

Workgroup Recommendations and Other Potential Control Measures
Diesel Initiatives Workgroup

DI010 – Chip Reflash

Description¹

In the mid-1990s, the United States Department of Justice (USDOJ), the United States Environmental Protection Agency (USEPA) and the California Air Resources Board (CARB) determined that seven major engine manufacturers (Caterpillar, Cummins, Detroit Diesel, Mack, Navistar, Renault, and Volvo) had designed their 1993 through 1998 model year heavy duty diesel engines in a way that produced excessive NOx emissions. Specifically, the electronic controls in the engine ensured that the NOx emissions were compliant with USEPA standards during laboratory testing, however the electronic calibration would then shift during real world conditions to alter the fuel delivery characteristics in order to improve fuel economy. This change in the fuel injection timing resulted in NOx emissions that exceeded the USEPA certification levels. Approximately 1.3 million vehicles are affected nationwide which translates to an additional 41 tons per day of NOx in the Northeast Region alone. In New Jersey, we estimate that 35,000 heavy duty diesel vehicles are affected (this is about half of the universe of registered heavy duty diesel vehicles in New Jersey).

USEPA, USDOJ and CARB subsequently signed consent decrees in which these seven companies agreed to provide software to their dealers, and others who request it, that modifies the injection timing adjustment that caused the excess NOx emissions (a process called “reflash”). The kits must be installed at the time the vehicle is brought in for a major engine rebuild. The reflash process is a straightforward software fix achieved by plugging in an electronic device and downloading revised software to the electronic control unit of the engine.

Compliance with this requirement has been significantly lower than originally projected (less than 10% over 4 years) because rebuilds are occurring later in a vehicle’s life than was originally anticipated, plus there is no federal oversight/enforcement of the consent decrees. In addition, engine manufacturers are not required to ensure compliance; they only have to provide reflash kits upon request.

In response, CARB moved forward with a mandatory program that required vehicle owners to have their engines reflashed between April 2005 and December 2006 (depending on the Model Year of the vehicle) as opposed to waiting until the time of rebuild. CARB’s rule has been the subject of a legal challenge by the engine manufacturers, primarily based on the allegation that engine manufacturers do not have any emission control obligations once the engines have been introduced into the stream of commerce. They also allege that the consent decrees were “contracts” and CARB’s mandatory program constitutes a breach of contract.

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It is recommended that a rule be adopted that requires certain heavy duty diesel vehicle owners to upgrade the software in their engine's electronic control module (i.e., chip reflash) to reduce excess NOx emissions.

Implementation

NESCAUM has developed a model rule for use by its member states to implement a program similar to California's. The model rule and consent decrees require that engine manufacturers must provide the reflash kits at no cost upon request, not just at rebuild, and this must be done within 6 months of the effective date of the rule. The compliance and enforcement component of the rule states that no trucks are allowed on roadways unless they have been reflashed and trucks must have a label affixed as proof of reflash.

Unless the states more aggressively pursue compliance via a mandatory program, such as the one outlined by NESCAUM's model rule, it is unlikely that the reflash rate will exceed 10% of the affected vehicles.

Cost

Manufacturers must provide the rebuild kits (approximately \$30) free to any dealer or truck operator who requests it. This is already required by the federal consent decree, so it is not a new cost. The installation is estimated at 18 minutes. There are recordkeeping requirements for the truck owner, as well as the dealer performing the reflash. It is estimated that fuel consumption will increase by approximately 2-6% as a result of reflash, which equates to an average of \$500 per year in increased fuel costs. In addition, state resources should be dedicated to enforcing the rule in order to provide a sufficient deterrent and improve compliance.

Effectiveness

A chip reflash program will reduce NOx emissions by an average of 23% per engine. Of the 41 tons per day emitted by these illegal engines in the northeast, engines in NJ could reduce 10 tons per day through a mandatory chip reflash program that was implemented with sufficient oversight and enforcement. However, the sooner the program is implemented, the more the emission benefits would be since there would be greater remaining useful life on the 1993 to 1998 model year trucks. Implementation by 2009 provides about 15 years of benefits, assuming a 30 year useful life.

Sources

Low NOx Software Upgrade for Heavy Duty Trucks, Staff Report by NESCAUM Mobile Source Committee, February 20, 2006.