Massachusetts HDOBD Pilot Program

Craig Woleader, P.E.
MassDEP Vehicle Inspection and Maintenance Program
Annual Safety and Emissions Inspection
Decentralized network of ~1,800 inspection stations
~5 million vehicle inspections per year
All on-road vehicles get a safety inspection
  • Non-commercial safety or Federal DOT equivalent commercial safety
~3/4 of the Massachusetts fleet gets an emission inspection
  • OBD - MY2006 and newer light-duty vehicles <=8,500 lbs
  • OBD - MY2007 and newer med-duty diesel vehicles <=14,000 lbs.
  • OBD - MY2008 and newer med-duty non-diesel vehicles <=14,000 lbs.
  • Diesel opacity SAE J1667 snap acceleration test – MY1984 and newer
diesel vehicles >10,000 lbs. that don’t get OBD
No new model year emissions test exemptions
HDOBD Background

- Federal requirement to phase in HDOBD for vehicles >14,000 lbs. starting with MY2010
  - 100% complete by MY2013
- HDOBD specification SAE J-1939
  - 9 pin round connector
- LD/MDOBD specification SAE J-1979
  - 16 pin connector
- OEMs may use either spec for their Heavy Duty vehicles
  - HD gasoline vehicles appear to be using same OBD systems as their MD vehicles, example Ford 6.8L V-10, J-1979
  - Smaller HD diesel OEMs (GM, Ford, FCA) appear to be using the same OBD system as their MD vehicles, example Ford 6.7L V-8, J-1979
  - Mack and Isuzu using J-1979 LD/MD OBD spec on the engines we scanned
HDOBD Pilot Program

- Purpose – integrate OBD testing into the I&M program for HD vehicles >14,000 lbs
  - Replace diesel opacity test for MY2014 and newer diesel vehicles
  - Create emission test for MY2014 and newer non-diesel vehicles
- MassDEP working in conjunction with I&M program network contractor, Applus Technologies
- 3 phases to Pilot Program
  - Phase 1 – Hardware and software shakedown
  - Phase 2 – Add HDOBD to I&M program as Fast Pass alt. to opacity test
    - Use opacity as a backup test if vehicle fails HDOBD
  - Phase 3 – Transition from Fast Pass HDOBD to Pass/Fail
    - No backup opacity test
    - HDOBD for non-diesel vehicles
Phase 1

- Developed J-1939 firmware upgrade to OBD scan tool (BAR certified DAD)
- Developed software to perform scans and store data
  - Helpful features – scan VIN barcode and VIN decoder
- Completed Fall/Winter 2019
- Successfully scanned 75 HDOBD vehicles
- Currently creating standardized format for J-1939 data
HDOBD Test Equipment
Phase 1 — Testing Locations and Vehicles

- Tri-State Trucking — Shrewsbury, MA
  - Freightliner dealership, Cummins, Detroit Diesel, and Paccar engines
- Ballard Mack, Auburn, MA
  - Mack and Isuzu dealership
- City of Boston School Bus Yard — Dorchester, MA
  - Thomas school buses — Cummins, Ford
- Worcester and Merrimac Valley Regional Transit Authorities
  - Diesel and Hybrid Buses — Cummins
- Cumberland Farms Distribution Center — Westboro, MA
  - Misc fuel tanker trucks and Semis
- Minuteman Truck Center
  - Ford truck dealership
## Phase 1 – Engines tested

<table>
<thead>
<tr>
<th>Make</th>
<th>Protocol</th>
<th>Displacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cummins</td>
<td>J-1939</td>
<td>6.7L, 8.9L, 11.9L, 12.8L, 15L</td>
</tr>
<tr>
<td>Detroit Diesel</td>
<td>J-1939</td>
<td>12.8L, 14.8L, 15.6L</td>
</tr>
<tr>
<td>Isuzu</td>
<td>J-1979</td>
<td>5.2L</td>
</tr>
<tr>
<td>Mack</td>
<td>J-1979</td>
<td>10.8L, 12.7L</td>
</tr>
<tr>
<td>Navistar</td>
<td>J-1939</td>
<td>7.6L</td>
</tr>
<tr>
<td>PACCAR</td>
<td>J-1939</td>
<td>12.9L</td>
</tr>
<tr>
<td>Volvo (MY2012)</td>
<td>J-1939</td>
<td>12.8L</td>
</tr>
<tr>
<td>Ford</td>
<td>J-1979</td>
<td>6.7L</td>
</tr>
</tbody>
</table>
Phase 1 – HDOBD Results

- Still working on table structure and formatting for J-1939 data
  - Raw scans files are text, varying size, typically >2000 lines of data
- Challenges
  - Minimum of 3 modules responding to OBD requests, don’t know which modules will support which data (monitors, MIL, DTCs)
  - Have seen up to 6 modules responding
  - No way to store a complete scan in a single row or VID record
  - A lot of extra data, examples
    - Idle time
    - Fuel used
    - Engine revolutions!
Phase 2 – Fast Pass HDOBD

• Purpose - gather large amounts of HDOBD data without failing vehicles and inconveniencing motorists

• Inspection lane software modified to add HDOBD tests for all MY2014 and newer vehicles that would normally receive an opacity test.
  • HDOBD Pass = emissions pass, no opacity test
  • HDOBD Fail = back up opacity test used to determine emissions Pass/Fail

• Likely use same pass/fail criteria as recommended by EPA
  • Permanent DTCs and miles/trips since code clearing replace strict monitor readiness requirements

• Writing software specs now, projected implementation winter 2020
Phase 3 – Pass/Fail HDOBD

- Phase 2 may run a year or longer to gather adequate data for designing the Pass/Fail program
- Possible Challenges
  - High failure rates? Will repair industry be prepared to fix these?
  - Push back from trucking industry, other stakeholders?
  - Tampering of emissions controls and OBD systems?
- Pass/Fail program design will be done in consultation with CA, EPA, and other interested states