



# SAE 2009 **On-Board Diagnostics** Symposium

Update on Light and Heavy Duty Vehicle

September 22-24, 2009 • Indianapolis Marriott Downtown • Indianapolis, IN

## CARB Heavy-Duty OBD Regulation Update



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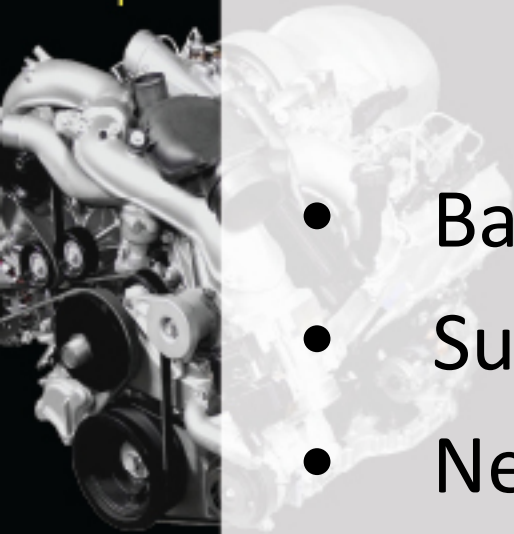
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## Discussion Points

- Background
- Summary of Latest Changes
- Next Steps





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- Originally adopted in 2005
  - 2010/2013 implementation
- Subject to periodic reviews
- First review completed
  - Hearing was May 2009
  - 15-day notice anytime
- Formal submittal shortly after 15-day notice





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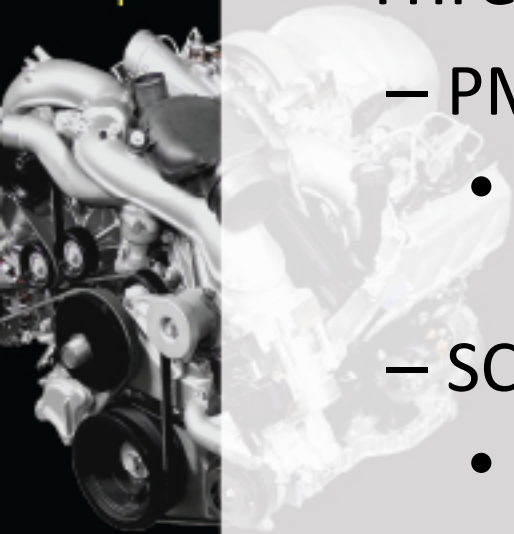


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- **Threshold Monitors:**
  - PM filter 2010-2012:
    - PM emissions  $> 0.07$  g/bhp-hr (or standard + 0.06) in lieu of  $> 0.05$
  - SCR catalyst and NOx sensors 2010-2012:
    - NOx emissions  $> \text{standard} + 0.4$  g/bhp-hr (in lieu of + 0.3)





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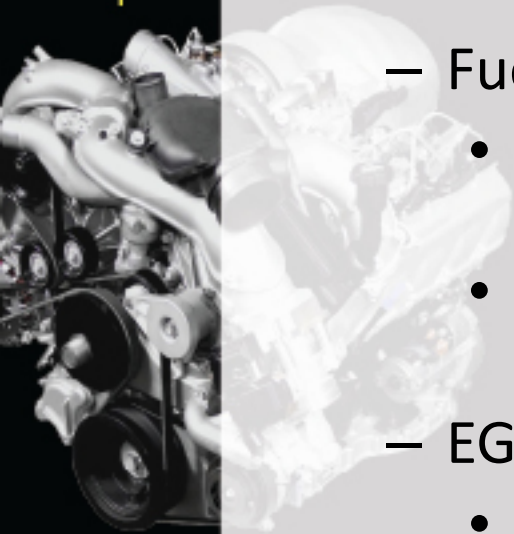
- Other 'major' monitor changes

- Fuel system

- 2010-2012 threshold based on one bad injector, not all injectors equally deteriorated
- 2013+ Similar conditions for fault code storing/clearing

