Reducing Idling Emissions From New and In-use Heavy-duty Trucks

Public Hearing
October 20, 2005
Sacramento, California

California Environmental Protection Agency
Air Resources Board
Today’s Presentation

- Background
- Staff’s Proposal
- Regulatory Impacts
- Air Quality and Other Benefits
- Issues
- Summary
Reasons for Truck Idling

- Operate power takeoff e.g. cement mixers, fire trucks, trash trucks
- Cabin climate control
  - Waiting
  - Sleeping
- Power in-cabin appliances
- Warm up engine in cold weather
Emission From Idling Sleeper Trucks Are Significant

- Smog emissions

<table>
<thead>
<tr>
<th>2010 Statewide (tons per day)</th>
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<tbody>
<tr>
<td>NOx</td>
</tr>
<tr>
<td>53</td>
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</table>

- Greenhouse gas emissions (CO2)
  - 2010 GHG emissions = 1.1 megatons per year

- Fuel consumption
  - Typically 1 gallon per hour
  - 2100 gallons per year per truck
Current Regulations Restrict Idling: Sleeper Trucks Excluded

- **School buses**
  - Prohibits idling at or near schools
  - Applies to other vehicles too

- **Commercial vehicles (diesel-fueled)**
  - 5 minute limit
  - Sleeper trucks excluded
Summary of Staff’s Proposal

- **Limits idling of all sleeper trucks to 5 minutes**
  - Same limit as currently applies to other trucks
- **New engine requirements**
  - Equip with automatic engine shutoff device
    - Or demonstrate low engine idle emissions
- **New and existing trucks**
  - Sets emission requirements for alternative devices that provide cabin comfort and power
- **Begins in 2008**
New Engine Requirements

- **Applies to**
  - Heavy-Duty Diesel Engines
  - 14,001+ pounds
  - 2008+ model year

- **Exemptions:**
  - motorhomes
  - buses
New Engine Requirements

- **Automatic engine shutdown system required**
  - After 5 minutes
  - Non adjustable
  - Tamper resistant
  - Similar devices used on some engines today

- **Alternative compliance**
  - Limit main engine idle NOx emissions to 30 grams/hour
  - May be technically possible for 2010+ engines
Engine Shutdown System - New Engines

- Activates when vehicle stops, transmission is in “neutral” or “park” position
- Allows manual reset
- Use of power takeoff overrides shutdown
- Engine warm up overrides shutdown (up to 60°F)
Benefits of Automatic Engine Shutdown – New Engines

- Helps ensure compliance with idling restrictions
  - Sleeper and non-sleeper trucks
- Encourages use of cleaner, alternative technologies for cabin comfort and power
- Helps assure emission reductions achieved
Optional NOx Idling Limit - New Engines

- Auto-shutdown device not needed if idle emissions low
  - 30 g/hour standard ~ 80% reduction
- Engine manufacturers requested option
- Transparent to trucker
- Eliminates cost of alternative technologies to provide cabin comfort and power
- Not yet clear if technically feasible
In-use Idling Restrictions - New and Existing Trucks

- Ends exemption for sleeper trucks
  - 5 minute limit applies to CA and out-of-state registered sleeper trucks
  - Exceptions for traffic congestion, during repairs, power take-off, etc.

- Establishes emission limits for alternative technologies that provide cabin comfort and power
  - More stringent limits for technologies used on 2007+ trucks
Alternative Technologies That Provide Cabin Comfort and Power

- Small auxiliary power system (APS) engines
  - Run A/C, provide electricity
- Battery powered A/C and power
- Fuel fired heaters
- Thermal storage devices
- Plug-in at electrified parking spaces
- Off board power, heating, and cooling, e.g. IdleAire
Special Emission Considerations for Diesel APUs

- **Pre-2007 truck**: Meet current new diesel engine emission standard

- **2007+ truck (low PM emissions)**:
  - Plumb exhaust through truck’s PM filter, or
  - Install verified level 3 retrofit device
  - Without this requirement, PM emissions would be higher than main engine
  - **Note**: This requirement a major issue with EMA
Special Emission Considerations for Fuel Fired Heaters

- **Pre-2007 truck:**
  - Any heater

- **2007+ truck:**
  - Meet ULEV standards
  - Currently commercially available
Cost of Engine Shutdown Devices
2008+ Engines

- Shutdown system is a standard feature in current electronic engines
  - No significant cost to develop the technology

- Cost to track engines destined for sale in California and minimal engine shutdown reprogramming cost:
  - $100 per engine
Cost of Alternative Technologies for Cabin Comfort and Power

**Fully Integrated Diesel-Fueled APS**
- OEM option, available on new trucks only
- Cost less than aftermarket APSs
- Heating, Cooling, Electrical Power
- Fuel use: ~ 0.2 gal/hour
- Manufacturers: Caterpillar, Cummins
Cost of Alternative Technologies for Cabin Comfort and Power

**Diesel-Fueled APS**
- Heating, Cooling, Electrical Power
- Fuel use: ~0.2 gallon/hour
  - Main engine ~ 1 gallon/hour
- Cost including installation: $6,000 - $8,500
- Cost of APS with verified PM control device $8,000 to $10,500
Cost of Alternative Technologies for Cabin Comfort and Power

