

Compression Ignition and Heavy-Duty Certification

2011 EMA Certification Workshop

May 3, 2011

California Environmental Protection Agency

 **Air Resources Board**

2011 EMA Certification Workshop

- 2012+ General Certification Topics
- 2012+ On-Road Certification Topics
- 2011+ Off-Road Certification Topics

2012+

General Certification

Topics

2012+ Certification

General Topics

- CI-HD Staffing / Responsibilities
- 2011 MY Diesel Engine Certification – Lessons Learned
- Certification Application Issues

Compression-Ignition and Heavy-Duty Certification (CI-HD)

- CA-MDE (engine certified GVWR 8501~14000)
- CA-MDV (using above: exhaust and evaporative)
- On-Road HD Otto Cycle Engines (GVWR>14000)
- On-Road HD Diesel Cycle Engines (GVWR>14000)
- On-Road HD Evaporative Vehicles Certification
- On-Road HD Hybrid Vehicles (GVWR>14000)
- Off-Road Compression-Ignition Engines
- On-Road HD ZEV Approvals
- Fuel-Fired Heaters Approval (GVWR>14000)

CI-HD Staff / E-Mail Address

Kimberly Pryor – Manager	kpryor@arb.ca.gov
Paul Adnani	padnani@arb.ca.gov
Zachary Evans	zevans@arb.ca.gov
Tsatsu Nukunya	tnukunya@arb.ca.gov
James Pang	spang@arb.ca.gov
Babak Pazokifard	bpazokif@arb.ca.gov
Michael Pham	lpham@arb.ca.gov

On-Road Light-Duty (ONLD)-- Diesel Certification

- ONLD certifies EMA manufacturers' diesel LDT and MDV.
- Diesel SCR and AECD reviews are coordinated between CI-HD and ONLD staff.
- Current ONLD staff certifying diesels:

Duc Nguyen, Manager

dnguyen@arb.ca.gov

Seongyup Kim

skim@arb.ca.gov

Lucky Benedict

nbenedic@arb.ca.gov

Tony Martino

tmartino@arb.ca.gov

Bill McDuffee

wmcduffe@arb.ca.gov

Lessons Learned

From 2011 Diesel Engine Certification

- Review of Sensors Table
- Sensors Fault vs. ATD Shut-off
- SCR Strategy Approval for 2011 MY
- Toxic Compound Emissions (TAC Emissions)

- ATD = After-treatment Device

Certification Application Issues

- Engine Label Testing
- Delegated Assembly Process
- DF Program Options

Engine Label Testing

- Labels must self-destruct upon removal
- Durability
 - 10 years or compliance period
 - Engine compartment environment
 - Normal solvent for de-greasing engine
- Provide at least TWO samples for ARB testing

Delegated Assembly (DA)

- ARB's On-Road HDDE regulations do not include DA, OFCI regulations are the same as EPA
- Staff accepts EPA's procedure
- Manufacturers must submit DA procedures/audit into DMS
- Manufactures must identify DA parts

DF Program Options

- 2011+ On-HHDD, Tier4i and Tier4 OFCI Engines
- Staff prefers 50% UL testing using in-use service cycle
- Optional 35% UL with 2011+ in-use validation program
 - EMA Co-op proposal
 - Continuing mileage on the original DF engine
 - Other alternatives
- Most manufacturers have already chosen option, discussion needed for new engines.

2012+

On-Road Certification

Topics

2012+ Certification

On-Road Topics

- OBD
- Sensors Table → All 2010 MY Engines
- Confirmatory Testing → “cut points”

On-Board Diagnostics

- MY2010-2012, one engine family with OBD per non SVM (except alternative fueled engines)
 - Parent rating (highest sales) – full OBD
 - Child ratings (others) – extrapolated OBD (malfunction criteria per engineering evaluation approved by ARB)
- OBD documents to MSCD directly
- OBD approval letter from MSCD to Mfr to DMS

AECD Sensors Table

- Speeds up review for 2011+ applications
- Identifies in-appropriate shut-off of critical emissions control systems
- Identifies and possibly reduces system tamper

Line Number	Sensor Name / Abbreviation	Sensed Parameter Range: High / Low (Units)	Sensor - Value: High (unit)	Sensor / Value: Low (unit)	Sensor still working? (yes / no)	Failure Detection	Failure Indication	Default Mode / threshold value	Failure Consequence	Impacts on Emissions	AECD Type	AECD Justification	ARB staff comment
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<http://www.arb.ca.gov/msprog/cihd/cihd.htm>

On-Road Heavy-Duty

Confirmatory Test “Cut-Points”

- General policy to request confirmatory testing when result exceeds 85% of standard

On-Road Heavy-Duty Diesel Engine Self-Retest

	<u>xxHC</u>	<u>CO</u>	<u>NOx</u>	<u>PM</u>	<u>HCHO</u>
Standard	0.14	15.5	0.20	0.01	0.050
85% : retest	0.12	13.2	0.17	0.0085	0.043

2011+ MY OFCI Certification Topics

California Environmental Protection Agency



2011+ MY OFCI

Certification Topics

- Tier-3 ~ Tier-4i / Tier-4 → Transition Topics
- DPF → Manual-only Regeneration Concern
- SCR → Implementation Concerns
- Sensors Table → All 2011+ MY OFCI Engines
- Confirmatory Testing → “cut points”
- Flex Engines

2011+ MY OFCI

Tier-3 to Tier-4 Transition Topics

- Carryover of DFs from Tier-3 to Tier-4i
- Two DFs needed for Tier-4i → NRTC and SS
- Carry-across of on-road DFs to off-road engines, where applicable