- EGR

- Cooler system monitor, not individual cooler functional check
- Catalyst monitoring not required until 2013
- Clarity on disablement of continuous monitoring



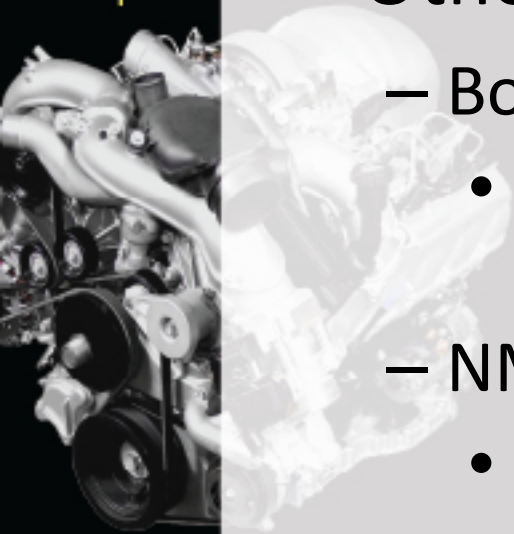


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- Other 'major' monitor changes (cont)
  - Boost pressure
    - 2013+ slow response for all systems, not just VGT
  - NMHC catalysts
    - 2013+ threshold of NMHC or NO<sub>x</sub>, whichever occurs first
    - Delay to 2013 for feedgas generation (e.g., NO<sub>2</sub>) functional check





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- Other 'major' monitor changes (cont2)
  - PM filter
    - 2013+ threshold of NMHC or NO<sub>x</sub> for frequent regen
    - Delay to 2013 for catalyzed PM filter NMHC performance
  - Cold start strategy
    - New for 2013+
    - Functional plus threshold check





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- Gasoline Monitor Changes
  - Harmonization with OBD II amendments done in 2006
  - Mostly minor changes and clarifications





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- Demonstration Testing
  - Near-term: aging to lower mileage goals
  - By 2016: testing at full useful life mileage of entire engine/system (using accelerated aging)
- Interim aging levels in 2010 and 2013
- Real world engine/system testing to validate aging at interims
  - ~2011 and 2014





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- Rate-based tracking
  - General denominator criteria changed
    - 5 cumulative minutes  $\geq$  1150 rpm in lieu of  $\geq$ 15% load for diesel engines
    - Idle definition changed to not include vehicle speed
  - PM filter and regen monitor denominators
    - Added criteria of 800 cumulative minutes of engine runtime



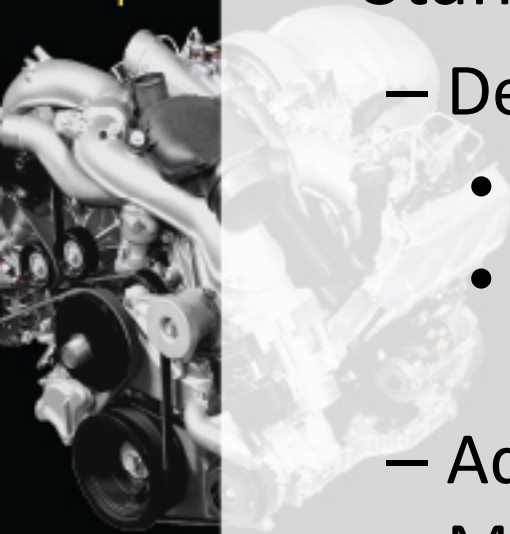


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- Standardization Changes
  - Detailed clarifying language
    - Permanent fault codes
    - Which monitors are part of readiness and test results
  - Added tracking of EI-AECDs like MDV/OBDII
  - Mail-out #09-22
    - Templates for submitted data





