

# RICE NESHAP Implementation

Ray Lukkarinen, P.E.

Stanley Consultants, Inc.



**Stanley Consultants** INC.

# Presentation Outline

- RICE NESHAP Overview (Existing CI Engines)
  - Definition
  - Compliance deadline
  - Engine Categories
  - CO Emission Limits
  - Fuel Requirements
  - Crankcase, Work Practices & Other Requirements
- Case Study

# RICE NESHAP

- What is RICE NESHAP?
  - National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines
  - Aka RICE MACT
  - 40 CFR Part 63 Subpart ZZZZ
  - Engines must be in compliance with regulatory standards by May 3, 2013

# Existing Engines

- For stationary RICE with a site rating  $> 500$  brake horsepower (BHP) located at a major source of HAP emissions, a stationary RICE is existing if you commenced construction or reconstruction of the stationary RICE before December 19, 2002.
- For stationary RICE with a site rating  $\leq$  to 500 BHP located at a major source of HAP emissions, a stationary RICE is existing if you commenced construction or reconstruction of the stationary RICE before June 12, 2006.

# Existing Engines

- For stationary RICE located at an area source of HAP emissions, a stationary RICE is existing if you commenced construction or reconstruction of the stationary RICE before June 12, 2006.
- A change in ownership of an existing stationary RICE does not make that stationary RICE a new or reconstructed stationary RICE.

# Engine Classification

- By Source: Major or Area
- By Service: Emergency or Non-Emergency
- By HP rating:
  - < 100 HP
  - 100 to 300 HP
  - 300 to 500 HP
  - > 500 HP

# Emergency Generator Set

- Any stationary internal combustion engine whose operation is limited to emergency situations and required testing and maintenance
- Stationary RICE used for peak shaving are not considered emergency stationary RICE

# CO Emissions Limits

## Major Sources

HP	Service	CO Emissions Limits
≤ 500	Emergency	NA
< 100	Non-Emergency	NA
100 – 300	Non-Emergency	230 ppmvd @ 15% O <sub>2</sub>
300 – 500	Non-Emergency	49 ppmvd @ 15% O <sub>2</sub> OR 70% reduction
> 500	Non-Emergency	23 ppmvd @ 15% O <sub>2</sub> OR 70% reduction



# CO Emissions Limits

## Area Sources

HP	Service	CO Emissions Limits
≤ 500	Emergency	NA
≤ 300	Non-Emergency	NA
300 – 500	Non-Emergency	49 ppmvd @ 15% O <sub>2</sub> OR 70% reduction
> 500	Non-Emergency	23 ppmvd @ 15% O <sub>2</sub> OR 70% reduction

# Fuel Requirements

## Major Sources

HP	Service	Fuel Requirement
≤ 500	Emergency	No
< 100	Non-Emergency	No
100 – 300	Non-Emergency	No
300 – 500	Non-Emergency	Yes <sup>1</sup>
> 500	Non-Emergency	Yes <sup>1</sup>

1. If displacement is < 30L per cylinder and using diesel fuel, must use only diesel fuel meeting requirements of 40 CFR 80.510(b) which requires:
  - a) Maximum sulfur content of 15 ppm; AND
  - b) Minimum cetane index of 40; OR
  - c) Maximum aromatic content of 35% by volume.

# Fuel Requirements Area Sources

HP	Service	Fuel Requirement
≤ 500	Emergency	No
≤ 300	Non-Emergency	No
300 – 500	Non-Emergency	Yes <sup>1</sup>
> 500	Non-Emergency	Yes <sup>1</sup>

1. If displacement is < 30L per cylinder and using diesel fuel, must use only diesel fuel meeting requirements of 40 CFR 80.510(b) which requires:
  - a) Maximum sulfur content of 15 ppm; AND
  - b) Minimum cetane index of 40; OR
  - c) Maximum aromatic content of 35% by volume.

# Crankcase Requirements

## Major Sources

HP	Service	Crankcase Requirement
≤ 500	Emergency	No
< 100	Non-Emergency	No
100 – 300	Non-Emergency	No
300 – 500	Non-Emergency	Yes <sup>1</sup>
> 500	Non-Emergency	Yes <sup>1</sup>

1. If the engine is not already equipped with a closed crankcase ventilation system, must do one of the following:
  - a) Install a closed crankcase ventilation system that prevents crankcase emissions from being emitted to the atmosphere; OR
  - b) Install an open crankcase filtration system that reduces emission from the crankcase by filtering the exhaust stream to remove oil mist, particulates, and metals.

# Crankcase Requirements

## Area Sources

HP	Service	Crankcase Requirement
≤ 500	Emergency	No
≤ 300	Non-Emergency	No
300 – 500	Non-Emergency	Yes <sup>1</sup>
> 500	Non-Emergency	Yes <sup>1</sup>

1. If the engine is not already equipped with a closed crankcase ventilation system, must do one of the following:
  - a) Install a closed crankcase ventilation system that prevents crankcase emissions from being emitted to the atmosphere; OR
  - b) Install an open crankcase filtration system that reduces emission from the crankcase by filtering the exhaust stream to remove oil mist, particulates, and metals.

# Management Practice

## Major Sources

HP	Service	Management Practice
≤ 500	Emergency	Yes*
< 100	Non-Emergency	Yes*
100 – 300	Non-Emergency	No
300 – 500	Non-Emergency	No
> 500	Non-Emergency	No

**\*Note:**

1. Change oil & filter every 500 hours of operation or annually, whichever comes first (can be extended with an oil change analysis program).
2. Inspect air cleaner every 1,000 hours of operation or annually, whichever comes first, and replace as necessary.
3. Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, and replace as necessary.