2011+ MY OFCI

Diesel Particulate Filters

- Manual-only regeneration → Approval NOT likely
 - Frequency vs. Accountability
 - Excess emissions vs. control logic
- Operator Commanded Regeneration (OCR) is allowed under safe harbor provisions per ARB letter (CHC-2006-007-1)

2011+ MY OFCI

Selective Catalytic Reduction (SCR)

- Similar concerns addressed by On-Road SCR
- Application specific approval may be possible
- Recommend early SCR discussion with agency
- Cu and V based SCR catalyst → TAC emissions needs to be quantified (approval is an open issue)
- Workshop slides as guidance
- More discussion with Manufacturers needed

2011+ MY OFCI - AECD Sensors Table

- Speeds up review for 2011+ applications
- Identifies in-appropriate shut-off of critical emissions control systems
- Identifies and possibly reduces system tamper

Line Number	Sensor Name / Abbreviation	Sensed Parameter Range / Low (Units)	Sensor - Actual Value (unit)	Sensor / Actual Value (unit)	Sensor still working? (yes / no)	Failure Detection	Failure Indication	Default Mode / threshold value	Failure Consquence	Impacts on Emissions	AECD Type	AECD Justification	ARB staff comment

<http://www.arb.ca.gov/msprog/cihd/cihd.htm>

2011 MY OFCI Confirmatory Test "Cut-Points"

- General policy - confirmatory testing when result exceeds 85% of Stds/FEL
- Contact certification representative for specifics

		OFCI Tier - 4i Exhaust			OFCI Tier - 4 Final Exhaust			
Category	NMHC + NOx	CO	PM	NMHC+NOx	CO	PM		
<8kw	*	*	*	7.5	8.0	0.40		
85% : retest	*	*	*	6.4	6.8	0.34		
8<kw<19	*	*	*	7.5	6.6	0.40		
85% : retest	*	*	*	6.4	5.6	0.34		
19<kw<37	7.5	5.5	0.30	4.7	5.5	0.03		
85% : retest	6.4	4.7	0.26	4.0	4.7	0.026		
37<kw<56	4.7	5.0	0.30	4.7	5.0	0.03		
85% : retest	4.0	4.3	0.26	4.0	4.3	0.026		
		OFCI Tier - 4 Phase - Out Exhaust			OFCI Tier - 4 Final Exhaust			
Category	NMHC + NOx	CO	PM	xxHC	N0x	CO	PM	
56<kw<75 phase - out	4.7	5.0	0.02	0.19	0.40	5.0	0.02	
85% : retest	4.0	4.3	0.017	0.16	0.34	4.3	0.017	
75<kw<130 phase - out	4.0	5.0	0.02	0.19	0.40	5.0	0.02	
85% : retest	3.4	4.3	0.017	0.16	0.34	4.3	0.017	
130<kw<560 phase - in	4.0	3.5	0.02	0.19	0.40	3.5	0.02	
85% : retest	3.4	3.0	0.017	0.16	0.34	3.0	0.017	
		OFCI Tier - 4 Phase-In and Alt NOx Exhaust			OFCI Tier - 4 Final Exhaust			
Category	xxHC	N0x	CO	PM	xxHC	N0x	CO	PM
56<kw<75 phase - in	0.19	0.40	5.0	0.02	0.19	0.40	5.0	0.02
85% : retest	0.16	0.34	4.3	0.017	0.16	0.34	4.3	0.017
56<kw<75 Alt. NOx	0.19	3.4	5.0	0.02	0.19	0.40	5.0	0.02
85% : retest	0.16	2.9	4.3	0.017	0.16	0.34	4.3	0.017
75<kw<130 phase - in	0.19	0.40	5.0	0.02	0.19	0.40	5.0	0.02
85% : retest	0.16	0.34	4.3	0.017	0.16	0.34	4.3	0.017
75<kw<130 Alt. NOx	0.19	3.4	5.0	0.02	0.19	0.40	5.0	0.02
85% : retest	0.16	2.9	4.3	0.017	0.16	0.34	4.3	0.017
130<kw<560 phase - in	0.19	0.40	3.5	0.02	0.19	0.40	3.5	0.02
85% : retest	0.16	0.34	3.0	0.017	0.16	0.34	3.0	0.017
130<kw<560 Alt. NOx	0.19	2.0	3.5	0.02	0.19	0.40	3.5	0.02
85% : retest	0.16	1.7	3.0	0.017	0.16	0.34	3.0	0.017
		OFCI Tier - 4i Exhaust			OFCI Tier - 4 Final Exhaust			
Category	xxHC	N0x	CO	PM	xxHC	N0x	CO	PM
>560kw (MM)	0.4	3.5	3.5	0.10	0.19	3.5	3.5	0.04
85% : retest	0.34	3.0	3.0	0.085	0.16	3.0	3.0	0.034
560<kw<900 gen	0.4	3.5	3.5	0.10	0.19	0.67	3.5	0.03
85% : retest	0.34	3.0	3.0	0.085	0.16	0.57	3.0	0.026
>900kw gen	0.4	0.67	3.5	0.10	0.19	0.67	3.5	0.03
85% : retest	0.34	0.57	3.0	0.085	0.16	0.57	3.0	0.026

2011+ MY OFCI – Flex Engines

- Flex Engine EOs being issued by ARB
- Flex Engine MAC will be forthcoming
- Additional guidance for equipment manufacturers forthcoming
 - Submittals
 - DO NOT email to Annette
 - Reports

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Contact Information

Kimberly Pryor, Manager

Phone Number: (626) 575-6640

Email Address: kpryor@arb.ca.gov

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