



# Large Spark-Ignited Workshop

April 10, 2003





# Background

- EPA Final rule published November 8, 2002
- Certification requirements start for new engines produced after January 1, 2004
- California ARB standards adopted in 1998
  - Phase-in before 2004 introduces technology without useful life requirements
  - California ARB requirements, nearly identical to EPA, also start in 2004



# EPA Contacts

<b>Responsibility</b>	<b>Contact</b>	<b>EPA Organization</b>	<b>Phone</b>	<b>e-mail</b>
Program design	Alan Stout	Assessment and Standards Division	734-214-4805	stout.alan@epa.gov
Certification	Greg Orehowsky	Certification and Compliance Division	202-564-9292	orehowsky.gregory@epa.gov
Enforcement	Rich Ackerman	Office of Enforcement and Compliance Assurance	202-564-1301	ackerman.richard@epa.gov



# Engines Not Covered

- Stationary
- Competition
- Motor vehicles
- Diesel engines
- Recreational vehicles
- Engines under 19 kW
- Marine propulsion engines



# Opt-Out Engines

- Nonroad spark-ignition engines under 1 liter, with power between 19 and 30 kW
  - meet Small SI standards instead
- Natural gas engines over 250 kW
  - meet nonroad diesel standards instead



# Covered Engines

- Nonroad spark-ignition engines over 19 kW used in all other applications
- This includes marine auxiliary engines
- Standards apply with special provisions for:
  - Severe-duty engines
  - High-load engines
  - Engines using noncommercial fuels



# 2004 Requirements

- Certify engines to CO and THC+NO<sub>x</sub> standards over full useful life
  - NMHC measurements ok for 2004 standards
- Measure emissions using C2 and/or D2 steady-state test cycles
- Closed crankcase
- Limit adjustable parameters
- Warranty
- Maintenance instructions
- Emission-related installation instructions
- Engine label



# Additional Requirements for 2007

- More stringent standards for CO and THC+NO<sub>x</sub>
- Measure emissions over transient duty cycle
- Standards also apply for “field testing” without defined duty cycle
- Evaporative standards
  - Low-permeation fuel lines
  - Tank venting
  - Fuel boiling
- Diagnostics





# CERTIFICATION

- Required by CAA before engine is sold, offered for sale, or introduced into commerce. Yearly.
- Streamlined process provides information we need to issue a certificate
- Mfrs required to comply with all requirements
- Certificate is issued based on the info in the application and statements made. We don't give up authority to review later, other required info



# Overview of Certification Process

- New mfrs must register to establish EPA's manufacturer code
  - Mfr code - used in engine family name
- Manufacturer Code Entry Form is attached & available at:
  - <http://www.epa.gov/otaq/cfeis.htm> (see "New Manufacturer Information")
  - Fax or email form to: Pete Petersen
  - email: [Petersen.Pete@epa.gov](mailto:Petersen.Pete@epa.gov)
  - fax: 734-214-4869
- The Code is usually assigned within 2 or 3 days
- EPA cert rep will be assigned to each mfr



# California Harmony

- **General**
  - EPA cert'n is required for engines mfr'd on or after 1/1/2004
  - EPA cert'n is required before intro in commerce in any State
  - Early certification is available now
- **For 2004 MY**
  - May choose CA standards (instead of tier 1) and requirements
  - Send EPA the CA application, instead of 1048.205
- **CA-only family**
  - Send approved CA Exec Order to EPA
  - Expect minimal additional review for EPA certification
- **50-state family**
  - Must get both CA + EPA certifications
- **49-state family**
  - Apply to EPA per §1048 using EPA's template



## For 2005 MY and later

- Follow EPA application requirements per §1048
  - (e.g., use EPA's application template)
- We expect mfrs will conduct both C2 and D2 cycles (and transient testing after 2006)
  - If not, then use unique engine labels
- Unique engines (e.g., carbureted vs injection) are expected to be different families, have different DF determinations & emissions data



## Develop engine families

- Is the basis for certification
- Is the basis for issues related to compliance
- Eng Fam = groups expected to have similar emissions
  - §1048.230 lists design features that apply to separate families
  - May divide further depending upon ...
- Name families using attached format



## Develop cert'n emissions data:

- **Test data developed by testing engine(s) – data and durability**
  - Test Engine Selection: mfr must test configuration most likely to exceed standards emissions
  - EPA may choose to measure emissions
- **Deterioration factors (DF) must be: (§1048.240)**
  - Based on emission measurement
  - Consistent with good engineering judgement (§1068.5)
  - Consistent with any available testing data



