Heavy Duty On Road Spark Ignition Engines

Overview

- What is in the sector and regulations
- Exhaust system integrity
- Selective enforcement audits
- On Board Diagnostics
- Evaporative emissions
- Greenhouse gas emissions

What is Included in This Sector

- Includes spark ignition engines used in heavy-duty on-highway vehicles with a GVWR of 14,000 and above
  - OEMs
  - Conversions
- Fuels
  - Gasoline
  - Natural Gas
  - Liquid Petroleum Gas

Applicable Regulations

- 40 CFR 86
  - Emission standards
    - Exhaust
    - Evaporative
- 40 CFR 85 – Conversion of certified engines
- 40 CFR 1036 -Greenhouse gas

Exhaust System Integrity

- EPA examining pre-catalyst exhaust leaks
  - 40 CFR 1060.130(e)
    - Asks that a chemical balance be performed
    - EPA will ask for the results of that chemical balance or other proof that leaks are minimized
  - EPA is exploring methods of characterizing the volume of leaks
    - Will seek to add that volume to post catalyst emissions to arrive at a true emission picture
  - Will be testing during compliance tests and in-use testing
  - Engine manufacturers must insure that equipment manufactures assemble install their engine in a manner that maintains exhaust integrity

Selective Enforcement Audits

- Governed by 40 CFR 86 Subpart K
- EPA has performed a number of SEAs in this sector
- Important issues
  - EPA will select the engines and mark them
  - EPA will inspect the test lab
  - EPA will be present for some if not all tests
  - Fuel samples will be taken and analyzed
  - Manufacturer will age and test the engines

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- OBD Approval
  - Typically EPA will grant the manufacturer a certificate if it receives a CARB approval for OBD and also meet the other criteria required by the regulations
  - If a manufacturer chooses to certify in “49 states” then EPA is obligated to examine the manufacturer’s OBD application
    - Typically these are conversion manufacturers
      - EPA will looks for specific items in these applications
- OBD Verification
  - We may also seek to call in vehicles to perform tests on the OBD systems

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What We Look For In Conversion Applications

- Description of the application
  - The description of the application must include the type of fuel used, and a description of the control algorithms. If a dedicated conversion alters the OEM controller calibration, a detailed calibration change section will be required describing the changes as well as “why” they needed to be changed.
- Additional Component List (BOM)
  - A list of all components that have been added to the originally certified system. The BOM should include all emission critical components added to convert the vehicle This includes manufacturer and part numbers. This BOM must include CVN of the base calibration used in the test vehicle (available through mode 9)
  - If the conversion includes a second controller for altering the fueling, the BOM must also include the CVN of the software/calibration in the conversion controller

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What We Look For In Conversion Applications

- Additional Component Diagnostic Descriptions
  - For all electrical components added to the system (including new modules) describe the diagnostics that have been created and how they comply with the comprehensive component regulations.
- Additional Component Diagnostic Table
  - A table of each added component with a description of the type of test being performed (rationality, functionality, Circuit High, Circuit Low, etc.) and the OBD or non OBD fault that is set with a description of how the fault is read (i.e. OBD tool or Manufacturer Specific Tool)
- Testing: New Diagnostic Verification
  - In this section the OEM must describe how they tested each of their diagnostics and give a table showing they were able to both pass and fail each diagnostic.

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What We Look For In Conversion Applications

- Testing: Original Diagnostic Functioning Statement
  - A statement by the company performing the conversion that all original OEM diagnostics still function and are capable of detecting failure components with the added hardware Testing: Emissions Testing
  - Emissions testing is required for Major monitors to verify that they still meet the 1.5x the standard failure criteria. How much flexibility do we have?
  - Major Monitors – As applicable
    - Fuel System Monitoring
    - Misfire Monitoring
    - Exhaust Gas Recirculation (EGR) System Monitoring
    - Cold Start Emission Reduction Strategy Monitoring
    - Secondary Air System Monitoring
    - Catalyst Monitoring
    - Evaporative System Monitoring
    - Exhaust Gas Sensor Monitoring

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What We Look For In OEM Demonstrations

- If EPA calls in a vehicle for OBD demonstration – authority CAA 206
  - Manufacturer will either perform the demonstration at their location or EPA or another laboratory
  - EPA will be present as they demonstrate various aspects of their OBD system
  - The main intent is to see that all required diagnostics detect failures.

Evaporative Emissions

- Who applies
  - Heavy-duty vehicles above 14,000 GVWR that run on voltile liquid fuel (such as gasoline or ethanol) or gaseous fuel (such as natural gas or LPG) (40 CFR 1037.103(a)(2))
- What tests are required
  - Diurnal and hot soak[1]
    - Low-altitude fleet average
    - High-altitude
  - Running loss[1]
  - Effective leak diameter for fuel system – does not apply per 40 CFR 1037.103(b)(2)
  - Refueling emissions[1]
  - Fuel Spitback – volatile liquid fuels only
- Standards
  - Begin in 40 CFR 1037.103 and reference and modify 40 CFR 86.1813

[1]Can perform engineering analysis in lieu of tests

Greenhouse Gas Emissions
Options for Compliance

- Three Options to certify engines
  - Meet the standards of 40 CFR 1036.108 in an engine test 627 g/hp-hr
  - Loose engine sales provision of 40 CFR 1037.150(m)
    - Option ends after 2023
    - Pay attention to the limits imposed
  - Optional Chassis pathway of 40 CFR 1037.150(l)
    - Manufacturers should seek to fully understand these provisions before embarking upon them
    - They would certify to the standards of 40 CFR 86.1819-14 instead of 40 CFR 1037.105

Greenhouse Gas Emissions

Options for Compliance

- Engine manufacturers must meet the greenhouse gas provisions as described
- Beginning in 2021 vehicle manufacturers must satisfy the standards via GEM 2
  - GEM2 information at: https://www.epa.gov/regulations-emissions-vehicles-and-engines/greenhouse-gas-emissions-model-gem-medium-and-heavy-duty#phase-2-final
  - Diesel Engine Compliance Center will be certifying Spark powered chassis

Closing

- Please fill out all required templates without altering
- If you have questions, ask them as far in advance as possible

- Your EPA contacts
  - Peter Caffrey caffrey.peter@epa.gov
  - Deb Adler Reed adlerreed.deborah@epa.gov
  - Eiji Mori mori.eiji@epa.gov