Proposal to Reduce idling from New 2007+ Heavy-Duty Diesel Trucks

Public Workshop
June 4, 2003

California Environmental Protection Agency
Air Resources Board
Agenda

• Overview
  – Need for control
  – Reasons for idling
  – Extent of idling
  – Emissions impacts
  – Available options to reduce idling

• Proposed solution

• Schedule

• Discussion
Need for Control

• Emissions from idling trucks
  – Highly localized and concentrated (truck stops, rest areas, distribution centers, ports, etc.)
  – Threat to public health
  – More serious in EJ communities

• SIP requirement
  – More reductions needed in non-attainment areas
  – Federal highway funds at risk
Why Trucks Idle?

- Heat or cool cab/sleeper compartments
- Warm the engine for easy start-up during cold weather conditions
- Power cab/sleeper appliances (refrigerator, television, laptop, etc.)
- Power to run auxiliary devices
- Habit
- Mask outside noise
California truck drivers idle

- At truck stops, rest areas, ports, distribution centers, etc.
- Primarily for climate control purposes
  - 83% idle to power the air conditioner
  - 67% idle to power the heater
  - 17% idle because other drivers are idling
  - 13% idle for other reasons

Source: SAE 2001-01-2828
How much truck idling?

- Idling times vary by season and location

- **U.S. DOE Study**
  - long-haul trucks with a typical trip > 500 miles from their home base
  - national average: 6 hours/day (1818 hours/year)
  
  (Stodolsky et. al., 2000)
ARB’s Analysis (EMFAC2002 ver 2.02)

• Based on GPS data logger instrumented truck data study

• 84 Heavy-Heavy Trucks (GVWR > 33,000 lbs.)
  – long-haul+short-haul trucks with idle time >5 min
  – fleet average HHDT: 105 minutes/day (640 hrs/year)
    (http://www.arb.ca.gov/msei/on-road/latest_revisions.htm#hhddt_idle)

• 34 Medium-Heavy Trucks (14K<GVWR<33K lbs)
  – fleet average MHDT: 6 minutes/day (36 hrs/year)
## Idle Emission Rates

**EMFAC2002 Ver. 2.2**

<table>
<thead>
<tr>
<th>All Model Years</th>
<th>HC (g/hr)</th>
<th>CO (g/hr)</th>
<th>NOx (g/hr)</th>
<th>CO2 (g/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.48</td>
<td>26.3</td>
<td>80.7</td>
<td>4098</td>
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</table>

**PM Idle Emission Rates**

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>PM (g/hr)</td>
<td>5.370</td>
<td>3.174</td>
<td>1.860</td>
<td>1.004</td>
</tr>
</tbody>
</table>

- HC, CO, NOx and CO2 from tests conducted by WVU
- PM rates are from Part 5 (US EPA)
# Emissions Impact - CY 2010

<table>
<thead>
<tr>
<th>EMFAC2002 Ver 2.2</th>
<th>Statewide</th>
<th>South Coast AB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MHD</td>
<td>HHD</td>
</tr>
<tr>
<td>CA-Registered Vehicles</td>
<td>200,087</td>
<td>150,560</td>
</tr>
<tr>
<td>NO_x (tpd)</td>
<td>1.7</td>
<td>22.6</td>
</tr>
<tr>
<td>ROG (tpd)</td>
<td>0.09</td>
<td>1.23</td>
</tr>
<tr>
<td>PM (tpd)</td>
<td>0.03</td>
<td>0.42</td>
</tr>
<tr>
<td>CO (tpd)</td>
<td>0.3</td>
<td>7.4</td>
</tr>
<tr>
<td>Diesel Fuel^1 Consumption (gal/day)</td>
<td>12,005</td>
<td>263,480</td>
</tr>
</tbody>
</table>

^1 Assumes diesel fuel consumption of 1 gall/hr for HHDV and 0.6 gall/hr for MHDV.
Technology Options

- Idle Limiting Devices
- Auxiliary Devices
- Truck Stop Electrification (TSE)
- Advanced TSE
Idle Limiting Devices

- **Idle Shutdown Timer**
  - shuts off the engine after a set time
  - available in all electronic engines

- **Automatic Start/Stop System**
  - automatically stops and restarts the engine based on battery voltage and engine and/or cab/sleeper thermostat settings
  - available as a factory option with DDC, Cummins, Caterpillar and Mack engines.
  - cost: $1,200 to $2,000
  - drawback: start/stop may be sleep disruptive
Auxiliary Devices

