

# Procedure for Approving Aftermarket Diesel Particulate Filters (DPF)

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## Public Workshop



December 4, 2014

California Environmental Protection Agency

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 **Air Resources Board**

# Overview

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- Purpose
- Background
- Procedure
- Next Steps

# Purpose

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- Provide end users the option to purchase a non-OEM aftermarket DPF
  - OEM new replacement part cost estimates: \$4300-\$7300 (multiple core types)
- Develop a procedure for evaluation and approval of modified emissions control systems
- Initial focus on 2007-2009 engines certified with DPFs
  - Later expand to other MY DPFs, DOCs and SCR

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# Background

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- Anti-tampering provisions in Vehicle Code 27156 and 38391
  - ARB approval required for device that modifies the original pollution control system
- Device or modification must:
  - Not reduce effectiveness/durability of required emission control device; and
  - Result in emission levels that are compliant with existing standards for that model year engine

# Existing Programs

## Aftermarket Parts & Verification

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### ■ Aftermarket Parts:

- For devices installed after initial vehicle/engine purchase which were not included in the original certification
- Significant restrictions on applying to engines certified with aftertreatment
- “Do no harm” for emissions impact

### ■ Verification:

- For devices installed after initial vehicle purchase
- Must demonstrate a real and durable reduction for NO<sub>x</sub> and/or PM
- Not intended for engines which are certified with DPFs

# Existing Programs

## Replacement Parts

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- Definition - 13 CCR 1900 (a)(20) “...is functionally identical to the original equipment part in all respects which in any way affect emissions (including durability)...”
- Testing and specifications equivalent to OEM certification
- Must be able to provide sufficient information to show that product meets these requirements (13 CCR 2221 and 2224)

# Modified Parts -DPFs

## Proposed Regulation

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- Modified parts

- Not identical in all respects to certified emissions control component
- Existing procedures deemed inadequate for certain emission critical parts like DOCs, DPFs, etc.
- Procedure does not exist for exemption of aftermarket DPF parts
- Separate evaluation procedure and approval path needed for aftermarket DPFs

# Proposed Concepts

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- Applicability
- Application Process
- Testing Requirements
  - Engine Validation
  - Emission Testing
  - Durability Testing
  - In-Field Compatibility Testing
  - Secondary Emissions Testing (if applicable)
- Warranty
- Other Requirements

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# Proposed Applicability

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- Manufacturers of aftermarket DPFs
- Installers

# Proposed Applicable Technology

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- Similar material as the OEM part
- Similar physical properties/dimensions as the OEM part
- Similar catalyst composition and loading as the OEM part
- No impact on operation of the engine, AECs, OBD monitoring strategy
- No additional parts from the OEM system
- No modification to certified OEM aftertreatment configuration

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# Proposed Application Process

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- Applicant submits formal preapplication
- ARB will respond to preapplication (iterative)
- ARB will provide approved test plan when preapplication is complete
- Applicant conducts testing
- Applicant submits data and information in final application and submits formal final application
- ARB will provide feedback (iterative)
- ARB awards Executive Order if warranted

# Proposed Emission Control Group

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- Emission control group will be defined by:
  - Engine OEM (aftertreatment configuration and regeneration strategies)
  - Catalyst formulation (OEM and modified part)
  - Significant physical changes in part structure and/or canning
  - Other factors as applicable

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# Proposed Testing Requirements

# Proposed Testing Goals

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- Ensure the device achieves emission reductions as certified to original OEM
  - Account for infrequent regeneration adjustments factors (IRAFs)
  - AECDs
- Ensure the device is durable
- Ensure the device is compatible with the engine
  - No fault, OBD, ECU impacts, etc.
- Ensure device does not affect engine function or normal operation

# Proposed Emission Engine Validation

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- Test engine requirements
  - Proper state of maintenance
  - Original OEM configuration
  - Minimum 5000 miles or 125 hours service accumulation
  - Meets certified emission standards (lab engines)
    - For  $\text{NO}_x$  / CO must not exceed 50% of certification emission value or must meet the standard, whichever is more stringent

# Proposed Test Plan Structure

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- Laboratory Testing
  - New OEM part and new aftermarket modified part accelerated engine aging
  - Emissions test both parts
  - Compare emissions
- Field Testing
  - Install the 500 hours lab-aged aftermarket modified part on a representative in-use vehicle
  - Emissions test
  - Two 200 hour additional units on different engine families within the emission control group

