2016 Detroit HD Engine Update
ODB16/GHG17 – Overview

2015 Northeast/Midwest Regions Joint Equipment Management Meeting
6/16/15
GHG14 Quick Facts

- The main goal of the regulation is to **reduce tailpipe CO2 emissions** by improving fuel efficiency.

- Under the new GHG14 regulations, certified trucks and buses built model year 2014 through 2018 are projected to reduce oil consumption by 530 million barrels and greenhouse gas emissions by 270 million metric tons.

- EPA’s greenhouse gas standards must be met beginning model year 2014, however Daimler has decided to lead the industry by **certifying its 2013 vehicle fleet one year early**. NHTSA’s fuel efficiency standards must be met beginning model year 2017 for diesel vehicles.

Source: 76 Fed Reg, 57107, Sept. 15, 2011
**HDES 2016 Program Overview**

**Detroit HDES 2016 Program – General Overview**

**Program Targets**

**SOP:** December 2015 (Engine)

**Certifications:**
OBD 2016, GHG 2017

- **DD13 FE1**
  Up to 2% FE improvement over DD13 FE0.

- **DD15 GHG 2017**
  Up to 1% FE improvement over DD15AT GHG14

- **DD16 2016**
  Up to 2.5% FE improvement over DD16 TC 2013

- **No substantial compromise in vehicle performance or trip times.**

- **DEF Consumption to increase**

- **Nominal DPF regeneration intervals essentially unchanged. Durations mildly shorter.**

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**Target Vehicles**

- **FTL Cascadia EVO**
- **FTL 114SD**
- **FTL M2-112**
- **WST 6900**
- **WST5700 (Phantom)**
- **OshKosh**
- **Van Hool**
- **Pierce**
- **MTU**
- **FTL 122SD**

**Program Targets**

- **GHG14**
- **HDES 2016 Program (GHG 2017)**

**Target Vehicles**

- **FTL – Freightliner**
- **WST – Western Star**
- **WST 4700**
- **WST 4800**
- **WST 4900**
- **MCI / Setra**
- **FCCC**
- **Pierce**
- **OshKosh Van Hool**
- **MTU**

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**Post GHG17**
**2016 Detroit HD Engine / ATS Changes**

**DD15**
1. In-house Turbo Charger  
2. Exhaust Manifold  
3. Global New Front End  
4. Vibration Damper (FE)  
5. Air Inlet Conn. (FE)  
6. Flywheel  
7. S Pipe  
8. Piston (FE)

**DD16**
1. Turbo Charger  
2. Power Turbine  
3. Exhaust Manifold  
4. Global New Front End  
5. Air Intake Elbow  
6. Gen II Fuel System (FE)  
7. Flywheel

**DD13**
1. FE1 Cylinder Head (FE)  
2. In-house Turbo Charger  
3. Exhaust Manifold (FE)  
4. Global New Front End  
5. Vibration Damper (FE)  
6. Gen II Fuel System (FE)  
7. Air Inlet Conn. (FE)  
8. Flywheel  
9. S Pipe  
10. Piston (FE)

**Fuel Economy (FE) Changes**  
1. Globally Common DOC Coatings (FE)  
2. High Ash Capacity DPF (FE. 500K+ miles)  
3. SCR Catalyst w/ Fe/Cu Zeolite (FE)  
4. Decreased Length of DOC, DPF and SCR (FE)  
5. NOx Sensor Location Change  
6. Gen 2.8 NOx Sensors (Performance)  
7. Soot Sensor Addition (Compliance)  
8. Rolled Flanges for Inlet & Outlet  
9. ACM Mounted to 1-Box  
10. Deletion of SCR Temp Inlet Sensor  
11. Deletion of Second Pressure Sensor

**Commonality Changes**  
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1 Box Filter Change

New Shorter DPF substrate

8 Inch Long DPF Shown

7.5 Inch DPF is Located At the Same Rear Face Position

The DPF filters will physically fit into either 1 Box configuration (MY2010 or GHG14). However, if the box and filter are mismatched, a fault reaction may be triggered. DPF ash cleaning interval maybe also be affected.
<table>
<thead>
<tr>
<th>Topic</th>
<th>NAFTA OBD 2013 Requirements</th>
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<tr>
<td>Product Scope</td>
<td>All engine families require OBD certification – <em>All DD15 and only one DD13 or DD16 ratings</em> can be selected for certification demonstration</td>
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<td>Standardized J1939 diagnostics communication required (Daimler proprietary format no longer acceptable)</td>
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<tr>
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<td>Financial liability for performance ratio requirements of 0.1 not met</td>
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<td>Increased reporting requirements</td>
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<tr>
<td>System aging</td>
<td>Correlation between accelerated aging and 185k miles of real life system aging required</td>
<td>Correlation between accelerated aging and 435k miles of real life system aging required</td>
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<tr>
<td>Vehicle evaluation</td>
<td>Production vehicle evaluation potentially on x&gt;1 production vehicles required</td>
<td>Same as in 2013</td>
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<tr>
<td>Production vehicle standardization test</td>
<td>Production vehicle communication standardization testing required annually on up to ten vehicle configurations per engine family</td>
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<td>2 free deficiencies. $50/$25 penalty per engine sold in California per deficiency thereafter</td>
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Engine and Components Marketing – February 2015
## Topic

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- Generally speaking, 2016 brings a 30% increase in overall number of diagnostic trouble codes required by OBD, due to additional requirements and/or system design changes.
- Approximately 85%-88% of the total number of diagnostic codes within the MCM & ACM are required by OBD regulations.
- Reminder: OBD is regulated to verify the integrity of the emissions control system. A diagnostic trouble code usually indicates some level of reduced performance of the emissions control system and not necessarily a full functional failure.

