

# **INVESTIGATION OF THE EFFECTS OF FUELS AND AFTERTREATMENT DEVICES ON THE EMISSION PROFILES OF TRUCKS AND BUSES**

**Dave Smith**  
British Petroleum

A multi-year technology validation program completed in the spring of 2001 evaluated the use of ultra-low sulfur diesel fuels and passive diesel particulate filters (DPF's) in several different diesel fleets operating in Southern California. The fuels used throughout the validation program were ultra-low sulfur diesels, dubbed ECD and ECD-1. These CARB-compliant fuels are produced by ARCO, a BP company, with less than 15-ppm sulfur content. The trucks and buses participating in the study were retrofitted with two types of catalyzed DPF's and operated for over 1 year.

As part of this program, a special study was undertaken to chemically characterize exhaust emissions from a subset of vehicles operated on a multitude of fuels. This select group of vehicles was tested with and without DPF's to obtain detailed emission profiles for a wide range of compounds. The test vehicles included a school bus, two grocery truck tractors, and three transit buses. The fuels used included a representative CARB diesel, ECD, ECD-1, Fischer-Tropsch (F-T) diesel, and motor vehicle-grade compressed natural gas (CNG).

Results from the program provided vehicle emission profiles for nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), total particulate matter (TPM), PM<sub>10</sub>, PM<sub>2.5</sub>, particulate-bound elements, inorganic ions, and elemental /organic carbon. Also provided are data for gas phase volatile organic compounds (VOC's), poly aromatic hydrocarbons (PAH), nitro-PAH's, and carbonyl compounds. All emission results are presented relative to the average CARB diesel fuel to highlight emission reduction potentials. In addition to results for the various compound classes, specific detailed chemical data will be presented for highly reactive or toxic compounds. These include compounds such as ethene, benzene, toluene, xylene, formaldehyde, and acetaldehyde.

The results will illustrate the impact of the fuel and hardware combinations on exhaust emissions and will compare emission profiles for controlled diesel vehicles vs. those fueled by CNG.