EMISSION TRENDS IN HEAVY-DUTY TRUCKS IN THE SOUTH COAST AIR BASIN

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Multi-Year Study Objectives

• To obtain On-Road Heavy-Duty Diesel Truck (HDDT) emissions over a five-year period at two locations in the South Coast Air Basin

• To follow HDDT emission changes during this period as new vehicles enter the fleet with even lower emission certified engines

• To compare commercial RSD system with research RSD system
Equipment and Measurements

DU FEAT with single measurement standard deviations

**NDIR** – CO$_2$
- CO $\pm$ 4 g/kg
- HC $\pm$ 4 g/kg
- %Opacity $\pm$ 0.8%

**UV** – NO $\pm$ 0.4 g/kg
- NO$_2$ $\pm$ 0.3 g/kg
- NH$_3$ $\pm$ 0.02 g/kg
- SO$_2$ $\pm$ 0.06 g/kg

Speed and Acceleration
License Plate Photo

ESP 4600

**NDIR** – CO, CO$_2$, HC, Smoke

**UV** – NO, Smoke
Current Regulations Status

• **EPA and California Engine Emission Standards**
  - PM - 0.01 g/bhp-hr  MY 2007+
  - NOx - 0.2 g/bhp-hr  MY 2010+

• **San Pedro Bay Ports Clean Air Action Plan**
  Complete! All Class 7 & 8 trucks now meet a 2007 standard

• **CARB Drayage Truck Regulation**
  Complete! All Class 7 & 8 trucks now meet a 2007 standard

• **CARB Statewide Truck and Bus Regulation**
  - 2012-2016  Phase-in most PM requirements
  - 2015-2023  Phase-in NOx requirements
Peralta Weigh Station
EB SR-91/Weir Canyon Rd.
Sept. 24 – 28 2012
2,547 Measurements
Mean MY 2004
5 – 15mph (Accel)

Port of Los Angeles
Water Street Exit
April 30 - May 4 2012
1,746 Measurements
Mean MY 2009.3
0 – 5mph (Accel)
New Cameras This Year

Exhaust Pipe

IR Thermograph

Green ~ 200°C

SCR Urea Tank Detection

Blue Cap = Urea tank
5 Year NO\textsubscript{x} and IR %Opacity Trends

Mean gNO\textsubscript{x}/kg of fuel

NO\textsubscript{2}  NO

2008 2009 2010 2012 2004

1995.6 2003.5 2007.9 2009.3

Measurement Year / Location

Peralta  Port
2012 Peralta NO\textsubscript{x} Emissions

<table>
<thead>
<tr>
<th>Chassis Model Year / SCR Status</th>
<th>Urea Cap</th>
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<tr>
<td>1990-2003</td>
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<td>2004-2007</td>
<td>90</td>
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<td>2011+</td>
<td>50</td>
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<tr>
<td>2011+</td>
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</table>

Data Point 1/99th
Maximum Observed
IR Estimated Exhaust Temperature

- POLA 155° C
  766 Measurements
- Peralta 225° C
  1969 Measurements

Truck Counts

IR Estimated Exhaust Temperature (°C)
SCR Equipped Truck Emissions Comparison

- **CO**
  - Peralta (233 Measurements)
  - POLA (32 Measurements)

- **HC**

- **NH₃**

- **NOₓ**

- **Mean Exhaust Temperature**

**g/kg of fuel**

**IR Exhaust Temperature °C**
Stoichiometric LNG Fueled Truck
Ammonia Emissions

Mean gNH₃/kg of fuel

Chassis Model Year

2009
2010
2011
2012

2009

2010

2011

2012
Conclusions

• Mean gNO\textsubscript{x}/kg emissions decreased 18.5% at Peralta and 12% at the Port and smoke emissions at the Port have remained low since 2010.

• Exhaust temperatures are 65 to 70° C higher at Peralta contributing to successful SCR operations and rapidly decreasing NO\textsubscript{x} emissions.

• SCR equipped trucks can have high NO\textsubscript{x} emissions when the equipment is inoperative as observed at the Port.

• NO\textsubscript{2}/NO\textsubscript{x} ratios continue to decrease and the ratios are lower in the newer MY trucks.