

Diesel Off-road Equipment Measure - Workshop

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Kim Heroy-Rogalski, P.E.,
Heavy-Duty Diesel In Use Strategies Branch

California Environmental Protection Agency



Air Resources Board

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Health Effects of Diesel PM

- Increases Cancer Risk, Hospital Admissions & Premature Deaths
- In California in year 2000, diesel PM associated with:
 - ◆ 2,000-2,500 annual premature deaths
 - ◆ ~3,600 annual hospital admissions for pneumonia, cardiovascular disease, asthma, bronchitis
- By comparison, 3,700 deaths from car accidents, 2,000 homicides

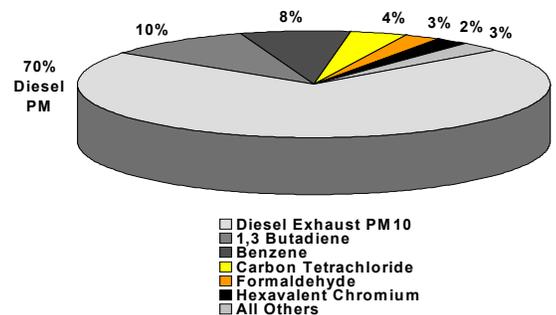
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Overview

- Introduction
- Background
 - ◆ Health Effects of Diesel PM
 - ◆ Diesel Risk Reduction Plan
 - ◆ ARB Diesel PM Control Measures
- Off-Road Equipment Measure
 - ◆ Equipment Affected
 - ◆ Reduction Options/Verification
 - ◆ Off-Road Activities
 - ◆ Possible Approaches for Measure
- Next Steps

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•70% of Known Statewide Air Toxics Risk is from Diesel PM - Year 2000



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Introduction

- Why we are here
- Help we hope to get from stakeholders
 - ◆ Input on how to structure rule
 - ◆ Participation in workgroup(s)
 - ◆ Help with survey
 - ◆ Help identifying other stakeholders
- Products we will develop
 - ◆ Regulation
 - ◆ Staff report

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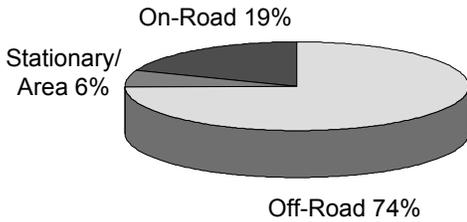


California Diesel Risk Reduction Plan

- Established Goals
 - ◆ Reduce PM emissions from all diesel-fueled engines in California
 - ◆ 75% reduction by 2010
 - ◆ 85% reduction by 2020
- Four-pronged approach
 - ◆ New engine standards
 - ◆ Cleaner diesel fuel - <15 ppm S
 - ◆ Retrofit of existing engines
 - ◆ Ensure in-use emissions maintained

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California Diesel PM - Year 2010



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Schedule for Future ARB Diesel PM Measure Adoption Cont'd

■ 2006

◆ Off-Road Equipment (Public and Private)

◆ Private On-Road Trucks

■ 2007+

◆ Agricultural Off-Road Equipment

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Adopted ARB Diesel Measures

- Transit agency fleet rule (2/00)
- School bus idling (12/02)
- Airport Ground Support Equipment Memorandum of Understanding (12/02)
- Solid waste collection vehicles (9/03)
- Stationary CI engines (2/04)
- Portable engines (2/04)
- Transport Refrigeration Units (2/04)
- Commercial vehicle idling (7/04)

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Off-Road Equipment Measure



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Future ARB Diesel Measures

■ 2004-5

- ◆ Intrastate Locomotive/Commercial Harbor Craft Fuel
- ◆ Transit Fleet Vehicles (Non Urban Buses)
- ◆ Public On Road and Private Utilities
- ◆ Cargo Handling Equipment (Ports and Intermodal Facilities)
- ◆ Harbor Craft
- ◆ Ship Auxiliary Engines
- ◆ Stationary Agricultural Engines

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Scope of Off-Road Equipment Rule

Category	PM, 2010, statewide [tpd]	# of Units
Construction & Mining	14.8	175,000
Industrial	0.8	8,500
Logging	0.4	2,800
Airport Ground Support Equipment (non South Coast, non-portable)	0.1	800
TOTAL	16.1	187,100

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PM Reduction Options

- Replacement
 - ◆ Newer equipment meets cleaner standards
- Repower
 - ◆ Replacement engines are cleaner
- Retrofit
 - ◆ Verified technologies reduce emissions



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Potential Reduction Technologies

- Exhaust Aftertreatment
 - ◆ Passive and Active Diesel Particulate Filters (DPFs)
 - ◆ Flow-thru Filters
 - ◆ Diesel Oxidation Catalyst (DOC)
 - ◆ Urea-SCR Catalyst
- Fuels
 - ◆ Fuel additives - fuel-borne catalysts
 - ◆ Emulsified Fuels, oxygenated fuels
 - ◆ Biodiesel
 - ◆ Fischer Tropsch

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Emission Standards for New Diesel Off-Road Engines

- Becoming stricter over time
- Levels and effective dates depend on engine size (hp)
 - ◆ Tier 1: First effective in 1996-2000
 - ◆ Tier 2: First effective 2001-6
 - ◆ Tier 3: First effective 2005-8
 - ◆ Tier 4: First effective 2011-2015
- Low-sulfur diesel fuel (<15 ppm) required mid-2006

