

SELECTIVE CATALYTIC REDUCTION

Selective Catalytic Reduction (SCR) is an advanced active emissions control technology system used in diesel engines that injects a liquid-reductant agent through a special catalyst into the exhaust stream of a diesel engine.

The reductant source is usually automotive-grade urea, otherwise known as Diesel Exhaust Fluid (DEF). The DEF sets off a chemical reaction that converts nitrogen oxides into nitrogen, water and tiny amounts of carbon dioxide (CO₂), natural components of the air we breathe, which is then expelled through the vehicle tailpipe.

SCR technology is designed to permit nitrogen oxide (NO_x) reduction reactions to take place in an oxidizing atmosphere. It is called "selective" because it reduces levels of NO_x using ammonia as a reductant within a catalyst system. The chemical reaction is known as "reduction" where the DEF is the reducing agent that reacts with NO_x to convert the pollutants into nitrogen, water and tiny amounts of CO₂. The DEF can be rapidly broken down to produce the oxidizing ammonia in the exhaust stream. SCR technology alone can achieve NO_x reductions up to 90 percent.

Why is SCR important?

SCR technology is one of the most cost-effective and fuel-efficient technologies available to help reduce diesel engine emissions. All heavy-duty diesel truck engines produced after January 1, 2010 must meet the new EPA standards, among the most stringent in the world, reducing particulate matter (PM) and nitrogen oxides (NO_x) to near zero levels. SCR can reduce 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. In the commercial trucking industry, some SCR-equipped truck operators are reporting fuel economy gains of three to five percent.

Where is SCR used?

SCR has been used for decades to reduce stationary source emissions. In addition, marine vessels worldwide have been equipped with SCR technology, including cargo vessels, ferries and tugboats. With its superior return in both economic and environmental benefits, SCR is also being recognized as the emissions control technology particularly helpful in meeting the US EPA 2010 diesel engine emission standards.

What are the special considerations of using SCR?

One unique aspect of a vehicle or machine with an SCR system is the need for replenishing DEF on a periodic basis. DEF is carried in an onboard tank which must be periodically replenished by the operator based on vehicle operation. For light-duty vehicles, DEF refill intervals typically occur around the time of a recommended oil change, while DEF replenishment for heavy-duty vehicles and off-road machines and equipment will vary depending on the operating conditions, hours used, miles traveled, load factors and other considerations.

DEF is an integral part of the emissions control system and must be present in the tank at all times to assure continued operation of the vehicle or equipment. Low DEF supply triggers a series of escalating visual and audible indicators to the driver or operator. Once the tank reaches a certain level near empty, the starting



system may be locked out the next time the vehicle is used, preventing the vehicle from being started without adequate DEF. A nationwide DEF distribution infrastructure has rapidly expanded to meet the needs of a growing SCR technology marketplace.

On-board tanks to store DEF are typically located in the spare tire area of passenger vehicles, while tractor trailers typically have a DEF tank alongside the diesel fuel saddle tank. Proper storage of DEF is required to prevent the liquid from freezing at temperatures below 12 degrees Fahrenheit, and most vehicle DEF dispensing systems have warming devices.

SCR SYSTEM