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**Engine and Components Marketing – February 2015**
Significant New OBD Requirements for 2016

➢ “Partial Operating” Misfire Monitoring
  ▪ Monitoring required in operating window: 20% - 75% load / idle-75% max engine speed
  ▪ Deletion of individual cylinder & simultaneous multiple-cylinder misfire
  ▪ Seven (7) new diagnostic trouble codes

➢ Introduction of Soot Sensor
  ▪ Installed at or near outlet of ATD
  ▪ Only purpose is to detect soot emissions which exceed OBD limits due to reduced DPF filtration efficiency
  ▪ Approximately thirty (30) new diagnostic trouble codes associated with soot sensor, includes sensor electrical checks, sensor functional performance checks, and DPF filtration checks

➢ J1939 Diagnostic Communications Modifications
  ▪ Mandatory change of diagnostic communications from 250k baud rate
  ▪ Requires new SAE Type II diagnostic connector
  ▪ DiagnosticLink and generic scan tool usage will be transparent to service technicians
  ▪ Will require updated interface hardware (i.e., connections at Nexiq box)
Expanded OBD16 Validation Mission

Purpose: Increase GHG17 OBD system exposure to an even larger variety of ambient conditions, terrain and duty cycle (including idle, shutdown) as experienced by customers to expand validation of powertrain software, calibration and OBD monitors.

Route Emphasis (1 - elevation, 2 - humidity, 3 - cold ambient, 4 - varying ambient)

Trucks/Issues Continually Documented, with Emphasis on Proving:
- Software Function & Integrity
- Calibration Optimization
- OBD Compliance
- Eliminating False Fault Codes

Start Testing Jan 2015
Trucks Based Out of Portland & Detroit
PC-11 STATUS UPDATE
Initiation of PC-11 (product change 11)

- In 2010 the Truck & Engine Manufacturers Association (EMA) has requested new lubricant technologies to the API (American Petroleum Institute) and ACC (American Chemistry Council)

- The request was to improve the current API CJ-4 category and to introduce new low viscosity oil category targets for better fuel economy.

- The industry accepted the request and formed a group called NCDT (New Category Development Team) with the name PC-11

- This group consists of API, ACC and other independent oil marketers who wish to participate in the development process.
## PC-11 Specification – Critical Tests

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>PC-11 A (High HTHS)</th>
<th>PC-11 B (Low HTHS)</th>
<th>Test That Measures Parameter (new)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piston Deposits, Fe and Oil Consumption</td>
<td>X</td>
<td>X</td>
<td>C-13</td>
</tr>
<tr>
<td>Piston Deposits, Al and Oil Consumption</td>
<td>X</td>
<td>X</td>
<td>1N</td>
</tr>
<tr>
<td>Ring and Liner Wear</td>
<td>X</td>
<td>X</td>
<td>T12 (New merit system)</td>
</tr>
<tr>
<td>Bearing Corrosion, Oxidation, Nitration</td>
<td>X</td>
<td>X</td>
<td>T-13</td>
</tr>
<tr>
<td>Soot/Viscosity in EGR Engines</td>
<td>X</td>
<td>X</td>
<td>RFWT</td>
</tr>
<tr>
<td>Elastomer Compatibility</td>
<td>X</td>
<td>X</td>
<td>ISM</td>
</tr>
<tr>
<td>Used Oil Viscometrics (Low Temp)</td>
<td>X</td>
<td>X</td>
<td>ISM</td>
</tr>
<tr>
<td>High Temperature Corrosion</td>
<td>X</td>
<td>X</td>
<td>MRV (T11)</td>
</tr>
<tr>
<td>Shear Stability</td>
<td>KO 90 Pass</td>
<td>KO 90 Pass</td>
<td>Cat Aeration Test</td>
</tr>
<tr>
<td>Volatility</td>
<td>13% max</td>
<td>13% max</td>
<td>NOACK (D5800)</td>
</tr>
<tr>
<td>Foaming</td>
<td>X</td>
<td>X</td>
<td>ASTM D892</td>
</tr>
<tr>
<td>Filter Plugging/ Sludge</td>
<td>X</td>
<td>X</td>
<td>ISM</td>
</tr>
<tr>
<td>Chemical Limits (Ash, Phos., Sulfur)</td>
<td>X</td>
<td>X</td>
<td>D874, D4951, D2622</td>
</tr>
<tr>
<td>High Temperature/High Shear Limit (Fresh Oil)</td>
<td>3.5cP min</td>
<td>2.9 – 3.2 cP</td>
<td>HTHS (D4683)</td>
</tr>
<tr>
<td>High Temperature/High Shear Limit (After KO 90)</td>
<td>3.4 min</td>
<td>2.8 min</td>
<td>HTHS (D4683)</td>
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</tbody>
</table>

Blue indicates existing test
Yellow indicates new test/limit
Fuchsia indicates a replacement test
Naming the PC-11

<table>
<thead>
<tr>
<th>PC-11 A</th>
<th>PC-11 B</th>
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<tr>
<td>API CK-4</td>
<td>API FA-4</td>
</tr>
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</table>

- **Consumer Awareness Alternatives**
  
  1. The API Donut with CK-4 or FA-4 with no change to viscosity designation. The current system remains the same.
  
  2. Add \textbf{L} after the Viscosity Grade. Any time FA-4 is claimed it must designate the grade with the letter. The current system will Change.

  For instance: API FA-4, SAE 10W-30 \textbf{L}

  These options are open and await final decision from the Category Name /New HD Viscosity Grade Task Force.
PC-11 Availability Date as API CK-4 and AF-4

- API and ACC and other trade organizations has proposed the first licensing period for the PC-11 category for March 2017.
- EMA wants the PC-11 release date 3Q or 4Q 2016