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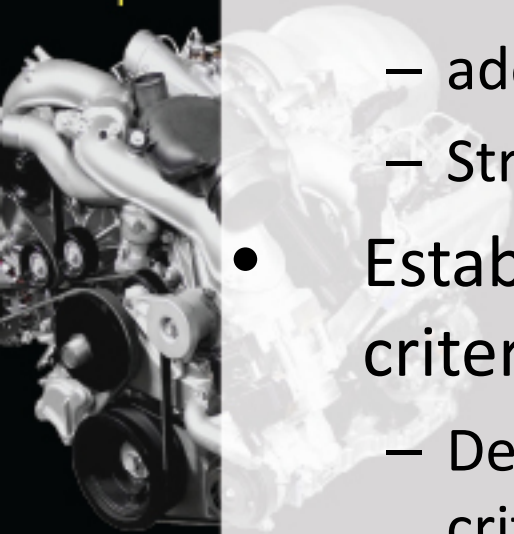


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- 1971.5 (Enforcement Regulation)
  - adopted by Board at May Hearing
  - Structured similarly to OBD II enforcement
- Establishes clear procedures and pass/fail criteria for determining noncompliances
  - Details sampling criteria, engine eligibility criteria, test methods, fail criteria, remedial actions, etc.





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- Key Points:
- Three 'groups' of non-compliances
  - Emission thresholds – Emission testing to verify, with threshold part installed, MIL on at/before required emission levels.
  - In-use frequency- Data sampling to verify monitors meet minimum in-use ratios.
  - “All other” – Testing to verify any other aspect of compliance (e.g., SAE standards, proper MIL illumination, enable conditions, fault detection, connector location, etc.)
- Separate test methods, sample size, criteria for each group



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- Key Points (cont.):
- Interim less stringent fail criteria:
  - Higher thresholds (e.g., double the ' OBD threshold' = 2.0x (2.5x HC std) = 5.0x HC std)
  - Lower in-use ratios (e.g., < 0.05 instead of 0.100)
  - Use of manufacturer determined IRAFs and 'worst-case' test cycle (in lieu of real world findings)
- Mandatory recall criteria
  - For 2013/2016+
  - Establishes even higher (less stringent) performance levels for which recall is the only remedial action accepted





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- Combination of manufacturer and ARB testing for emission thresholds
  - ARB conducts all testing for in-use frequency and ‘other’ categories
- ARB testing
  - Authority to emission test engines
    - Likely at non-manufacturer facility contracted by ARB
- Manufacturer testing of a few in-use engines each year
  - (e.g., 1-3 engines per year)
  - Target in-use engines with 75% of useful life mileage
    - Typically would be done ~3 years after engines first sold
- Engine selection criteria largely mimics criteria used for manufacturer in-use NTE compliance (PEMS) testing



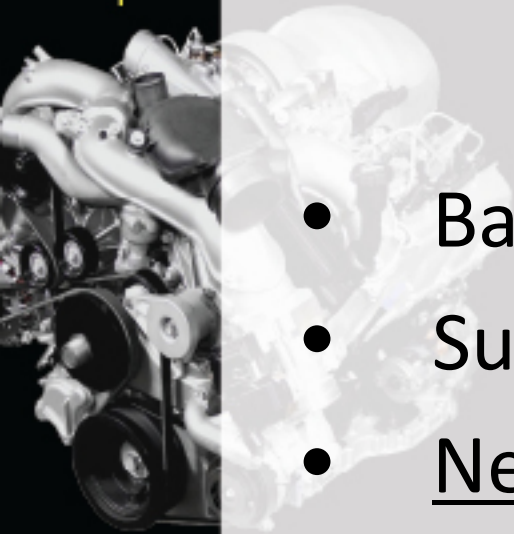
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- Certification for 2010
  - Starting to trickle in
  - 1<sup>st</sup> submission for many so expect some additional back/forth
- 2013 planning
  - Increased involvement in standardization efforts to ensure successful roll-out
  - Try to get feedback from early testing of 2010 products to identify issues in time to correct
  - Future review in time to make adjustments





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Official CARB documents available from

– [www.arb.ca.gov](http://www.arb.ca.gov)

• Direct link to OBD page:

– <http://www.arb.ca.gov/msprog/obdprog/obdprog.htm>

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