

DIESEL RETROFIT PROGRAM

**Proposed
Solid Waste
Collection
Vehicle Rule
Sept. 2001**



California Environmental Protection Agency

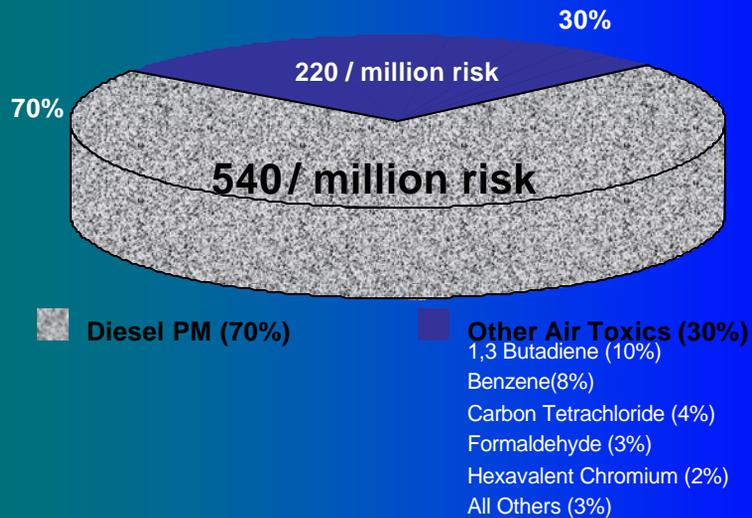


Air Resources Board

Workshop Topics

- ◆ Workshop 1 (June 2001)
- ◆ Workshop 2 (September 2001)
 - Revised proposed regulation
 - Verification of emission control systems (ECS)
 - Cost effectiveness

70% Air Toxic Risk from Diesels



Diesel Risk Reduction Plan (DRRP)

- ◆ Reduce Emissions from New Engines
- ◆ Ensure In-use Emission Performance
- ◆ Provide Low Sulfur Fuel (<15ppm) to Enable Aftertreatment Technology
- ◆ *Require Retrofit of Existing Engines*

Mobile Diesel PM Retrofit Rules

- ◆ Public Transit Bus Fleets (Feb. 2000)
- ◆ Solid Waste Collection Vehicles (Dec. 2001)
- ◆ Fuel Tanker Trucks (2002)
- ◆ Remaining On- and Off-road Heavy-duty Diesel Fleets (2003+)

Proposed Rule Draft - Scope

- ◆ Definition of “Refuse Removal Vehicle”
Changed to “Solid Waste Collection Vehicle”
 - HDDV greater than 14,000 lbs. GVWR
 - Used to collect residential and commercial waste
 - Front, side and rear manual and automatic loaders
 - Rolloffs
 - Fixed route generally

Proposed Rule Draft - Standards

- ◆ In-Use Engine Performance Standards:
 - Diesel PM certified to 0.01 g/bhp-hr
- ◆ Engines that Already Meet Standard:
 - Diesel PM certified to 0.01 g/bhp-hr
 - Alternative-fueled
- ◆ If Engine Doesn't Meet Standard:
 - Retrofit using highest verified level ECS
 - Repower
 - Convert to alternative-fueled

Alternative Fueled Definition

- ◆ Alternative-fueled Defined
 - **Natural gas**
 - Propane
 - Ethanol
 - Methanol
 - Electricity
 - Fuel cells
 - Non-diesel fuel advanced technologies
 - These fuels used in combination with each other or in combination with other non-diesel fuels.

Dual Fuel = Alternative Fueled?

- ◆ Dual Fuel or Hybrid-electric Vehicles 0.01 g/bhp-hr diesel PM Emissions = Alt. Fueled Exempt
 - No solid waste collection vehicles meet explicitly
- ◆ Other Dual Fuel Collection Vehicles (>0.01 g/bhp-hr PM Emissions)
 - LNG dual fuel vehicles with Executive Orders
 - San Diego refuse hauler study
 - Implementation delay to Tier 3
 - Further study

Proposed Rule Draft - Retrofit

- ◆ Retrofit using an ECS
 - Verified to the highest level diesel PM emission reduction capability
 - Level 1 = between 30 and 60%
 - Level 2 = between 60 and 85%
 - Level 3 = greater than 85%, or 0.01 g/bhp-hr absolute

Retrofit - Current Status

- ◆ ECS have been Verified that Meet Level 3 85% PM Emission Reduction Goal
 - Johnson Matthey: DDC S50 Bus (1999-2000), S50 Truck (1999), and S60 12.7L (1998)
 - Engelhard: Cummins M11 (1995-1997); ISM (1998-2001)
- ◆ Applications
 - Trucks (refuse, fuel tanker, long haul)
 - Buses (urban and long haul)