# Proposed Laboratory Aging

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- Both the modified part and OEM part are aged for 500 hours on the same engine
- Backpressure and temperature measured for the duration of the aging
- Ramped modal or FTP test cycle
  - 2 cycles followed by a full regeneration for FTP,
  - 1 cycle followed by a full regeneration for ramped modal
- Data must be valid and no EMD/OBD fault codes prior to and during testing

# Proposed 500 Hour Emission Testing

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- Testing on engine representative of emission control group
- Devices (OEM and modified part) must not have been operated after last aging regeneration
- FTP heavy-duty transient cycle
- 1 cold start plus 3 hot starts
- Emissions testing during regeneration event of a loaded filter
- Other testing as necessary (e.g. CFR 1065, Subpart L for semi-volatile organic compounds)

# Proposed Criteria

## Aged AMP vs. Aged OEM

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- Emissions levels of HC, CO, NO<sub>x</sub> must meet certification standards
- Emissions of PM must be  $\leq 0.01$ g/bhp-hr
- Catalytic Activity Check
  - Emissions levels of NO<sub>2</sub> no greater than 10% below OEM
- Average backpressure and temperature no greater than 10% above or below OEM
- Must check and record all ECU codes

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# Proposed In-Field Compatibility Testing

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- Purpose
  - Demonstrate device compatibility with engine and vehicle
  - Ensures modified part maintains catalytic activity and physical integrity
- Aged system must run an additional 500 hours on a representative engine/vehicle part of the emission control group
- Two additional 200 hour compatibility units on engines representative of the emission control group

# Proposed In-Field Compatibility Testing (continued)

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- Independent datalogger requirements:  
Timestamp, Engine RPM, Temperature, Backpressure,  
all ECU codes ( $\leq 10$  sec intervals)
- Third party letters
- Photographs of the device
- Device must not:
  - Have EMD/OBD error/fault codes or ECU interference caused by modified parts
  - Require maintenance or cleaning

# Proposed Field Unit Emission Testing

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- The field unit must be removed and retested on the original emissions test engine using the same test cycles/method
- Comparison of 500 hour field-aged modified part to previous 500 hour lab-aged modified part
  - Emissions of NMHC/HC no greater than 100% above new modified part
  - PM must be  $\leq 0.01$  g/bhp-hr
  - All other emissions within 10% of original testing
  - NO<sub>2</sub> within 20%

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# Proposed Additional Requirements

# Proposed Warranty

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- Product Warranty
  - 5 years or 150,000 miles, or
  - 2 years/unlimited miles
  - Annual reporting of sales and claims
- Claims exceeding 100 units or 4% of sales, whichever is greater, must be reported
  - Valid claims in excess of 4% will result in ARB action which may include revoking the EO, recall, ED action, etc.

# Proposed Warranty

## Continued

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- Installation Warranty
  - 1 year from date of installation
  - Installed correctly in accordance with manufacturer's instructions
  - Must keep track of installations and report claims greater than 4% of total installations or 100 individual claims
  - Installer must be approved by manufacturer

# Proposed Recordkeeping

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- Manufacturers & installers maintain information on:
  - Valid end user contact information
  - Description of vehicles and engines on which the units are installed
  - Date of purchase/installation
  - Hours/miles on engine at time of installation
  - Reason DPF was replaced
  - Vehicle assessment prior to installation
  - Device serial number
- Records maintained for 4 years from date of sale or installation or the warranty period, whichever is longer

# Proposed Vehicle Preassessment

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- Vehicle Assessment Requirements Ensuring
  - Appropriate vehicle/engine
  - Engine and DOC are in proper state of maintenance
  - No engine error codes, etc.
  - System is in original OEM exhaust aftertreatment configuration
  - Aftermarket part is installed in same location and orientation as OEM part
  - Original DPF is out of warranty

# Proposed Labeling

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- Legible, visible, durable
- EO number issued by ARB
- Unique serial number
- Name, address, phone number of manufacturer
- Part number
- Date (month/year) of manufacture
- Filter “birth weight” (i.e., original clean weight)
- Directional flow arrow

# Proposed Additional Requirements

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- Prohibit resale of used DPF
- Recall Process if:
  - Catastrophic failures / Safety issues
  - Enforcement action
  - High warranty claims, and/or operation failure issues
- Surveillance Testing
  - Manufacturer testing or inspection of in-use units triggers
  - ARB can require a manufacture to provide a device for inspection and testing

# Next Steps

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- Potential second public workshop anticipated March 2015
- Board Hearing Date – November 2015

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# Questions/Comments

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