

SELECTIVE CATALYTIC REDUCTION SYSTEMS FOR HEAVY-DUTY TRUCKS: PROGRESS TOWARDS MEETING EURO 4 EMISSION STANDARDS IN 2005

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ABSTRACT

Emissions of diesel engines contain some components that support the generation of smog and are classified as hazardous. Exhaust gas aftertreatment is a powerful tool to reduce NO_x and particulate emissions.

NO_x emissions can be reduced by selective catalytic reduction (SCR) technology. A reduction agent has to be injected into the exhaust upstream of a catalyst. On the catalyst, the NO_x is reduced to N_2 and H_2O . This catalytic process was developed in Japan about 30 years ago to reduce the NO_x emission of coal-fired powerplants. The first reduction agent used was NH_3 .

SCR technology was used with diesel engines starting in the mid-1980's. The first applications were stationary operating generator sets. In 1991 a joint development between DaimlerChrysler, MAN, IVECO, and Siemens was started to use SCR technology for the reduction of NO_x in heavy-duty trucks. Several fleet tests demonstrated the durability of the systems. Today, SCR technology is the most promising technology to fulfil the new European Regulations EURO 4 and EURO 5 being effective in October 2005 and October 2008. The efficient NO_x reduction of the catalyst allows an engine calibration for low fuel consumption. Daim-

lerChrysler decided to use the SCR technology on every heavy-duty truck and bus in Europe, and many other truck manufacturers will introduce SCR technology to fulfil the 2005 emission regulation.

The truck manufacturers in Europe agreed to use aqueous solution of urea as the reducing agent. The product is called "AdBlue," which is a non-toxic, non-smelling liquid. The consumption is about 5 percent of the diesel fuel consumption to reduce the NO_x emissions. A small AdBlue tank has to be installed on the vehicle. With an electronically controlled dosing system, the AdBlue is injected into the exhaust. The dosing system is simple and durable. It has proven its durability during winter and summer testing as well as in fleet tests.

The infrastructure for AdBlue is under evaluation in Europe by urea producers and mineral oil companies to be readily available in time. Urea is one of the most common chemical products in the world, and its production and the distribution are very much known. However, a pure grade is needed for automotive application and requires special attention.