CARB Light-Duty OBD Regulation Update

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California Air Resources Board
Discussion Points

Background
Regulatory Changes
Other Changes
Recent In-Use Issues
Background

- Over 17 years since first systems introduced
- Dominant technology used by IM programs
  - Identify vehicles in need of repair
  - Facilitate quick and accurate inspection
- Only CA standard that directly addresses emissions beyond useful life
2011 Calif IM Data

Percent of SmogCheck Failures

- Failed by OBD test
- Failed by tailpipe test

Model Year

Only a Fraction of the Benefit is Seen in I/M Data

Estimated True OBD Failure Rates
North Carolina 2011

- MIL On
- Not Ready
- Pass w/Recent Clear

Only a Fraction of the Benefit is Seen in I/M Data

- 2005 (7yrs): 7.50%
- 2006 (6yrs): 6.95%
- 2007 (5yrs): 6.01%
- 2008 (4yrs): 5.44%
- 2009 (3 yrs): 3.70%
- 2010 (2yrs): 2.97%

Not Seen by IM program as fails

Pass w/Recent Clear
Nationwide IM update

- 30+ states doing OBD inspections
- Recent EPA guidance suggests States look at tightening readiness
  - Current Policy: allow any 2/any 1 not ready for ‘96-'00/'01+ model year
  - Calif actively looking at tighter criteria for older and newer cars including use of permanent DTCs

<table>
<thead>
<tr>
<th>Tons/Day (HC+NOx) 2011 CA Fleet</th>
<th>% of MIL Off Roadside Vehicles Meeting Readiness</th>
</tr>
</thead>
<tbody>
<tr>
<td>O2 Complete No more than 1 unset</td>
<td>Data from 1998-2000 MY cars</td>
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<tr>
<td>Require Cat Complete</td>
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<tr>
<td>Cat + O2 Complete</td>
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<tr>
<td>Evap Only Unset</td>
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<tr>
<td>All Indicators Set</td>
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</tbody>
</table>
Nationwide IM update

• Light-/Medium-duty diesel
  • Workgroup convened by EPA to develop diesel-specific guidance
  • Several states already inspecting diesels and more interested

• Recommendation near completion
  • To reduce reliance on stringent readiness criteria, includes use of:
    • Permanent DTCs,
    • Distance since code clear, and
    • Number of warm-ups since code clear
Discussion Points

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Regulatory Revisions

- Regulatory revisions conducted periodically
  - Five revisions in last 15 years
  - Update for new technology, problems found, etc.
- Time-critical revisions were recently made
  - Part of the LEV III rulemaking in January
Light-duty Diesel Revisions

- Monitoring delayed until 2015 for:
  - Catalyst proper feedgas generation (e.g., NO/NO₂)
  - Catalyzed DPF proper NMHC catalyst performance
  - Tolerance compensation features (e.g., coded fuel injectors)
- PM Filter monitoring (1.75x std in 2013MY)
  - Allow 4th year of deficiency in 2013 MY only
  - Extend provision to exempt some failure modes (e.g., partial melt/partially crack) to 2013 MY only
  - Free deficiencies for PM sensor-based monitors in 2014-2015
Plug-in Hybrid Revisions

• In-use Monitoring Performance Ratio Changes
  • General denominator criteria uses ‘propulsion system active’ instead of engine runtime
  • Major monitor denominator adds 10 secs engine runtime
    • Rest of criteria based on vehicle operation (regardless of IC operation)
  • Evap denominator changed
    • ‘Engine off time > 6 hours’ replaces ECT vs ambient cold start criteria
  • Two ignition cycle counters
    • Track all vehicle trips
    • Track only trips with an engine start
  • Lower (0.100) minimum ratio for early years

• Warm-up cycle definition
  • Used to erase DTCs from Mode $03 after MIL is off
  • Change to general denominator trip instead of ECT warm-up based trip
Additional Changes

- Recent HD OBD rulemaking
  - Changes also affect medium-duty diesel
- Future rulemaking schedule
  - Resource permitting, late 2013 calendar year rulemaking
  - Major items:
    - Typical clean-up
      - Which monitors need test results
      - Which monitors tied to each readiness bit, etc.
    - LEV III updates
      - Threshold for HC+NOx std and new categories
      - DOR threshold
    - Hybrid updates
      - Misfire detection interval for plug-ins
      - Other issues
    - GHG involvement
      - In or out of OBD
      - Threshold vs functional vs any measurable increase
      - Constrained to ‘powertrain’ somehow
## LEVIII Gasoline Thresholds

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<th>NOx</th>
<th>CO</th>
<th>HC+NOx Multiplier</th>
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Discussion Points

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Other Changes

• **Document Management System**
  • Have been working on migrating to DMS for OBD
    • Essentially, electronic submission of application
  • ~50% of manufacturers submitting applications via DMS
• 2013MY Goals:
  • Every LD manufacturer with at least one application uploaded (even if is post-cert)
• 2014MY Goals:
  • Every LD application submitted via DMS prior to cert
  • Very early 2014 MY can be uploaded after cert
Other Changes (cont)

• Mail-outs/Guidances
  • Used to clarify existing requirements, provide examples, etc. *typically in between rulemakings*
  • Drafts near completion on:
    • Alternate fuel conversions
    • Driver selectable switches
    • EWMA implementation

