USING ON-ROAD HEAVY-DUTY EMISSIONS MEASUREMENT SYSTEM FOR A HEAVY-DUTY VEHICLE INSPECTION AND MAINTENANCE PROGRAM

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Motivation

Investigate a Heavy-Duty Diesel Vehicle (HDDV) Inspection and Maintenance (I/M) Program for the Dallas-Fort Worth (DFW) Region

Characterize Nitrogen Oxides (NOx) Emissions from HDDVs Utilizing On-Road Heavy-Duty Measurement System (OHMS)

Investigate Other Technologies to Integrate with OHMS

Assess Data, Validity, and Implications for HDDV I/M or Screening Programs

Incorporate Efforts into Emissions Enforcement and Technology Developments
Project Overview

Phase 2 Study Follow-Up to 2012 Phase 1 Study

Main Objectives for Phase 2 Study
- Identify and Test Refinements of System Design
- Investigate Other Technologies to Integrate
- Deploy Refined System for Real World Application

System Design Refinements and Other Technology Testing
Performed at Texas A&M Campus

Field Study Deployment Performed at Texas Weigh Station

Partnered with Multiple Agencies
### Testing Technology

<table>
<thead>
<tr>
<th>Technology Name and Entity Name</th>
<th>Type</th>
<th>Collected for Test Runs at TTI Campus</th>
<th>Average Difference from PEMS*</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-Road Heavy-Duty Emissions Measurement System; University of Denver</td>
<td>Shed Structure Technology Monitoring System</td>
<td>CO, CO2, NO, NO2, NOX Gases</td>
<td>9.2%</td>
</tr>
<tr>
<td>MultiGas 2030 FTIR; MKS Instruments</td>
<td>5 Hz Fourier Transform Infrared Spectrometer</td>
<td>CO, CO2, NO, NO2, NOX Gases</td>
<td>14%</td>
</tr>
<tr>
<td>SDM 5060**; ETEST Corporation</td>
<td>Remote Sensing Technology</td>
<td>CO2, NO2, NOX Gases</td>
<td>18.96%</td>
</tr>
</tbody>
</table>

*Average difference is computed on a run-by-run basis. **Some runs had NO2 injected leading to higher average NOX readings compared to other tests.
OHMS Overview

Three Major Components:
Exhaust Collection
Vehicle Monitoring
Emissions Analysis

OHMS = On-Road Heavy-Duty Emissions Measurement System

Photo Source: TTI
Field Study Results

Fleet Analysis:
Model Year 2007 Trucks Peaked in 2012 and 2016

Tested Trucks MY Distributions

- 2012 Data from Phase 1 Study
- 2016 Data from Phase 2 Study
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Field Study Results

NOx Results by Truck Model Year

![Graph showing NOx results by truck model year with 95% percentile and average values. The x-axis represents years from 1994 to 2017, and the y-axis represents g NOx/kg CO2. The graph indicates a downward trend in NOx emissions over the years.]
Potential Emissions Reductions in DFW Area

Classifying High-Emitter (HE) as any Truck Higher than the 95th Percentile Within a Model Year (MY)

7.3% of Vehicles Accounted for 21% of Total NOx Emissions

Potential Reduction of 5.15 tons/day NOx if HE Replaced with “Average” Vehicle from Same MY

Classifying HE as any Truck Higher than the 95th Percentile of Entire Fleet

Potential Reduction of up to 6.98 tons/day NOx Possible Depending on how the HE is Replaced
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Potential Applications

I/M Programs
Clean Screening of Vehicles
Identifying HE from a Fleet

Enforcement of Emissions Reduction Devices

Photo Source: Getty Images

Photo Source: Diesel Technology Forum
Considerations and Next Steps

Further Research:
- Low Exhaust Stack Configurations
- Light-Duty Vehicles
- Truck Load Weights
- Truck Speeds

Implementation Considerations:
- Legislative Process
- Funding
- Deployment Locations and Enforcement
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Efforts Moving Forward

Develop International Stakeholder Working Group
Monitor Ongoing Research
Coordinate Common Technology Needs

Involve Emissions Testing Technology Manufacturers

Develop On-Road Inspections
Start with Visual Verification
Move Toward Integrated Technology

Perform Driver and Fleet Outreach

Promote Funding Opportunities
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