



# Clean Air Facts

## Cleaner Fuels for Cleaner Motor Vehicles

### Overview

Motor vehicle exhaust emissions are influenced not only by the emission control system, but by engine design and fuel quality as well. Since 1975, catalyst technology and engine designs have advanced dramatically, contributing to significant reductions in exhaust emissions. Changes in fuel quality, most notably eliminating lead in gasoline, have also helped reduce emissions. The sulfur levels in both gasoline and diesel fuels are decreasing. Sulfur in fuel inhibits the emission control performance of various emission control technologies (see Figure 1).

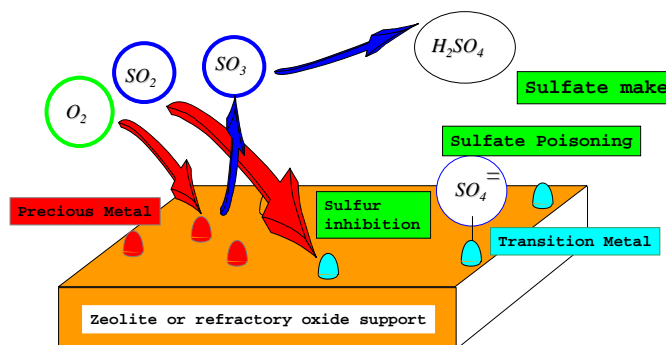


Figure 1. Diagram of the adverse impact of fuel sulfur on emission control technology

### Sulfur in Gasoline Fuel

- In 2005, the current refinery sulfur average level in gasoline in U.S. was set at 30 parts per million (ppm), with a corporate average of 90 ppm and a cap of 300 ppm. In 2006, the per gallon sulfur cap is reduced to 80 ppm.
- Sulfur is a catalyst inhibitor which competes with exhaust pollutants for space on the active catalyst surface.
- Upon combustion, fuel sulfur is oxidized to sulfur oxides, primarily sulfur dioxide ( $SO_2$ ) with small amounts of sulfur trioxide ( $SO_3$ ).  $SO_2$  and  $SO_3$  are known to inhibit the catalytic function of catalytic converters.

### U.S. EPA's Tier 2/Gasoline Sulfur Rulemaking

- In the December 1999 rulemaking, the U.S. Environmental Protection Agency (EPA) concluded that new emission standards could be achieved cost-effectively with available technology, and that current levels of sulfur in gasoline must be reduced because sulfur impedes the performance of catalytic converters.

- The rule requires the nation's gasoline suppliers to meet a 30 ppm average sulfur level with a maximum cap of 80 ppm in 2006.
- EPA estimates the cost at just under two cents a gallon, or about \$12 dollars per year per car.
- Coupled with uniform exhaust emissions standards for passenger cars, pick-up trucks, mini-vans, and SUVs that began in 2004 and will be fully phased-in in 2009, EPA estimates that the emissions reductions from the program would be the equivalent of taking 164 million cars off the road by 2030.
- EPA calculates that the final rule will prevent as many as 4,300 deaths, more than 10,000 cases of chronic and acute bronchitis, and tens of thousands of respiratory problems a year.

## Sulfur in Diesel Fuel

- In the U.S., sulfur levels in diesel fuel for on-road vehicles are as high as 500 ppm and levels for off-road vehicles and equipment are as high as 5000 ppm.
- Current sulfur levels in diesel fuel are a barrier to the commercial introduction of advanced NOx emission control technologies, such as lean NOx catalysts and NOx adsorbers, as well as catalyst-based filter technologies.
- Also, current sulfur levels in on-road diesel fuel inhibits the particulate matter (PM) control efficiencies of oxidation catalysts and catalytic particulate filter technologies, thus preventing the further optimization of these technologies for maximum effectiveness for PM and hydrocarbon (HC) control.
- The catalytic reaction required to reduce the NOx and PM emissions is adversely impacted by exposure to sulfur which attaches to the chemical sites and impairs its performance and longevity.

### *U.S. EPA's 2007 MY Heavy-Duty Engine Standards/Low Sulfur Diesel Rule*

- Finalized in December 2000, the rule caps sulfur levels in on-road diesel fuel at 15 ppm beginning in 2006.
- In addition, the rule requires on-road heavy-duty engines to meet a 0.2 g/bhp-hr NOx standard to be phased in beginning in 2007 and a 0.01 g/bhp-hr PM standard starting in 2007. The standards will require a 90 percent reduction of PM emissions and a 95 percent reduction in NOx emissions compared to the current standards.

### *U.S. EPA's 2004 Clean Air Nonroad Diesel Rule*

- Finalized in May 2004, the rule sets a 500 ppm sulfur limit on diesel fuel produced for nonroad engines, locomotives, and marine applications starting in 2007.
- The rule also sets a subsequent limit of 15 ppm sulfur limit for nonroad fuel by 2010 and by 2012 for locomotive and marine applications.

For more information:

**Manufacturers of Emission Controls Association**

1730 M Street, NW \* Suite 206 \* Washington, DC 20036 \* tel: (202) 296-4797 \* fax: (202) 331-1388  
e-mail: [info@meca.org](mailto:info@meca.org) \* web site: [www.meca.org](http://www.meca.org)