

## Mobile Cargo Handling Equipment Workgroup Meeting

### ARB Enforcement of 2011 CHE Regulatory Amendments

August 27, 2015

Oakland, California



California Environmental Protection Agency



Air Resources Board

## Overview

- ◆ Background
- ◆ U.S. EPA Authorization to Enforce
- ◆ Opacity Monitoring
- ◆ Tier 4 Alt PM Engine Retrofit Requirements
- ◆ Enforcement
- ◆ Next Steps
- ◆ Questions/Comments



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## Background



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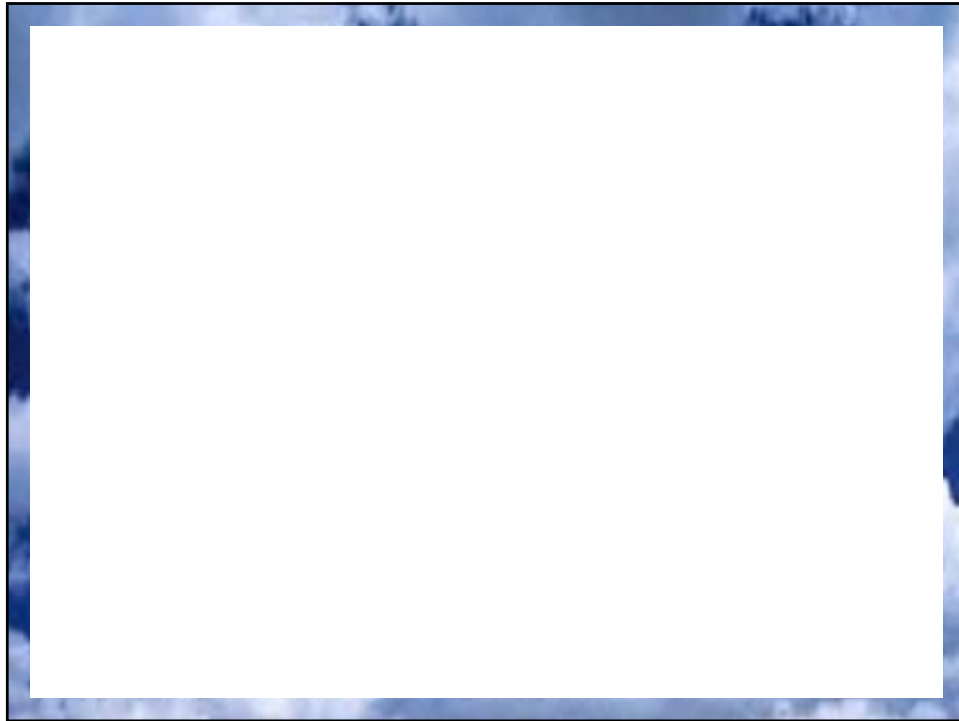
Background

## CHE Regulation Background

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- ◆ Adopted by ARB December 2005
- ◆ Implementation began January 2007
- ◆ Amendments adopted by ARB September 2011
- ◆ Implementation of amendments began November 2012

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## Need for EPA Authorization

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- ◆ Clean Air Act (CAA) prohibits states from enacting emission standards for motor vehicles
- ◆ Allows California to request an authorization to enforce its own non-road standards
- ◆ CAA Section 209(e)(2) allows EPA to grant authorization to California if:
  - Standards are not arbitrary or capricious
  - Standards required to meet compelling conditions
  - Standards and enforcement consistent with CAA

## U.S. EPA Authorization to Enforce CHE Regulation

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- ◆ U.S. EPA authorized enforcement of initial CHE regulation November 2011
- ◆ U.S. EPA authorized enforcement of 2011 amendments to CHE regulation April 2015

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## Requested U.S. EPA Authorization for Two Amendments

