

On-Board Diagnostics (OBD) Requirements

- Applicable to new vehicles and engines
- Applicable light-duty regulations
 - 1968.2 OBD II (light-duty) and 1968.5 OBD II enforcement
 - In place since the 1996 model year
- Applicable heavy-duty regulations
 - 1971 EMD (engine manufacturer diagnostics)
 - 1971.1 HD OBD (heavy-duty) and 1971.5 HD OBD enforcement
 - Full HD OBD not required until 2018 (proposed) MY
 - “EMD+” per 1971.1(d)(7.5) required on 2013+MY
- OBD website:
- <http://www.arb.ca.gov/msprog/obdprog/obdprog.htm>

OBD 101

- Mostly software in the engine and other ECUs
 - Not a magic sensor that directly measures tailpipe emission levels
- Runs 'monitors' in the background to diagnose emission-controls
 - Monitors virtually every powertrain component/system that can affect emissions
 - Typically 200+ monitors on an individual vehicle
 - Most critical monitors correlated to tailpipe emissions, less critical monitors calibrated to verify function/rationality
- Illuminates the MIL and stores info for repair techs for faults
- Dominant mechanism used in Inspection programs nationwide to fail vehicles (e.g., vehicles in need of emission repairs)

Major Areas for Alt Fuels

- Work involved to comply
- Certification process
- Post-Certification required testing

Work involved to comply with OBD

- Base OEM Vehicle Selection
 - Start with OBD II certified
 - Convert the same model year (e.g., a 2012 vehicle to a 2012 alt fuel vehicle)
- Control strategy/calibration changes to base vehicle
 - Base control calibration changes (e.g., EGR flow rates, etc.) can alter OBD requirements
- Emission threshold monitors
 - Critical emission controls monitored to detect faults before tailpipe emissions exceed a specified level (e.g, detect an EGR fault before > 1.5x standards)
 - Rely on correlation established by manufacturer from sensed parameter to tailpipe emission level (e.g., sense EGR flow and correlate to tailpipe emission level as flow is restricted)
 - Change to alt fuel alters this correlation
 - Tailpipe emissions may be more sensitive/less sensitive to same degree of fault
 - Certifying conversion to a different tailpipe std (LEV as a SULEV) exacerbates this
 - Emission data required

Work involved to comply with OBD (cont.)

- Demonstration testing
 - Each emission threshold monitor tested with fault implanted
 - Verifies fault detected before exceeding emission threshold
 - Required on 1-3 vehicles per year per manufacturer
 - OBD data collected during testing called out in (i)(2.4)
 - Done on vehicle representative of full useful life (e.g., 120,000 miles)
- Added/Modified/Deleted components
 - Need to add monitors for added components
 - Need to verify/recalibrate monitors for modified components
 - Need to 'cleanly' disable diagnostics for deleted components

Work involved to comply with OBD (cont.)

- Monitoring frequency
 - Minimum in-use frequency required for most critical monitors
 - Data in vehicle tracks how often monitors run relative to how often vehicle is operated
 - Conversions need to ensure they don't jeopardize monitoring frequency
- Standardization
 - SAE and ISO standards called out in section (g)
 - Covers everything from real-time sensor data to information about the calibration being run by the vehicle
 - Conversions need to verify the data being output is still accurate
 - Deleted components/disabled monitors reported appropriately
 - Appropriate fault codes being used
 - Calibration version (CAL ID) information changed to reflect alt fuel calibration

Certification Process

- Certification plans, OBD groups, test vehicle selection
 - Come in well in advance of cert with plans for the year
 - Identify all test groups to be converted/offered for sale, projected sales, etc.
 - ARB will identify specific test groups for demonstration, post-certification testing, etc.
 - Based on total number of test groups planned for the year
- Application
 - Detailed submittal requirements called out in section (h)
 - System description, summary table, etc.
 - Need to document added/modified/deleted diagnostics
 - Fastest review if you use strike-out/underline to show changes from OEM
 - Demonstration data showing emission threshold compliance
- Deficiencies
 - Can still be certified if you fall short of requirements
 - Deficiency(ies) can be granted
 - Require ARB approval, must meet good faith effort to comply and to come into compliance as fast as possible, restrictions on carry-over of deficiencies
 - More than two and \$25-\$50 per vehicle per deficiency fines apply

Post-Certification Testing

- **Standardization Compliance**
 - (j)(1): Uses SAE J2534 reprogramming interface plus SAE J1699-3 software to test adherence to standardization requirements
 - Test one production vehicle per test group, within first two months of production
- **Monitor Compliance**
 - (j)(2): Implants fault one by one to verify MIL illumination for every diagnostic
 - 2-6 vehicles per year by size of manufacturer, within first six months of production
 - No emission testing, only test monitors added/modified/affected by alt fuel conversion
- **In-use Monitoring Frequency Compliance**
 - (j)(3): Download standardized data from actual in-use vehicles to verify minimum monitoring frequency satisfied
 - Up to 15 vehicles per test group, within first 12 months of production
 - Uses standard scan tool to download data

OBD Contacts

- Contacts:

Mike McCarthy, Manager - mmccarth@arb.ca.gov

Advanced Engineering Section