• Future topics include:
  • Readiness/Test result mapping
  • Dual-path purge lines on turbo engines
  • LEV III thresholds (if needed before scheduled rulemaking)
  • Exclusion of safety critical system default actions
Discussion Points

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Recent In-Use Issues
Dual-path Purge

• More commonly seeing boosted engines with two purge paths
  • ‘normal’ path for non-boost operation
  • Separate path for boost operation
  • Increasing importance on downsized turbocharged that spend more time in boost and need to purge

• Verification of flow to engine required on both paths
  • Have had to remind manufacturers about this
  • Guidance planned to further help
Rate based data template

- Automated template working to highlight issues
- Quick and easy for manufacturer/ARB
Rate based data template

- Zooming in:
  - Denominators not matching up raised questions

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Varied Approach to Compliance

Zero/Non-compliance

Absolutely/Full compliance

Here’s what we know is required and these are the things we fall short on

Here’s what we are proposing to do, is it good enough?

The ‘continuum of compliance’
Myth#1: Definition of ‘diagnostic-critical control units’

- Recent misinterpretations:
  - ABS controllers are identified as exempt in definition thus: OBD comprehensive component monitoring requirements also do not apply:
    - ABS inputs/outputs can be used to enable/disable other OBD monitors; and
    - You are exempt from any and all monitoring of these components
  - Controllers with OBD inputs/outputs and OBD diagnostics but not required to support CAL ID and CVN are:
    - Not required to illuminate the MIL for those OBD diagnostics
    - Not covered under emission warranty

- Reality: Definition in OBD regulation
  - Solely determines whether control unit needs to report CAL ID and CVN
  - All other OBD (and emission warranty) rules still apply
Myth #2: No-start = No OBD required

- Misinterpretation: If you detect a fault and take default action to shut the engine down and/or prevent re-starting, you are exempt from OBD requirements and emission warranty coverage
  - Variation #1: If a failure causes a no-start, you are exempt from monitoring/detecting that fault.
  - Rationale is that subsequent to the fault being detected, there is no further emission increase
- Reality:
  - If a failure causes a no-start and it is not technically feasible to detect the fault because of the no-start condition, ARB will approve the system being unable to detect the fault. However, emission warranty coverage still required for that component.
    - Example: Crankshaft position sensor no signal fault causes engine to be unable to start.
  - Faults that cause a no-start but are able to detected must be detected
    - Example: Insufficient fuel pressure to begin injection.
  - Faults that are detected and then default action invoked to prevent re-starts are not exempt from OBD monitoring or warranty coverage
    - Not an option to detect a catalyst fault and then default to no-start to avoid MIL illumination and warranty coverage
    - And, while default action will prevent a further emission increase, emissions have typically already increased prior to fault detection so that component still does affect emissions.
Air Quality in Los Angeles
Regulation Has Been Effective: Less Summertime Smog

<table>
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<th>Greater Los Angeles</th>
<th># of Smoggy Days(^1)</th>
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\(^1\) Pollution exceeds national 8 hour ozone standard

- Pop. ↑21%
- VMT ↑25%
Objectives

- Meet 2023 and 2032 federal Ozone standards
  - Los Angeles and San Joaquin Valley
  - NOx reduction primary need

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<tr>
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<th>8 hour Ozone, ppm</th>
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- Meet GHG target
  - 80% reduction in 2050 from 1990 emissions
Sources of Emissions Today – NOx*

- 89% Motor Vehicle
- Greater Los Angeles
Sources of Emissions Today - GHG

38% Motor Vehicle

- Industrial
- Electricity
- Agric.
- Residential
- Other
- Pass. veh.
- Truck
- Off-rd
Emission Targets for O3 NAAQS attainment

- **BAU: NOx Mobile Source Emissions (South Coast)**

  - **Remainin g Emissions Relative to 2010**
    - 110%
    - 100%
    - 90%
    - 80%
    - 70%
    - 60%
    - 50%
    - 40%
    - 30%
    - 20%
    - 10%
    - 0%

- **Year**
  - 2010
  - 2020
  - 2030
  - 2040
  - 2050

- **Emission Reductions**
  - 65% reduction
  - 80% reduction

- **Categories**
  - Hydrogen
  - Electric
  - Jet Fuel (engine + upstream)
  - Gasoline Upstream
  - Gasoline Vehicle
  - Diesel and NG Upstream
  - Vehicle - Rail & Other Off-Road
  - Vehicle - Trucks
  - Vehicle - OGV

- **Scenario**
  - BAU: NOx Mobile Source Emissions (South Coast)

- **Engine + Upstream**
  - 65% reduction
  - 80% reduction
BAU: GHG Mobile Source Emissions (statewide)

Remaining Emissions Relative to 2010

Emission Target

85% reduction
What is the Solution?

• Cars and light trucks
  – Nearly complete conversion to electric drive by 2050
    • Mostly battery and fuel cell vehicles
  – Further reduction in electricity and hydrogen production GHG emissions (60-70% lower carbon intensity)
  – Modernization of legacy vehicles through incentives and scrap, to reduce NOx
  – Reduction in VMT (~13-22%) by 2035
Official CARB documents available from

www.arb.ca.gov

Direct link to OBD page:

http://www.arb.ca.gov/msprog/obdprog/obdprog.htm

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