Engine Rules from A to ZZZZ

A high level overview of the federal NSPS and NESHAP rules as they apply to owner/operators of internal combustion engines

Presented by:

Brandon Guillory & Andy Goldberg
Introduction

- New Source Performance Standard (NSPS) 40 CFR 60 Subpart IIII
  - Stationary Compression Ignition (CI) Internal Combustion Engines (ICE)
- NSPS 40 CFR 60 Subpart JJJJ
  - Stationary Spark Ignition (SI) ICE
- National Emissions Standards for Hazardous Air Pollutants (NESHAP) 40 CFR 63 Subpart ZZZZ
  - RICE at both major and area sources of HAPs
NSPS Subpart IIII
NSPS Subpart III
Applicability

- Construction Date = Order Date
- Construction after July 11, 2005 where:
  - Manufactured after April 1, 2006 non-emergency and emergency, except fire water pumps
  - Manufactured after July 1, 2006 for NFPA approved fire water pumps
- Modified or reconstructed after July 11, 2005
- Rule focus is on $\text{SO}_2$, NO\textsubscript{x}, PM\textsubscript{10}, and VOC
NSPS Subpart III
Basic Requirements

- Emissions limitations based on model year, HP, and engine liters/cylinder (L/cyl)
  - For both emergency and non-emergency engines
  - Many emissions limits referenced from 40 CFR Parts 89 and 1039 (non-road engine rules)
  - Manufacturers of 2007 model year and later engines must certify emissions to applicable limit
  - Fire water pump engines are treated separately (certification year and emission limits)
NSPS Subpart III
Basic Requirements

- **Fuel Usage**
  - Currently must use fuel with <500 ppm sulfur
  - October 1, 2010 engines with displacement < 30 L/cyl must use fuel <15 ppm sulfur
    - Pre 2011 model engines can petition to use remaining stock of non compliant fuel

- **Importing Old Engines**
  - After December 31, 2008 cannot import an engine not compliant to 2007 standards
  - Additional deadlines for installing previous model year engines for various HP ranges are listed in §60.4208
  - Does not apply to modified/reconstructed engines or engines removed from existing location and reinstalled at a new location
NSPS Subpart III
Basic Requirements

- Monitoring Requirements
  - Install non-resettable hour meter on emergency engines prior to startup
  - If equipped with a diesel particulate filter to comply with PM standard, install a backpressure monitor that notifies the operator when high limit is approached
Compliance Requirements

- All engines must operate/maintain according to manufacturer’s written instructions
- Pre 2007:
  - Purchase engine certified to Part 89 or 94 or
  - Keep records of performance test of similar engine or
  - Keep records of manufacturer data indicating compliance with the standards or
  - Keep records of control device vendor data indicating compliance with the standards or
  - Conduct an initial performance test
Compliance Requirements (cont’d)

- 2007 model and later with disp. < 30 L/cyl
  - Purchase certified engine and install per manufacturer instructions
- 2007 model and later with disp. > 30 L/cyl
  - Conduct initial performance test
  - Establish operating parameters
  - Annual performance test for non-emergency engines
- Must limit operation of emergency engine outside of emergency situations to 100 hr/yr
NSPS Subpart III
Basic Requirements

- Reporting/Recordkeeping
  - Non-emergency engines >3,000 hp or disp. >10 L/cyl, or pre-2007 model >175 hp
    - Initial notification
    - Maintain records
  - Emergency engines starting with model year 2011 that do not meet applicable standards
    - No initial notification
    - Maintain records of hours of operation
NSPS Subpart IIII
Basic Requirements

- Reporting/Recordkeeping
  - If equipped with a diesel particulate filter, maintain records of corrective action taken after backpressure monitor indicates the high limit is reached
NSPS Subpart J
Construction Date = Order Date

Commence construction after June 12, 2006 and manufactured:
- After July 1, 2007 for engines > 500 HP
- January 1, 2008 for lean burn engines > 500 HP and < 1,350 HP
- July 1, 2008 for engines < 500 HP
- January 1, 2009 for emergency engines > 25 HP

Commence modification/reconstruction after June 12, 2006
NSPS Subpart JJJJ
Basic Requirements

- **Emission Standards**
  - Based on HP
  - Based on fuel type (different requirements for gasoline and rich burn LPG)
  - Standards for NO\textsubscript{x}, CO, VOC based on manufacture date

- **Cannot install engines that do not meet applicable requirements after:**
  - July 1, 2010 for engines < 500 HP
  - July 1, 2009 for engines > 500 HP
  - January 1, 2011 for emergency engines > 25 HP
  - Does not apply to modified/reconstructed engines or engines removed from existing location and reinstalled at a new location
NSPS Subpart JJJJ
Basic Requirements