• Direct Fired Heater
  – provides heat to cab/sleeper or engine or both
  – compact and high heating efficiency
  – uses on-board fuel and truck batteries for power
  – cost: $1,000 to $3,000
  – drawbacks: no cooling, and may drain batteries
Auxiliary Devices

- Auxiliary Power Units
  - uses a small off-road diesel engine (~10 to 15hp) and on-board fuel
  - equipped with an alternator/generator to provide electrical power
  - heating, cooling, engine warming and electrical power for battery charging and on-board appliances
  - cost: $5,000 to $8,000
  - drawbacks: heavy, needs maintenance, high initial cost
Truck Stop Electrification

- 110 V AC at truck stops: for heating, cooling and for battery charging and on-board appliances
- requires electrical outlets at parking spaces, and inverter/chargers and electrical connections on trucks
- inverter/chargers - offered as options by Volvo, Freightliner, and International.
- cost: $1,700 to $2,400 per parking space and $1,400 for truck add-on.
- drawbacks: high infrastructure costs, add-on to trucks and available only at truck stops.
Truck Stop Electrification

• Advanced Truck Stop Electrification
  – truck modifications not needed
  – independent HVAC units for each truck installed above each parking space
  – 110 V AC power outlets for on-board appliances
  – telephone, internet and television services
  – $1.25 per hour for basic services
  – drawbacks: high infrastructure costs and available only at truck stops
Proposed Solution

• Require idle shutdown timer
  – all new 2007+ MY heavy-duty trucks, GVWR > 14,000 lbs.
  – shuts off the engine if idle time > 5 minutes
  – tamper-resistant and non-adjustable
  – allow the option to use auxiliary power units
  – APUs must meet CA emission standards for small off-road engines

• Trucks with sleepers
  – allow optional use of automatic start/stop systems
  – minimum of 50% idle reduction during ambient conditions of 95°F.
Proposed Solution

- Monitor the system for proper functioning using the on-board diagnostics system to be implemented for HDVs in 2007

- Include a functional inspection of the idle shutdown timer in the HDVIP program
# Emissions Reductions

## Preliminary Estimates (tpd)

**Assumptions:**
- Percent of Trucks w/ sleepers: 20%
- Percent reduction using auto start/stop system: 50%
- Percent reduction using idle shutdown timer (HHDD): 95%
- Percent reduction using idle shutdown timer (MHDD): 17%

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>NOx</td>
<td>4.58</td>
<td>10.86</td>
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<tr>
<td>ROG</td>
<td>0.25</td>
<td>0.60</td>
</tr>
<tr>
<td>PM</td>
<td>0.06</td>
<td>0.14</td>
</tr>
<tr>
<td>CO</td>
<td>1.49</td>
<td>3.54</td>
</tr>
<tr>
<td>CO2</td>
<td>0.24</td>
<td>0.55</td>
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Emissions Reductions

Inventory improvements needed:

- emission rates in the inventory were obtained at low idle speeds with no loading
- NOx at elevated RPM and with HVAC loading is approximately double that observed at low idle with no HVAC loading. (CATI, U.S. EPA, UC-Davis, studies).
- idle time for medium-heavy diesel engines may change.
- change methodology to calculate emission reductions, e.g., keeping the fleet average of 1.75 hrs/day idle time but assuming 20% of them (w/sleepers) idle at 6 hrs/day and the remaining 80% (w/o sleepers) at 0.69 hrs/day.
- Requirement of 50% reduction from automatic start/stop system is under severe conditions (95ºF) - benefit may be more than 50%, since average temperatures are most of the time lower than 95ºF.
• Emission rates: not representative of long duration idling trucks with HVAC loading
• Why start with the 2007 MY and why not earlier?
• What will the ARB do with pre-2007 MY trucks?
• Does the requirement apply to government as well as private fleets?
• Are there exemptions for vehicles that require power to operate auxiliary devices (e.g., cement mixers, emergency vehicles, etc.)?
Schedule

- Meetings with manufacturers and stakeholders: June - July 2003
- Staff report and draft regulatory language: August - September 2003
- Board hearing: November 13, 2003
Contact information

• Daniel Hawelti - (626) 450-6149 (dhawelti@arb.ca.gov)

• Truck idling listserv:
  – http://www.arb.ca.gov/listserv/truck-idling/truck-idling.htm

• Truck idling website:
  – http://www.arb.ca.gov/msprog/truck-idling/truck-idling.htm