## Develop cert'n emissions data (cont'd):

- **EPA will accept DFs that are approved by CARB**
  - Must be based on 3500 hr of operation (for tier 1)
  - Multiplicative for aftertreatment. Minimum = 1.000
  - Additive for non-aftertreatment. Minimum = 0.000
- **Apply the DFs to the emission test data to determine certification level**
  - Round result to the same # of decimal places as the emission standard
  - Compare rounded result with standard



## Develop cert'n emissions data (cont'd):

- **Useful life (UL)**
  - Is the period during which the engine is designed to properly function without being reman'd
  - Defined in units of hrs of operation or cal years
  - Basic minimum for LSI is 7 yr/5000 hr
  - Mfr must specify longer UL if
    - you make/market the engine to last longer or
    - the basic mechanical warranty is  $> 7/5000$
  - Mfr can request shorter UL if it has docu from in-use engines rarely operate longer





## Pay the Certification fee

- **Final rule is currently being developed**
  - Estimated publication = August 2003. Actual effective date 60 days thereafter
  - Expected to be based on the date of receipt of a complete application
- **We project: all applications received after 10/01/03 will require fee payment**
  - Fee is not based on model year but on application date
  - Projection for LSI: \$827 per engine family
- **Filing form on web has instructions & will be updated for LSI**
  - <http://www.epa.gov/otaq/fees.htm>
- **Pay fee before our review process**



## Complete the certification application

- Our application template supplies a min amount of necessary info and data
- Filemaker® software: Template is a guide to the limited info we need
  - Filemaker is not required, but others currently use it ...
  - Facilitates processing & allows a database ...

Also:

- Describe the emission control system
- Describe the evap emission controls (starting 2007)



## Complete the cert'n app (cont'd)

- Describe the diagnostic system
- Installation instructions for OEMs (§1048.130)
  - Placement of catalyst, evap system requirements ....
  - In 2007, state steps necessary to prevent activation of engine protection modes (§1048.101 d)
- Describe any special or alternate test procedures
- Identify any high-cost warranty parts
- Statements required in §1048.205
  - Some are in our sample statement of compliance
  - Others can be provided in the application



## Complete the cert'n app (cont'd)

- Submit the info we ask for in our template. We have authority to acquire & review other info later
- Confidential Business Information (§1068.10)
  - Mfr must clearly identify information that is CBI
  - We handle CBI in accordance with 40 CFR Part 2
  - Info not labeled CBI may be released
- Regarding the Cert Application:
  - Before certification, we hold the complete cert app as CBI
  - After certification, info not labeled as CBI may be released
  - EPA's cert app has provisions for marking items "CBI"



## Include a statement of compliance

- **States mfr compliance wrt reqrmts & commitments to future actions ...**
- **Signed by authorized company official**
- **See sample language attached**
- **Statements required in §1048.205**
  - Some are in our sample statement of compliance
  - Others can be provided in the application



## Send all certification application documents (including electronic or hardcopy) to:

- Mr. Richard Deadwyler
  - Engine Programs Group (Mail code 6403J)
  - Certification and Compliance Division
  - Environmental Protection Agency
  - Deadwyler.Richard@EPA.GOV
  - Phone: (202) 564-9294
- Office/Express Mail (before late 2003\*):
  - (Mail Code 6403J)
  - 501 3rd Street, NW
  - Washington, DC 20001
- Office/Express Mail (after late 2003\*):
  - (Mail Code 6403J)
  - 1310 “L” Street, NW
  - Washington, DC 20005
- Mailing Address:
  - (Mail Code 6403J)
  - 1200 Pennsylvania Ave. NW
  - Washington, DC 20460
  - \* Stay tuned for our re-location



# EPA's Review

- EPA will review
  - cert app, statement, AECD descriptions & other necessary info for compliance w/requirements
- Certificate issued upon compliance
  - See attached sample draft
- Changes after certification:
  - Called “running changes” during the production year
- Subsequent-year certifications
  - Certification is required on yearly basis
  - New families require new test data
  - Can “carry-over” data + information when no changes made to engine design that affects emissions
- Current process for other industries may take up to 1 to 2 months depending upon issues



# FileMaker Pro Forms

## – Files

- Base file (Family and Test info)
- Models file
- Parts file
- Base file     DATABASE
- Models file   DATABASE
- Parts file     DATABASE

Use these to  
prepare your  
application

Use these to  
setup your  
database



Bitmap Image





# FileMaker Pro Forms

- Data entry
  - Fill out all 3 forms
  - Data in the Models and Parts files is copied to the appropriate pages of the base file
  - Function buttons included to minimize data entry: automatically create Carryover applications, delete records, check for errors, etc.