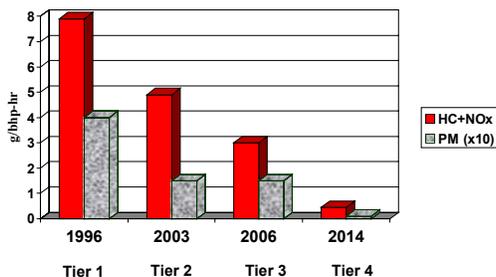
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ARB Retrofit Verification Process

- Evaluates emission reduction capabilities of technology
- Ensures real and durable reductions
- 3 levels of verification:
 - ◆ Level 3 ($\geq 85\%$ PM reduction or ≤ 0.01 g/bhp-hr PM)
 - ◆ Level 2 ($\geq 50\%$ PM reduction)
 - ◆ Level 1 ($\geq 25\%$ PM reduction)

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Emission Standards for a 175 hp Diesel Engine



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Current Verifications

- Level 3
 - Cleaire Flash & Catch CRT/DPX (25% NOx ↓)
 - Cleaire Longview DPF + Lean NOx (25% NOx ↓)
 - Clean Air Partners DPF
 - CleanAIR Systems DPF (Stationary)
 - Donaldson DPF
 - Johnson Matthey CRT DPF
 - Lubrizol ECS Purifilter DPF

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Current Verifications Cont'd

■ Level 2

- Environmental Solutions Worldwide Flow Thru Filter
- Lubrizol PuriNOx (15% NOx ↓)
- Lubrizol PuriNOx/Purimuffler (20% NOx ↓, off-road intermodal facilities)

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Off-road PM Control Activities

■ Sacramento Air District Construction Mitigation



- ◆ Suggests 20% NOx↓ and 45% PM↓ from state average construction fleet emissions
- ◆ Has encouraged the use of newer construction equipment

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Current Verifications Cont'd

■ Level 1

- Cleaire Flash and Match (25% NOx ↓)
- Donaldson DOC
- Donaldson DOC + Spiracle
- Lubrizol ECS AZ Purifier & Purimuffler (off-road intermodal facilities)

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Off-road PM Control Activities cont'd

■ San Luis Obispo Air District Construction Mitigation



- ◆ Best Available Control Technology for construction equipment
- ◆ Avila Beach Remediation - 12 DOCs, 3 DPFs on construction equipment
- ◆ Woodlands Housing Development - 12 DOCs on scrapers; repowered bulldozer

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Further Information on ARB Verification Process

■ For further info, see website

<http://www.arb.ca.gov/diesel/verdev/verdev.htm>

■ Contact:

Scott Rowland, Manager, Retrofit Assessment Section, (626) 575-6972, growland@arb.ca.gov

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Off-road PM Control Activities cont'd

■ CIAQC 2003 Demonstration

- ◆ Joint effort-CIAQC, SCAQMD, ARB, LA County
- ◆ Retrofitted 18 heavy-duty construction vehicles
- ◆ DPFs on 24 engines

■ Boston Central Artery Tunnel "Big Dig"

- ◆ >100 pieces of construction equipment retrofitted with DOCs (cranes, lifts, excavators, bulldozers, etc.)
- ◆ Idling limits



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Off-road PM Control Activities cont'd

- World Trade Center Diesel Emissions Reduction Project
- New York City Construction Ordinance
 - ◆ Lower Manhattan, then all of New York City
 - ◆ Requires ultra-low S diesel fuel and best available PM control technology
 - ◆ Diesel off-road vehicles \geq 50 hp owned by or operated on behalf of the City

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Possible Approaches for Off-Road Equipment Measure

- Accelerated turnover to cleaner engines
- Retrofit with Best Available Control Technology
 - ◆ Could include exhaust aftertreatment and/or alternate diesel fuels
- Idling limitations
- Registration, recordkeeping, reporting, and/or inspection

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Off-road PM Control Activities cont'd

■ Swiss Construction Retrofit Ordinance



- ◆ DPFs required for all construction equipment used at large construction sites
 - + Equipment > 50 hp by 9/1/03
 - + Equipment \geq 25 hp by 9/1/05
- ◆ Over 6,000 construction machines have been retrofitted with DPFs

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Next Steps for Off-Road Equipment Rulemaking

- Survey
- Workgroup
- More workshops to come in 2005
- Public hearing and consideration by Board in early 2006

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Off-road PM Control Activities cont'd

■ VERT Filter List

- ◆ VERT began in response to diesel PM problem in tunnel construction
- ◆ Joint German, Austrian, Swiss project
- ◆ Suitability testing and subsequent field tests for particle-trap systems

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Contacts

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| ■ Kim Heroy-Rogalski (staff)
kheroyro@arb.ca.gov
(916)327-2200 | ■ Annette Hebert, Chief, Heavy-duty Diesel In-use Strategies Branch
ahebert@arb.ca.gov
(626)575-6973 |
| ■ Ron Nunes (staff)
rnunes@arb.ca.gov
(916)327-0376 | ■ Kitty Martin, Manager, In Use Controls Section
kmartin@arb.ca.gov
(916)324-1362 |
- Website:**
<http://www.arb.ca.gov/msprog/ordiesel/ordiesel.htm>

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