596f Development of a New Composite School Bus Test Cycle and the Effect of Fuel Type on Mobile Emissions from Three School Buses

Daniel Sujo, J. Hearne, A. Toback, J. Akers, R. P. Hesketh, and A. J. Marchese

The New Jersey Department of Transportation (NJDOT) sponsored a research study at Rowan University to develop strategies for reducing diesel emissions from mobile sources such as school buses and class 8 trucks. This paper presents the results of mobile school bus testing that has been performed to quantify the emission reduction capabilities of various alternative fuels, such as B20/#2 diesel, ultra low sulfur diesel (ULSD), and B20/ULSD, when applied to school buses that are representative of those currently in use in the state of NJ. Three school buses equipped with an International T444E, an International DT466E, and a Cummins 5.9L ISB engine were instrumented and tested at the Aberdeen Test Center at the Aberdeen Proving Grounds in Maryland. Exhaust gas emission measurements were made using a Semtech-D mobile emissions analyzer to measure CO, CO2, NO2, NO, O2, and unburned hydrocarbons, along with a Sensors PM-300 to measure particulate matter (PM). In addition to the exhaust emissions measurements, operating parameters such as instantaneous vehicle speed, engine speed, percent load and fuel flow rate were acquired from the engine electronic control module (ECM) during testing. To ensure repeatability of testing under conditions that accurately reproduce actual school bus operating conditions, a new composite mobile school bus cycle was developed. The cycle was developed by acquiring Global Positioning System (GPS) data from actual school bus routes from 5 different municipalities within the state of New Jersey. For all three buses, HC emissions were significantly reduced for each of the three alternative fuels tested. Emission reductions of NOx, PM and CO varied for each bus tested. For example, both the ULSD and the B20/#2 diesel blend reduced CO and PM emissions by over 30% for the T444E and Cummins engines. The ULSD/B20 blend reduced CO and PM emissions by 20% to 50% for the T444E and DT466E engines. Generally, the B20 blends resulted in slight increases in NOx emissions, with the exception of the DT466E engine with B20/ULSD blend, which resulted in decreased NOx emissions.