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- ◆ Opacity monitoring - for both yard truck and non-yard truck CHE
- ◆ Retrofit of Tier 4 Alt PM engines
  - Tier 4 Alt PM emissions standards essentially Tier 3
  - Retrofit with highest level VDECS required within 1 year
- ◆ U.S. EPA authorized enforcement - April 29, 2015

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## U.S. EPA Confirmed Other Amendments Within Scope of Existing Authorization

- ◆ **Modification of retrofit requirements**
  - Examples: provide additional extension time and add safety as a criterion
- ◆ **Modification of operational practices**
  - Examples: add low-use compliance extension and allow non-yard truck transfers between facilities under common control
- ◆ **Allow demonstration of emissions equivalency for alternative technologies**
- ◆ **Modification of compliance requirements**
  - Examples: allow fleets to bring older engines in to compliance first and add a rural low-throughput ports exemption

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## Opacity Monitoring



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## Opacity Monitoring

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- ◆ Similar to ARB’s heavy-duty diesel vehicle smoke inspection program
- ◆ New CHE exempt for first four years
  - Example: 2015 MY engine exempt until January 1, 2019
- ◆ Alternative method of compliance available
  - Must be approved by ARB
  - Must demonstrate opacity test not feasible
  - Must detect increased soot

## Compliance Phase-in Schedule

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Percentage of Fleet Opacity Tested	Compliance Date
25%	October 26, 2015
50%	January 24, 2016
75%	April 28, 2016
100%	July 27, 2016

## Maximum Allowable Opacity Based on Engine PM Certification Standard

PM Standard or Emissions Limit		Maximum Opacity
g/kw-hr	g/bhp-hr	
Greater than 0.54 or uncertified	Greater than 0.40	55 percent
$0.42 \leq x \leq 0.54$	$0.31 \leq x \leq 0.40$	45 percent
$0.28 \leq x \leq 0.40$	$0.21 \leq x \leq 0.30$	35 percent
$0.15 \leq x \leq 0.27$	$0.11 \leq x \leq 0.20$	25 percent
$0.07 \leq x \leq 0.13$	$0.05 \leq x \leq 0.10$	15 percent
Less than 0.07	Less than 0.05	5 percent

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## Engines Must Be Tested in Certified Configuration

- ◆ Retrofitted engines
  - Test with VDECS removed or sampling port upstream of VDECS
  - May schedule when VDECS removed for cleaning or inspection
  - Opacity limit more stringent of:
    - Limit based on engine PM certification standard
    - Opacity limit for VDECS
- ◆ Engine with OEM aftertreatment
  - Such as Tier 4 or on-road 2007 or later
  - Test at exhaust of OEM aftertreatment

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## Opacity Testing - Overview

- ◆ Step 1: Determine the engine family name
- ◆ Step 2: Locate ARB certification Executive Order (EO) for the engine family name
  - <http://www.arb.ca.gov/msprog/offroad/cert/cert.php>
- ◆ Step 3: Determine engine PM certification standard
- ◆ Step 4: Determine opacity limit based on PM certification standard
- ◆ Step 5: Compare measured opacity to opacity limit

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## Step 1 – Engine Family Name



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## Step 2 – Executive Order

**AIR RESOURCES BOARD**      **CUMMINS INC.**      **EXECUTIVE ORDER LAR-03-010**  
Non-CO<sub>2</sub> Fuel  
Compression-Ignition Engines

Pursuant to the authority vested in the Air Resources Board by Sections 43013, 43016, 43101, 43102, 43104 and 43105 of the Health and Safety Code, and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order 0-02-063.

**IT IS ORDERED AND RESOLVED:** That the following compression-ignition engine and emission control system produced by the manufacturer are certified as described below for use in off-road equipment. Production engines shall be in all respects the same as those for which certification is granted.