# FileMaker Pro Forms

- Using files
  - Use the Application files for creating new records; use the DATABASE files for storage only
  - Never change the names of the files. When you're finished preparing a new record, use the "Save a copy as" command to save the copy you'll send to EPA.
  - The files provide a means to submit the whole application electronically EXCEPT the compliance statement; you have to sign/submit this on paper.
  - We're trying to coordinate with CARB so you don't have to fill out a separate application for CARB certification.
  - If anyone would like to take a copy of the template home and experiment/comment on it, please let me know. This would help me identify any problems prior to sending it out.

**FAMILY**

Test

Models

Parts

Tech Descr.

Manufacturer:

Engine category: **Greater Than 19 Kw Nonroad SI**

Cert contact: **first** **last**

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Change of Address Date EPA Fee Paid:

SAVE

PRINT

CHECK YOUR WORK [Results](#)

SEND TO D/B

OPEN D/B

DELETE REC

- 1. EPA Engine Family:
- 2. Family name on label:
- 3. Trade name (eg, Vortec):
- 4. **PROCESS CODE:**
- 5. Are you carrying over test data?:   Previous family
- 6. Equipment applications:
 

<input type="checkbox"/> Fork lift	<input type="checkbox"/> Refrig<50hp
<input type="checkbox"/> Turf care	<input type="checkbox"/> Tractor
<input type="checkbox"/> Generator	<input type="checkbox"/> Pre-empted
<input type="checkbox"/> Sweeper	<input type="checkbox"/> Other...
<input type="checkbox"/> Compressor	
- 7. Sales area for family:  49 states  California  50 states
- 8. Projected sales: 49  Cal  Tot
- 9. Production engine description:
- 10. Family displacement(s) (L):
- 11. Power ratings (kw): lowest model in family:   
highest model in family:
- 12. 2-stroke/4-stroke:  2  4
- 13. Engine type:  Reciprocating  Other...
- 14. Valve type:
- 15. Number of valves: intake  exhaust

- 16. Engine cooling fluid:
- 17. # cylinders:     
(Fill in as many as needed)
- 18. Cylinder arrangement:
- 19. Fuel sys type:
- 20. Fuel:
- 21. Fuel metering device:
- 22. Number of devices:
- 23. Emission Control System:
 

<input type="checkbox"/> Catalyst	<input type="checkbox"/> EGR
<input type="checkbox"/> Engine Modification	<input type="checkbox"/> None
<input type="checkbox"/> Electronic Control	<input type="checkbox"/> Other...
<input type="checkbox"/> Smoke Puff Limiter	
- 24. O<sub>2</sub> sensor:
- 25. Aspiration type:
- 26. Aftercooling type:
- 27. Send cert to:
 

First name	Last name
<input type="text"/>	<input type="text"/>
Title	<input type="text"/>
Address (street #, street name, city, state, zip):	<input type="text"/>
Phone	<input type="text"/>
Fax	<input type="text"/>

Template date:

**Template**

(Version 1.0)

Family

**TEST**

Models

Parts

Tech descr.

Compl. st.

Addr change

SAVE

PRINT

CHECK YOUR WORK

SEND TO D/B

OPEN D/B

DELETE REC

Manufacturer:

Engine category: **Greater Than 19 Kw Nonroad SI**

Cert contact: first

last

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Change of Address

New durability testing:  yes  no

If no, carryover family:

Template date:

**Template**

(Version 1.0)

1. EPA Engine Family:

2. PROCESS CODE:

Emission Data Engine:

3. Engine Code:

4. Engine Model:

5. Displacement(s) (L):

6. Test Engine ID#:

7. Rated Power

**Kw**

8. Rated Speed:

9. Torque Rating:

**N-m**

10. Torque Speed:

11. Test Fuel:

12. Special Device Used:

Yes  No

13. Test Procedure Used:

14. Break-in hours:

15. Gas Sampling:

raw  dilute

16. Evap results:

I collected new data  I'm using design-based certification

16. Transient results:

Durability Data Engine:

17. Model of Durability Eng:

ID #:

Hrs Accumulated:

18. Results: Report all numbers in g/kw-hr.

**Confidential Business Information**

CBI Until Introduction into Commerce

CBI Indefinitely

CBI date

Family Information

Test Date: ..... DF's



Family

Test

Models

**PARTS**

Tech descr.