**Fuel Fired Heaters**

- Engine and/or cab heating only
- Fuel use: 0.02-0.16 gal/hour
- Cost: ~ $1,000 - $3,000
Cost of Alternative Technologies for Cabin Comfort and Power

**Battery Electric APS**
- Heating, cooling, electrical power
- Battery recharged while driving
- Cost: $4,000 - $10,000

Power Pack
Cost of Alternative Technologies for Cabin Comfort and Power

**Thermal Energy Storage**

- Cooling energy stored while driving
- Cab cooling only
- Cost: ~ $3,600
- Can be integrated with fuel-fired heater for heating (Cost for cooling and heating: $4,600)
Cost of Alternative Technologies for Cabin Comfort and Power

**Shore Power with On-Board Truck Equipment**

- 110 Volts electrical power, internet, cable television
- Cost ~ $3,500-$6,000 per parking space
- Cost of electric AC unit, inverter/charger, electrical connections: ~$4,000 per truck
Cost of Alternative Technologies for Cabin Comfort and Power

Off-Board Power Infrastructure

- Heating, cooling, 110 Volt electrical power, internet, telephone, television
- Cost for truck operator $1.60 to $1.88 per hour, for basic services (climate control)
- Cost ~ $12,000 - $20,000 per parking space
## Payback Time With Fuel Savings

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Technology</th>
<th>Cost ($)</th>
<th>Payback (years)</th>
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</thead>
<tbody>
<tr>
<td>Thermoking</td>
<td>Diesel APS (APS+PM trap)</td>
<td>8500 (10500)</td>
<td>1.7 (2.1)</td>
</tr>
<tr>
<td>Pony Pack</td>
<td>Diesel APS (APS+PM Trap)</td>
<td>7000 (9000)</td>
<td>1.4 (1.8)</td>
</tr>
<tr>
<td>Idling Solutions</td>
<td>Battery Electric</td>
<td>10000</td>
<td>1.6</td>
</tr>
<tr>
<td>Bergstrom (NITE System)</td>
<td>Battery Electric for AC + Fuel Fired Heater</td>
<td>4200</td>
<td>0.7</td>
</tr>
<tr>
<td>Webasto (BlueCool Truck + Air Top 2000)</td>
<td>Cold Storage for AC + Fuel Fired Heater</td>
<td>4600</td>
<td>0.7</td>
</tr>
<tr>
<td>Xantrex/Dometic</td>
<td>Inverter/charger + Electric AC and Heat</td>
<td>4000</td>
<td>0.6</td>
</tr>
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Idle Hours/year = 2100; Fuel Use = 1 gal/hour; Fuel Cost: = $3.05/gal
Availability of Carl Moyer Funding

- Funding possible for technologies that go beyond the proposed requirements
  - Cleaner than diesel APS
    - Battery electric APS
    - Thermal energy storage
    - Truck on-board equipment for use with on-shore power

- Carl Moyer Program guidelines will be revised in November 2005
  - Staff still evaluating guidelines for alternative technologies
# Emission Benefits

## 2010 Statewide Emission Reductions*

<table>
<thead>
<tr>
<th>Reductions (tons per day)</th>
<th>NOx</th>
<th>HC</th>
<th>PM</th>
<th>CO2</th>
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<tr>
<td></td>
<td>46</td>
<td>4.2</td>
<td>0.42</td>
<td>1930</td>
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*Sleeper truck population = 75,000*
Other Benefits

- Consistent with Board adopted SIP, Diesel Emission Reduction Plan, EJ Policy
- Consistent with Governor’s GHG reduction plan
  - 2010 GHG reductions of ~1 megaton per year
- Reduces petroleum use consistent with ARB/CEC policy recommendations
  - 160 million gallons/year saved
Issues

- **EMA:** Changes current practice of aligning new engine standards with USEPA
  - Tier 4 standards for off-road engines in the 0 to 25 hp category
  - New NOx idling emissions standard for on-road heavy-duty diesel engines

- **Staff Response:**
  - Requirement for use of filter on APS (2007+) applies to truck operator, not engine manufacturer
  - NOx idling emission standard is optional
Issues

- **ATA and CTA:**
  - More lead time needed to adjust to requirement
  - Nationwide requirements would provide consistency for truck operators

- **Staff Response:**
  - Emissions are significant and need to be addressed
  - Alternative technologies already available
  - US EPA has no plans for adopting nationwide idling rule (model rule for states only)
Staff Recommended Modifications
15-day Changes

- New Engine Requirements
  - Minor change to PTO override provisions

- In-Use Idling Requirements
  - Exempt battery-electric and electric infrastructure technologies from EO approval requirement
  - Clarification on electric shore power availability as a compliance option
Summary

- Provides needed smog emission reductions
- Consistent with SIP, DRRP, EJ policy
- Consistent with achieving Governor’s GHG reduction goals
- Consistent with ARB/California Energy Commission’s recommendation to reduce demand of petroleum use
- Feasible technologies provide cabin comfort and power w/o engine idling
- Payback to typically 2 years or less
- Staff recommends Board approval