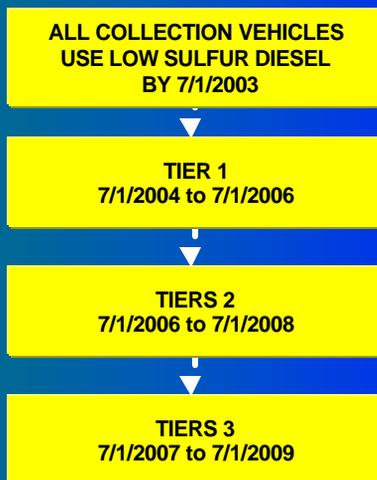
Retrofit - Collection Vehicles

- ◆ 67% Surveyed in California
- ◆ 65% Cummins Engines
- ◆ 13% M-11/ISM have Verified ECS
- ◆ No DDC Engines in Survey Meet Criteria
- ◆ More Verified ECS to Come

Proposed Rule Draft - Repower

- ◆ Repower Engine to a Certified 0.01 g/bhp-hr PM Emission Standard
 - Definition
 - Rebuilt, replaced, remanufactured
 - California certified kit or engine
 - Meets required certified PM emission level
 - Diesel engine certified to 0.01 g/bhp-hr PM emission standard
 - Diesel engine certified to 0.1 g/bhp-hr + ECS
 - Converted to alternative fueled engine

Proposed Rule Draft - Deadlines



Proposed Rule Draft - Deadlines

Tier	Engine Model Year	Fleet %	Implementation Date
1	1991-2002	25%	2004
		50%	2005
		100%	2006
2	Pre-1991	25%	2006
		50%	2007
		100%	2008
3	2003-2006	25%	2007
		50%	2008
		100%	2009

Proposed Rule Draft - Fuel

- ◆ Low Sulfur Diesel Fuel Used in all Diesel-fueled Collection Vehicles by July 1, 2003
- ◆ Application for Delay
 - ◆ Fuel/fuel infrastructure availability
 - ◆ Apply for delay to 7/1/2006
 - ◆ Documentation due to ARB by 1/31/2003
 - ◆ If fuel exemption granted, owner's Tier 1 vehicles moved to Tier 2 implementation schedule

Proposed Rule Draft - ECS

- ◆ Compliance Extension
 - ◆ No ECS available by six months prior to the vehicle model year's implementation date
 - ◆ Apply for one-year delay with annual report
 - ◆ Verifications announced by January 1st of each calendar year → Automatic delays
 - ◆ After the one-year delay, engine must use another method to meet the standard

Proposed Rule Draft - Reporting

INITIAL REPORT
TO ARB BY 1/31/2003

ALL COLLECTION VEHICLES
USE LOW SULFUR DIESEL
BY 7/1/2003

ANNUAL REPORTS
TO ARB BY

1/31/2004

1/31/2005

1/31/2006

1/31/2007

1/31/2008

1/31/2009

1/31/2010

TIER 1
7/1/2004 to 7/1/2006

TIERS 2
7/1/2006 to 7/1/2008

TIERS 3
7/1/2007 to 7/1/2009

Proposed Rule Draft - Reporting

- ◆ Reporting Made Easier
 - Initial report
 - Contact information
 - Vehicle/engine inventory
 - Retrofit information
 - Annual report
 - Changes to initial report
 - Maintenance and inspection records

Capital Costs

- ◆ Lowest Cost System:
 - ECS
 - Average \$2540 (range \$630-\$5500)
 - Installation
 - Similar to muffler
 - Average \$290 (range \$160-\$480)
 - Engine backpressure monitor (~\$1000)
 - Costs not accounted for:
 - Training - included with cost of ECS

Operation & Maintenance Costs

- ◆ Low Sulfur Diesel Fuel
 - ~\$0.06/gal extra
- ◆ Incremental Fuel Transportation
 - Average \$230 (range \$70 - \$400) annually
 - Depends on distance, load, and frequency
 - Cost from 2003 - 2005
- ◆ Increased Maintenance/ECS Cleaning
 - Visual inspection
 - One cleaning per year
 - Average cost \$80

Negligible Ash Disposal Fee

- ◆ Ash disposal from ECS cleaning
 - 10 - 15 grams per disposal
 - Once per year
- ◆ Manage with Other Hazardous Wastes

Cost Per Vehicle

Cost	Average Annual Cost per Vehicle*
Annualized Capital	\$225
O & M	\$80 (\$510**)
TOTAL:	\$315 (\$735**)

*Based on four year lifetime.

**Cost includes incremental fuel and fuel transportation costs before July 1, 2006.

Additional Data Collection

- ◆ Demonstration Programs
 - LA City Sanitation - 15 collection vehicles
 - Older vehicle demonstrations
 - September 2001 – September 2002
 - In-depth engine survey for pre-1991 model year engines

Regulation Plans

- ◆ Workshops
 - Public comment by September 7, 2001
- ◆ Staff Report and Proposed Rule
 - October 26, 2001
- ◆ Board Hearing:
 - December 13 – 14, 2001

www.arb.ca.gov/diesel/dieselrrp.htm

Comments Encouraged

- ◆ Dual Fuel
- ◆ Costs
- ◆ Revised Implementation Schedule
- ◆ Revised Standards

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