Compl. st.

Addr change

Open parts file

SAVE

PRINT

CHECK YOUR WORK

SEND TO D/B

OPEN D/B

DELETE REC

Manufacturer:

Engine category: **Greater Than 19 Kw Nonroad SI**

Cert contact: first last

Contents Page

Change of Address

1. EPA Engine Family:

2. PROCESS CODE:

Template date:

**Template**

(Version 1.0)

Provide data for:

Injection pump	Supercharger	Spark plug	Air injection system control valve
Injector	Other (LPG regulator)	EGR valve assembly	Air injection system solenoid valve
Turbocharger	Other (Air resonator)	Ignition coil	Exhaust manifold
Pressure Regulator	Intake manifold	Ignition control valve module	
Oxygen sensor	Distributor	Vacuum control valve	

part numbers, as applicable. Complete the Parts file and the data will appear below.

Part name	Part number	Engine Code	Engine Model

### Confidential Business Information

CBI Until Introduction into Commerce

CBI Indefinitely

CBI date



Family | Test | Models | Parts | Tech descr. | Compl. st. | Addr change

Manufacturer:

Engine category: **Greater Than 19 Kw Nonroad SI**

Cert contact: first last

- SAVE
- PRINT
- CHECK YOUR WORK
- SEND TO D/B
- OPEN D/B
- DELETE REC

**STATEMENT OF COMPLIANCE**

Template date:

**Template**

(Version 1.0)

HPR CONTACT INFO

April 9, 2003

DATE

*TO SEE THE SAMPLE LANGUAGE*

Certification Team Leader  
Engine Compliance Programs Group  
U.S. Environmental Protection Agency  
Mail Code: 6403-J  
1200 Pennsylvania Ave.  
Washington, DC 20460

- NOTES:**
- 1) *To Tab: You must use ctrl-tab. Simply using tab will move you to the next field.*
  - 2) *Modify the sample language as necessary (i.e., alternative fuels, alternate or special test procedures, etc).*

Dear Certification Team Leader:

Please find enclosed the model year <XXXX> application for engine family <XXXXXXXXXXXXXXXX>. On behalf of the <XY Engine Company>, I hereby certify that the test engine(s), as described in



Family

Test

Models

Parts

Tech descr.

Compl. st.

Addr change

SAVE

PRINT

CHECK YOUR WORK

SEND TO D/B

OPEN D/B

DELETE REC

Manufacturer:

Engine category: **Greater Than 19 Kw Nonroad SI**

Cert contact: first last

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Change of Address

### CHANGE OF ADDRESS FORM

Please complete entire form.

- |  |  |
|--|--|
| <input type="checkbox"/> On-highway Mfr    | <input type="checkbox"/> Equipment Mfr     |
| <input type="checkbox"/> Large CI NR Mfr   | <input type="checkbox"/> Trade Association |
| <input type="checkbox"/> Marine Engine Mfr | <input type="checkbox"/> Other...          |
| <input type="checkbox"/> Small SI NR Mfr   |  |

<input type="text"/>	<input type="text"/>	<input type="text"/>	CONTRACT CATEGORY
FIRST NAME	INITIAL	LAST NAME	

<input type="text"/>	<input type="text"/>
TITLE	DIVISION

<input type="text"/>	<input type="text"/>
COMPANY NAME	PO BOX

ADDRESS

<input type="text"/>	<input type="text"/>	<input type="text"/>
CITY	STATE	COUNTRY

<input type="text"/>	<input type="text"/>	<input type="text"/>
ZIP	E-MAIL	KEEPER (O PTD NAL)

<input type="text"/>	<input type="text"/>
PHONE	FAX

Template date:

**Template**

(Version 1.0)

Family Form Checkou



# Production Line Testing (PLT)

- PLT verifies that a manufacturer can mass produce Cert engine
  - Minimum test rate from formula
    - Test 2 engines per quarter to determine sample size
    - Maybe 1 engine for carry-over families as early as 2006
    - Manufacturer may request an alternative program under 1048.301(d)
  - Maximum test rate not to exceed:
    - 30 engines
    - 1% of U.S. directed annual production
    - Testing on steady state or transient cycle
  - CARB
    - May use CARB data for 50 state families



# Production Line Testing (PLT)

- Pass/Fail
  - Fail if action limit exceeded for two consecutive tests
- Engine families which fail PLT have certificate suspended
- Any failed engines must be brought into compliance before sale
- Reporting Requirements
  - Required quarterly
  - No approved electronic format yet
- Selective Enforcement Audits (SEAs)
  - EPA may conduct SEAs as necessary