MODEL YEAR	ENGINE FAMILY	DISPLACEMENT (liters)	FUEL TYPE	USEFUL LIFE (hours)
2008	KCDL223HAD	3.3	Diesel	8000

SPECIAL FEATURES & EMISSION CONTROL SYSTEMS	TYPICAL EQUIPMENT APPLICATION
Direct Diesel Injection, Turbocharger, Charge Air Cooler	Crane, Loader, Tractor, Dozer, Pump and Compressor

The engine models and codes are attached.

The following are the exhaust certification standards (STD), or family emission limits (FEL) as applicable, and certification levels (CERT) for hydrocarbon (HC), oxides of nitrogen (NOx), or non-methane hydrocarbon plus oxides of nitrogen (NMHC+NOx), carbon monoxide (CO), and particulate matter (PM) in grams per kilowatt-hour (g/kw-hr), and the opacity certification standards and certification levels in percent (%), (0.2 opacity certification level), (lug), (3), and the peak value from either mode (Peak) for the engine tests (Title 13, California Code Regulations, 101320.1).

RATED POWER CLASS	EMISSION STANDARD CATEGORY	EXHAUST (g/kw-hr)					OPACITY (%)			
		HC	NOx	NMHC+NOx	CO	PM	ACCEL	LUG	PEAK	
75 ≤ kW < 130	Tier 2	STD	N/A	N/A	6.6	5.0	0.30	20	15	50
		FEL	N/A	N/A	6.2	N/A	N/A	N/A	N/A	N/A
		CERT	--	--	5.3	0.6	0.18	12	3	35

**BE IT FURTHER RESOLVED:** That the family emission limits (FEL) is an emission level declared by the manufacturer for use in any averaging, banking and trading program and in lieu of an emission standard for certification. It serves as the applicable emission standard for determining compliance of any engine within this engine family under 13 CCR Sections 2423 and 2427.

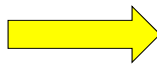
**BE IT FURTHER RESOLVED:** That for the listed engine models, the manufacturer has submitted the information and materials to demonstrate verification compliance with 13 CCR Section 2424 (emission control labels), and 13 CCR Sections 2423 and 2426 (emission control system warranty).

Engines certified under this Executive Order must conform to all applicable California emission regulations.

This Executive Order is only granted to the engine family and model specified above. Engines in this family that are produced for any other model year are not covered by this Executive Order.

Executed at El Monte, California on this 13<sup>th</sup> day of October 2005.

*Albert J. Clark*  
 Albert J. Clark, Chief  
 Mobile Source Operations Division



## Step 3 – PM Certification Standard

RATED POWER CLASS	EMISSION STANDARD CATEGORY		EXHAUST (g/kw-hr)					OPACITY (%)		
			HC	NOx	NMHC+NOx	CO	PM	ACCEL	LUG	PEAK
75 ≤ kW < 130	Tier 2	STD	N/A	N/A	6.6	5.0	0.30	20	15	50
		FEL	N/A	N/A	6.2	N/A	N/A	N/A	N/A	N/A
		CERT	--	--	5.3	0.6	0.18	12	3	35



## Steps 4 & 5 – Determine Opacity Limit and Compare to Measured Level

U.S. EPA PM Emissions Limits (g/bhp-hr)	Percent Opacity Not to Be Exceeded
> 0.4	55
0.31 ≤ to ≤ 0.4	45
0.21 ≤ to ≤ 0.3	35
0.11 ≤ to ≤ 0.2	25
0.05 ≤ to ≤ 0.1	15
< 0.05	5


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Preliminary Cleanout Sages
Test # Peak %
1 11.5
2 7.31
3 8.10

.....OFFICIAL OPACITY TESTS.....
Test # Peak % Corrected Peak%
1 6.43 6.43
2 5.43 5.03
3 4.85 4.85

Results Corrected for Ambient Conditions
Peak Opacity Difference: 1.78 %
HI-LO Difference within spec
*** HI-LO Difference VALID ***
*** Zero-Drift Check VALID ***

3 TEST AVERAGE OPACITY:.....5.37
    
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## What If Measured Opacity Above Limit?