- Emergency engines that do not meet the applicable standards must install non-resettable hour meter after:
  - July 1, 2010 for > 500 HP
  - January 1, 2011 for > 130 HP and <500 HP
  - July 1, 2008 for < 130 HP

- Must keep records of operation recorded through the meter
NSPS Subpart JJJJ
Basic Requirements

- General Compliance Methods
  - Purchase a certified engine or
  - Purchase a non-certified engine

- Certified engine that is not maintained according to manufacturer’s written instructions, it is treated as a non-certified engine
Certified engines demonstrate compliance by:
- Maintain maintenance records
- No performance testing required

Non-certified engines demonstrate compliance by:
- Keep maintenance plan and records of maintenance
- Required performance testing:
  - No testing for engines < 100 HP
  - Initial within 1 year for engines > 100 HP and < 500 HP
  - Initial and every 3 years or 8760 hrs of operation for >500 HP
NSPS Subpart JJJJ
Basic Requirements

- Emergency engines may operate up to 100 hr/yr
- Natural gas fired engines may operate up to 100 hr/yr on propane
Reporting/Recordkeeping required:

- Agency notifications
- Maintenance records
- Certification documentation
- If not certified, documentation that the engine meets the emission standards

Non-certified engines > 500 HP must submit an initial notification
NESHAP Subpart ZZZZ
Applies to RICE located at major and area sources of HAP emissions.

Pollutants of concern:
- CO
- Formaldehyde

New or reconstructed RICE at an area source meets the requirements of ZZZZ by meeting the requirements of NSPS IIII or JJJJ
- Also applies to smaller engines located at major sources – §63.6590(c)
NESHAP ZZZZ
Basic Requirements

- ZZZZ has multiple compliance paths
- 4SRB engines
  - Can either reduce formaldehyde by 76% or
  - Limit concentration of formaldehyde in exhaust to 350 ppbvd
  - Operating limitations based on if a NSCR is used or not
NESHAP ZZZZ
Basic Requirements

- 2SLB engines
  - Either reduce CO by 58% or
  - Limit formaldehyde in exhaust to 12 ppmvd

- 4SLB engines
  - Either reduce CO by 93% or
  - Limit formaldehyde in exhaust to 14 ppmvd

- CI engines
  - Either reduce CO by 70% or
  - Limit formaldehyde in exhaust to 580 ppmvd

Operating limitations then depends on if an oxidation catalyst is used or not
Semiannual performance testing is required for all engine categories, pollutant standards, and control devices.

Assure continual compliance through the use of a Continuous Monitoring System (CMS):

- CEMS monitors emissions
- CPMS monitors operating parameters indicative of properly functioning control device
Reporting Requirements

- Semiannual compliance report
  - Identify any deviation
  - Identify any periods when CMS was out-of-control
  - Identify any SSM events which caused an exceedance
- Immediate SSM Report if actions were inconsistent with the SSM Plan and excursion occurred
  - Notification within 2 days via telephone or fax
  - Report within 7 days after the end of the event
Reporting Requirements Cont’d

- Annual Report if firing landfill or digester gas greater than 10% annual gross heat input
  - Report fuel flow rates and heat input from each fuel
  - Report operating limits provided in your permit and any deviations to those limits
  - Report any problems or errors with the meters
New Facility with eight 4,735 HP natural gas fired CAT 3616 engines (4SLB) (three installed)

Facility is major for HAPs

No compression ignition engines, so NSPS IIII does not apply

Engines ordered after June 12, 2006 applicability date for NSPS JJJJ, but one of the three was manufactured before July 1, 2007 applicability date

◦ Chose to treat all three as subject to JJJJ to create uniformity for compliance
Facility chose to control CO to at least 93% by using catalytic oxidation

Due to limited operational knowledge of CEMS units, facility chose CPMS

- Maintain catalyst inlet temperature $>450^\circ$F and $<1,350^\circ$F on a rolling 4 hour average
- Maintain catalyst pressure drop to $<2$ inches water at 100% load plus or minus 10% from pressure drop determined during initial performance test (monitored monthly)

Dual exhaust engines so six CPMS systems installed (two catalyst systems per engine)
Installed an add-on CPMS system to monitor inlet temperature and pressure drop – created additional data collection challenges

Challenges demonstrating compliance with pressure drop due to irregular operating schedule and operating loads

Subsequent performance testing schedule
  ◦ NESHAP ZZZZ – semiannual for CO
  ◦ NSPS JJJJ – 3 years or 8760 hrs of operation for NO$_x$ & VOC
Engine Case Study
Lessons Learned

- Future engines will have monitoring parameters pre-programmed to the control board for data capture.
- Will ensure performance test company fully understands all aspects of the NSPS and NESHAP rules.
- Extensive training of operators is required to maintain compliance with documentation/recordkeeping requirements.