

Diesel Emission Standards For Today & Tomorrow



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2004 Heavy-Duty On Highway Emission Standards:

- To be certified and compliant for 2004, the engine's today must meet EPA standards of:
- 2.5-g/hp-hr NO_x+NMHC
- 0.10-g/hp-hr PM





2007-2010 Heavy-Duty On Highway Emission Standards:

- Looking ahead to 2007-2010, emissions requirements change dramatically for heavy-duty trucks over this period.
- Both NO_x and PM (particulate matter) are reduced by 90% from 2004 levels. Specifically, NO_x must be reduced to 0.2-g/hp-hr by 2010, while the particulate standard is reduced to:
 - 0.01-g/hp-hr PM beginning in 2007





2007-2010 Heavy-Duty On Highway Emission Standards:

- The EPA has allowed for NO_x phase-in from 2007 through 2009. During this time, 50% of the engines produced must meet the 0.2-g/hp-hr NO_x standard, while 50% may continue to meet the 2.5-g/hp-hr NO_x+NMHC standard.
- Most engine manufacturers will likely use the NO_x phase-in provisions along with averaging to certify engines to a NO_x value roughly halfway between 2.5-g/hp-hr NO_x+NMHC and the 0.2-g/hp-hr NO_x levels through 2009. This calculates to approximately 1.2 g/hp-hr NO_x.
- The PM level is not phased in, and thus all engine production is required to be at 0.01-g PM beginning January 2007.

2007-2010 Heavy-Duty On Highway Emission Standards:



- In addition to the lower NOx and PM levels, crankcase gases will also be included in the emissions measurements.
- This requirement will likely drive closed crankcase systems for 2007 or ultra-low emissions from open systems.



2007-2010 Heavy-Duty On Highway Emission Standards:

- Open systems allow crankcase gases to be vented into the atmosphere through a breather tube.
- Closed systems reroute crankcase ventilation gases from the breather tube back into the engine intake airflow to be used for combustion.
- We expect soon to see EPA regulations which will require advanced onboard diagnostics, with additional sensors to monitor the effectiveness of emissions systems on the engine.



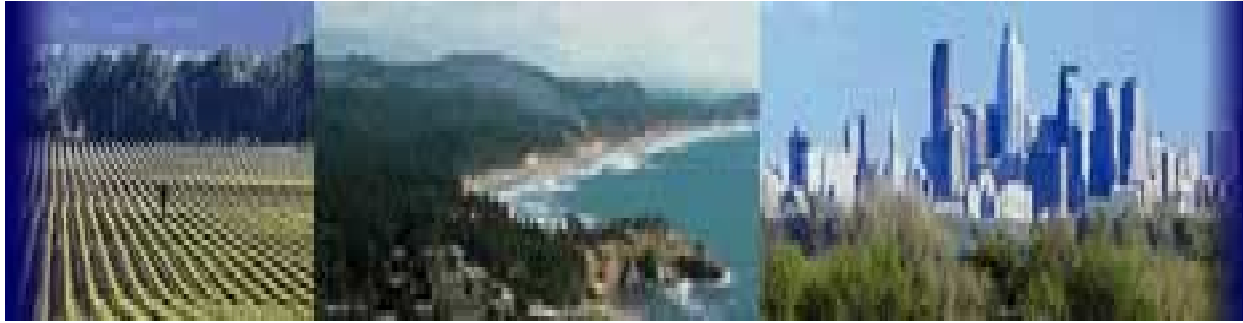
Ultra-Low Sulfur Fuel

- In addition to new exhaust emissions standards and in support of them, the EPA is also lowering the limit for diesel fuel sulfur from 500 parts per million (ppm) to 15 ppm.
- The new fuel standard will be phased in beginning September 1, 2006 (80% participation) through September 1, 2010 (100% participation).
- On a volume basis, over 95% of highway diesel fuel produced in 2006 is projected to meet the 15-ppm sulfur standard.
- On a facility basis, over 90% of refineries and importers have stated that they plan to produce some 15-ppm diesel fuel.

2007 Lubricating Oil



- New specifications are being developed for lubrication oil compatible with low-emissions solutions for 2007-2010.
- The primary focus will be to make the oils compatible with aftertreatment devices.
- For 2007, the immediate requirement is to reduce ash in order to enable extended maintenance intervals on the diesel particulate filter while maintaining the important lubricity capability of the lubricant.



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Thank you for the opportunity.
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