# Manufacturer In-Use Testing

- In-use testing by the manufacturer
  - Effective for 2004 model year engines
  - EPA identifies up to 25% of engines families in any model year
  - Manufacturer has one year to develop test plan, two years to complete testing
  - Minimum sample is 4 engines per family
    - Minimum sample is 2 engines if:
      - Selected engine family is less than 500 or
      - Total production for all families is 2000 or fewer



# Manufacturer In-Use Testing

- In-use testing on the dynamometer
  - Test over applicable test cycle(s)
    - For Tier 1 engines, compare results to in-use standards
    - For Tier 2 engines, compare results to duty cycle standards
- Field testing
  - May be done instead of dyno testing
  - Testing done in equipment
  - Use procedures in §1048-515
    - Meet in-use testing standards for Tier 1
    - Meet field testing standards for Tier 2
  - If all of selected engines meet the standards, testing is complete
    - For each engine which fails, test two additional engines up to a maximum of 10 per family



# Manufacturer In-Use Testing

- Failing engines
  - If the average emissions level for the engine family exceeds the standard, report results within 15 days.
  - Otherwise report results with 3 months.
  - Determine the reason each engine exceeds emissions standard.
  - Any defect which causes a failure must be corrected during future production.
- EPA will consider the following information to determine if remedial action is necessary:
  - Failure rates
  - Average emission level
  - Defects
  - Other information



# Defect Reporting and Recall

- Manufacturers analyze available data to determine if a defect exists in an engine family
  - Defect investigations are triggered by:
    - Warranty claims
    - Parts shipments for unscheduled maintenance
    - Defects discovered before engine reaches ultimate purchaser
    - Other information such as hot line complaints or dealer feedback
  - Thresholds for conducting an investigation differ for :
    - Engines rated above 560 kW have lower thresholds
    - Catalytic converters and aftertreatment devices
    - Other emissions related components



# Defect Reporting and Recall

- During the investigation phase, manufacturer determines if defect reporting threshold is reached.
  - Not all warranty claims or parts replacements are defects
  - Defects corrected before engine reaches ultimate purchaser do not count towards defect reporting threshold.
- Defect reporting thresholds are lower than investigation thresholds.
  - Thresholds vary by rated power and component





# Defect Reporting and Recall

- Reports on investigations must be sent mid-year and end of year even if they don't trigger defect reports.
- Recall
  - If EPA determines a substantial number of properly maintained and used engines do not conform to regulations, the manufacturer submits a plan to remedy the nonconformity.
    - EPA has 15 days to approve/disapprove remedial plan
    - Owner notification requirements
    - Manufacturer must label recalled engines
  - Manufacturer can request hearing to contest need for recall



# Rebuilding Requirements

- A rebuild is a major overhaul which replaces pistons or power assemblies or makes other changes which significantly increases service life of the engine.
- A certified engine must be rebuilt to have the same emissions performance
  - Based on reasonable technical basis
  - Rebuild to original certified configuration



# Rebuilding Requirements

- All emissions related components must be checked, cleaned, adjusted, repaired, or replaced according to manufacturers recommended practice.
  - O2 sensors
  - Catalysts
  - Clean or replace fuel system components
- Rebuilder is required to keep records for two years after rebuild.



# Exemptions and Exclusions

- Exemptions
  - **Testing** used for research, investigations, studies, demonstrations, or training.
  - **Manufacturer-owned** used for product development, assess production methods, or promote products
  - **Display**
  - **National Security**
    - Armored or equipment with permanently attached weapons are exempt
    - Other equipment may be exempted. The request must be endorsed by a federal agency.



# Exemptions and Exclusions

- Exemptions
  - **Export** engines meant for use outside the U.S.
  - **Competition**
  - **Replacement engine** exemption allows building new uncertified engine.
    - Must be a certificate holder
    - No certified engine will fit in the equipment
    - Certificate holder must take possession of the old engine
  - **Hardship** exemptions
  - **Equipment** manufacturer exemption
    - Engine exempted under this provision
- Most exemptions have labeling requirements



# Imports

- Imported may take the previously discussed exemptions plus:
  - **Identical configuration** exemption
    - Own engine for one year
    - Do not transfer ownership
    - Evidence to show engine is in same configuration as a certified engine
  - **Repairs and alterations** exemption allows temporary importation
  - **Diplomatic or military** exemption allows temporary importation while holding either status
- Most temporary exemptions require a bond