- ◆ Take engine out of service and perform required repair or maintenance
- ◆ Repeat opacity test after repair/maintenance
- ◆ Post-repair/maintenance opacity must be no more than 5% above opacity limit
- ◆ Equipment must remain out of service until measured opacity is no more than 5% above the opacity limit

## Tier 4 Alt PM Engine Retrofit Requirements



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### U.S. EPA Tier 4 Alt PM Emissions Standards

## U.S. EPA Tier 4 Alt PM Engine Retrofit Requirement

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- ◆ Family Emissions Limit (FEL) Tier 4 Alt PM engines
  - PM certification standard essentially Tier 3
  - May be up to 20 percent of OEM's U.S. production
- ◆ Highest level VDECS must be installed within one year of purchase or lease
- ◆ Retrofit not required for engines certified to primary Tier 4 PM emissions standards

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## Tier 4 Alt PM Engine EO

RATED POWER CLASS	EMISSION STANDARD CATEGORY		EXHAUST (g/kw-hr)					OPACITY(%)		
			NMHC	NOx	NMHC+NOx	CO	PM	ACCEL	LUG	PEAK
130-560	Interim Tier 4/ ALT 20% NOx + NMHC, ALT 20% PM	STD	N/A	N/A	2.1	3.5	0.02	20	15	50
		FEL	N/A	N/A	4.0	N/A	0.20	N/A	N/A	N/A
		CERT	**	**	3.3	2.8	0.14	14	4	20

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## Seller/Leasor Disclosure Requirement

- ◆ CHE regulation section (p) requires written disclosure if engine is certified to Tier 4 Alt PM standards
- ◆ Must provide following disclosure on the bill of sale, lease agreement, or rental agreement:  
 “When operated at a California port or intermodal rail yard, this engine is subject to the retrofit requirements of either subsection (e)(1)(B)3., (e)(3)(B)1.b., (e)(3)(B)2.b., or (e)(3)(B)3.b. of the California Air Resources Board’s Regulation for Mobile Cargo Handling Equipment at Ports and Intermodal Rail Yards.”

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## Enforcement



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## Opacity Recordkeeping Requirements

Enforcement

- ◆ No reporting requirements
- ◆ Recordkeeping requirements:
  - To be kept with engine-specific maintenance records for 2 years
  - Records to be available to ARB staff upon request:
    - Maintenance records
    - Opacity test records
    - Repair records

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## Opacity Test Records Required

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- ◆ Brand name and model of opacity meter
- ◆ Dates of last opacity meter and chart recorder calibrations
- ◆ Name of opacity test operator
- ◆ Name and address of facility contracted to conduct tests (if applicable)
- ◆ Engine make, model, model year, serial number, and opacity test date
- ◆ Opacity standard for tested CHE
- ◆ Measured opacity (three successive readings)
- ◆ Opacity test result: pass or fail

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## Post-Test Failure Repair Records Required

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- ◆ Name of mechanic
- ◆ Date of repair
- ◆ Statement identifying nature of repair
- ◆ Itemized parts list
- ◆ Post-repair opacity test date
- ◆ Post-repair measured opacity (three successive readings)
- ◆ Post-repair opacity test result: pass or fail

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## Tier 4 Alt PM Engine Retrofit Recordkeeping Requirements

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- ◆ Recordkeeping same as for Tier 2 and 3 retrofit requirements
  - VDECS
    - VDECS type, manufacturer, model, serial number
    - Installation date
    - Level of control (1, 2, or 3); if not 3, include justification
    - Maintenance records
  - If no VDECS available – require documentation supporting non-availability

## Next Steps

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- ◆ ARB staff available for implementation and enforcement questions
- ◆ Enforcement begins October 26, 2015

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## Contacts

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**Web Site:** <http://www.arb.ca.gov/cargo>

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