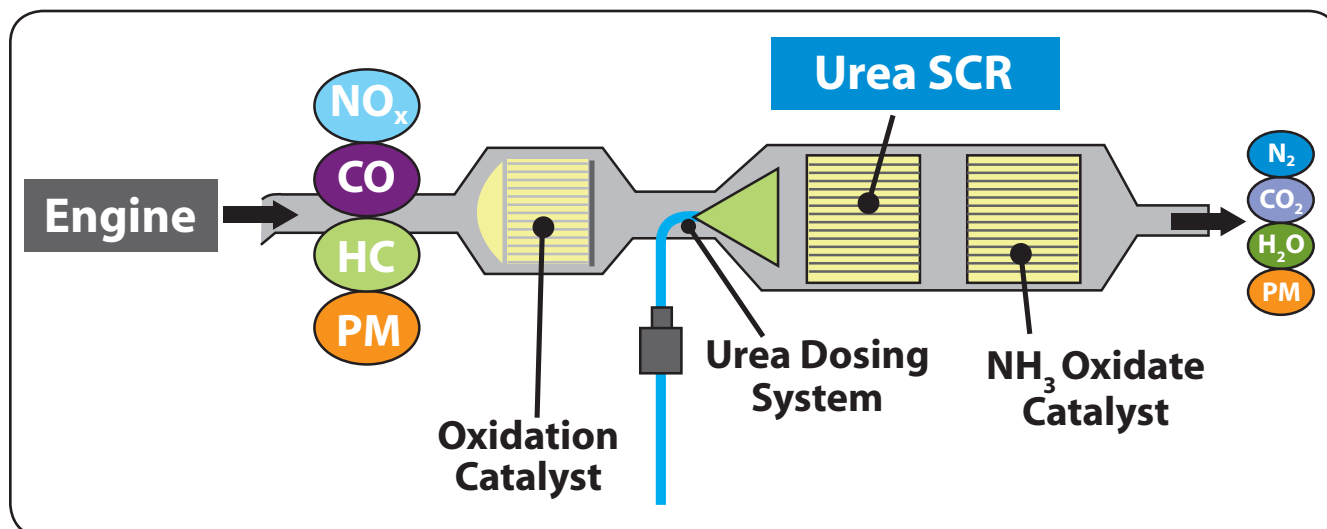
## What is SCR?

Selective Catalytic Reduction is a technology that injects urea – a liquid-reductant agent – through a catalyst into the exhaust stream of a diesel engine. The urea sets off a chemical reaction that converts nitrogen oxides into nitrogen and water, which is then expelled through the vehicle tailpipe. While urea is the primary operating fluid presently used in SCR systems, alternatives to the urea agent are currently being explored. One option involves the use of diesel fuel to transform  $\text{NO}_x$  into harmless gases.

## Why is SCR important?

SCR technology is one of the most cost-effective and fuel-efficient technologies available to help reduce emissions. SCR can reduce  $\text{NO}_x$  emissions up to 90 percent while simultaneously reducing HC and CO emissions by 50-90 percent, and PM emissions by 30-50 percent. SCR systems can also be combined with a diesel particulate filter to achieve even greater emission reductions for PM. SCR technology may play a key role in achieving emissions reductions that allow light-duty diesel vehicles to meet the new, lower EPA emissions regulations to be phased in through 2009 and potentially expand the diesel vehicle sales market to all 50 states.

## SCR SYSTEM



MeetCleanDiesel

## Where is SCR used?

SCR has been used to reduce stationary source emissions since the 1980s. In addition, more than 100 marine vessels worldwide have been equipped with SCR technology, including cargo vessels, ferries and tugboats.

While SCR has been installed on both highway and nonroad engines in diesel retrofit demonstration projects throughout the U.S., SCR systems have become the technology of choice for many of Europe's heavy-duty diesel truck and bus manufacturers where the urea agent is commonly known as AdBlue. SCR technology may become more prevalent in the United States as both light- and heavy-duty engine manufacturers work to meet future emissions reduction standards starting in 2009. In fact, several light-duty diesel manufacturers have already indicated that they are considering the use of SCR in future products.

## What are the technology challenges of using SCR?

A major challenge of the SCR system is the replenishment of the urea solution. The urea solution is carried in an onboard tank which must be periodically replenished based on vehicle operation. For light-duty vehicles, urea refill intervals will occur around the time of a recommended oil change, while urea replenishment for heavy-duty vehicles will vary depending on the vehicle specifics and application requirements.

While vehicles could continue to function normally even without the urea solution, the emissions system will not meet NO<sub>x</sub> reduction requirements. Manufacturers are currently working with the EPA to address these technology and emissions performance challenges. One concept is to establish a nationwide urea distribution infrastructure for consumers, while another option links the replenishment of urea with pre-existing scheduled maintenance intervals (i.e. oil changes).

Other issues include the availability of space on vehicles to provide user-friendly access to the urea tank and other SCR components. In addition, proper storage of urea is required to prevent the liquid from freezing at temperatures below 12 degrees Fahrenheit.

<sup>1</sup> National Clean Diesel Campaign – 2005 Progress Report (<http://www.epa.gov/cleandiesel/publications.htm>)