DVECSE LNT data

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Reference:
C. Scott Sluder and Brian H. West, "Catalyzed Diesel Particulate Filter Performance in a Light Duty Vehicle." SAE Paper #2000-01-2848. Society of Automotive Engineers, Warrendale, PA, 2000

C. Scott Sluder and Brian H. West, "NOx Absorber Performance in a Light-Duty Diesel Vehicle." SAE Paper #2000-01-2912. Society of Automotive Engineers, Warrendale, PA, 2000

C. Scott Sluder and Brian H. West, "Performance of a NOx Absorber and Catalyzed Particle Filter System on a Light-Duty Diesel Vehicle." SAE Paper #2001-01-1933. Society of Automotive Engineers, Warrendale, PA, 2001

Detailed Description/Comments:

Documentation for the DVECSE LNT data files compiled by C.S. Daw and reviewed by Scott Sluder, 8/27/2002.

The associated data files f1003naa.xls => f1003nag.xls, f3003naa.xls => f3003nag.xls, f3030naa.xls => f3030nag.xls, sc003naa.xls => sc003nag.xls, and sc030naa.xls => sc030nag.xls are taken from data recorded under the Diesel Vehicle Emission Control Sulfur Effects (DVECSE) project at Oak Ridge National Lab (ORNL) during FY 2000. More detailed documentation on this project is given in the companion reference: "NOx Adsorber Performance In A Light-Duty Diesel Vehicle," by Brian H. West and C. Scott Sluder, SAE 2000-01-2912.

This particular test series was focused on measuring the performance of a prototype NOx adsorber installed in a Mercedes A170 1.7-liter diesel vehicle operated on a chassis dynamometer using fuel with two

different sulfur levels (3 and 30 ppm). The fuel met the Diesel Emission Control Sulfur Effects (DECSE) standard specifications with 86.3% C and 13.4% H2. The 30 ppm S level was produced by doping the 3 ppm fuel with sulfur compounds including dibenzo(b)thiophene, benzo(b)thiophene, di-t-butyl disulfide, and ethyl phenyl sulfide. The 30 ppm level adsorber tests were preceded by an accelerated sulfur loading with 150 ppm fuel (as a surrogate for and rough equivalent of 3,000 miles of driving with 15 ppm fuel) in order to assess the impact of sulfur poisoning.

The prototype NOx adsorber contained a 5.66-inch diameter, 6-inch long monolith with 400 cells/square inch that was supplied pre-canned by the Manufacturers of Emissions Controls Association (MECA). The adsorber was installed downstream of a 1.6-liter replacement oxidation catalyst (also supplied by MECA), which was installed in the close-coupled location immediately after the turbocharger exhaust. The reductant was an artificial syngas mixture consisting of 64-66% CO, 31-32% H2, and 2-5% ethylene and was injected upstream of the oxidation catalyst in two-second pulses at 50-90-second intervals. Sluder and West reported that combustion of the syngas mixture was generally audible (probably due to the H2) during the injection pulses.

LNT inlet temperature and composition (O2, CO2, CO, HC, NOx) and exit gas NOx and temperature were recorded at 0.5 s intervals. Gas temperatures were measured by placing 1/8" type-K thermocouples in the exhaust stream. Gas compositions were measured by standard emissions instrumentation (NDIR, PMD, heated FID, heated CLD), with O2 measurement by UEGO. Instrument time response (excluding UEGO) was generally approximately 2 seconds, not including transport delays. The analog signal exchange between the UEGO and the data system was configured for good readings at low oxygen concentrations; accuracy at higher oxygen concentrations (e.g. 20.9%) were sacrificed to accomplish this. The exhaust flow rate was calculated by subtracting the dilution tunnel makeup air (measured by laminar flow element) from the known total dilution tunnel flow; hence, there may be substantial error stackup if this measurement is used to calculate gram emissions rates on a second-by-second basis.

A combined LA4-US06 drive cycle was used in most of the tests to simulate realistic driving conditions. Some tests were also run using the SC03 "air conditioning" cycle, although the test vehicle was not equipped with air conditioning. The included files consist of selected variables extracted from the more complete project data files. Data file names designate the following:
characters 1&2 - f1=cold start LA4, f3=hot start LA4+US06, sco3=air conditioning cycle
characters 3-5 - ppm S (003 = 3 ppm, 030 = 30 ppm)
characters 6-8 - run number