# Management Practice Area Sources

HP	Service	Management Practice
≤ 500	Emergency	Yes*
≤ 300	Non-Emergency	Yes*
300 – 500	Non-Emergency	No
> 500	Non-Emergency	No

**\*Note:**

1. Change oil & filter every 500 hours of operation or annually, whichever comes first (can be extended with an oil change analysis program).
2. Inspect air cleaner every 1,000 hours of operation or annually, whichever comes first, and replace as necessary.
3. Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, and replace as necessary.

# Oil Change Analysis Program

Sources can extend the period for changing the oil if the oil is part of an oil analysis program and no condemning limits are exceeded. Analyses must be conducted at the same frequency specified for changing the oil.



# Condemning Limits

- Total Base Number is less than 30% of the TBN of the oil when new; OR
- Viscosity of the oil has changed by more than 20% from the viscosity of the oil when new; OR
- Percent water content (by volume) is greater than 0.5.

# Startup Requirements

Owners and operators must minimize the engine's time spent at idle and minimize the engine's startup to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes, after which time the engine must meet applicable emission standards.

# Operating Limits

## Major Sources

HP	Service	Operating Limit
≤ 500	Emergency	No
< 100	Non-Emergency	No
100 – 300	Non-Emergency	No
300 – 500	Non-Emergency	No
> 500	Non-Emergency	Yes*

**\*Note:**

1. Owners and operators of engines that are equipped with oxidation catalyst must maintain the catalyst so that the pressure drop across the catalyst does not change by more than 2 inches of water from the pressure drop across the catalyst that was measured during the initial performance test.
2. Owners and operators of these engines must also maintain the temperature of the stationary RICE exhaust so that the inlet temperature is between 450 and 1350°F.

# Operating Limits Area Sources

HP	Service	Operating Limit
≤ 500	Emergency	No
≤ 300	Non-Emergency	No
300 – 500	Non-Emergency	No
> 500	Non-Emergency	Yes*

**\*Note:**

1. Owners and operators of engines that are equipped with oxidation catalyst must maintain the catalyst so that the pressure drop across the catalyst does not change by more than 2 inches of water from the pressure drop across the catalyst that was measured during the initial performance test.
2. Owners and operators of these engines must also maintain the temperature of the stationary RICE exhaust so that the inlet temperature is between 450 and 1350°F.

# Compliance Demonstration

## Major Sources $\leq$ 500 HP

HP	Service	Compliance Demonstration
$\leq$ 500	Emergency	Yes <sup>1</sup>
< 100	Non-Emergency	Yes <sup>1</sup>
100 – 500	Non-Emergency	Yes <sup>2</sup>
300 – 500	Non-Emergency	Yes <sup>2</sup>

1. Must operate and maintain their stationary RICE and aftertreatment control device (if any) according to the manufacturer's emission-related written instructions or develop their own maintenance plan.
2. Must conduct an initial performance test to demonstrate compliance with required emissions standards.

# Compliance Demonstration

## Major Sources > 500 HP

HP	Service	Compliance Demonstration
> 500	Non-Emergency	Yes <sup>1,2</sup>

1. Must conduct an initial performance test and must test every 8,760 hours of operation or 3 years, whichever comes first, to demonstrate compliance with the required emissions standards.
2. Must continuously monitor and record the catalyst inlet temperature if an oxidation catalyst is being used on the engine. The pressure drop across the catalyst must also be measured monthly. If an oxidation catalyst is not being used on the engine, the owner or operator must continuously monitor and record the operating parameters (if any) approved by the Administrator.

# Compliance Demonstration

## Area Sources $\leq 500$ HP

HP	Service	Compliance Demonstration
$\leq 500$	Emergency	Yes <sup>1</sup>
$\leq 300$	Non-Emergency	Yes <sup>1</sup>
300 – 500	Non-Emergency	Yes <sup>2</sup>

1. Must develop a maintenance plan that specifies how the work practices will be met.
2. Must conduct an initial performance test to demonstrate compliance with required emissions standards.

# Compliance Demonstration

## Area Sources > 500 HP

HP	Service	Compliance Demonstration
> 500	Non-Emergency	Yes <sup>1,2</sup>

### 1. Usage:

- a) Limited Use Units – Must conduct an initial performance test and must test every 8,760 hours of operation or 5 years, whichever comes first, to demonstrate compliance with the required emissions standards.
- b) Non-Limited Use Units – Must conduct an initial performance test and must test every 8,760 hours of operation or 3 years, whichever comes first, to demonstrate compliance with the required emissions standards.

2. Must continuously monitor and record the catalyst inlet temperature if an oxidation catalyst is being used on the engine. The pressure drop across the catalyst must also be measured monthly. If an oxidation catalyst is not being used on the engine, the owner or operator must continuously monitor and record the operating parameters (if any) approved by the Administrator.



# Limited Use Stationary RICE

- Any stationary RICE that operates less than 100 hours per year

# Record Keeping & Reporting Major Sources

HP	Service	Record Keeping & Reporting
≤ 500	Emergency	Yes <sup>1</sup>
< 100	Non-Emergency	No

1. Must keep records of hours of operation. Owners and operators are required to install a non re-settable hour meter on their engines.

# Record Keeping & Reporting

## Major Sources

HP	Service	Record Keeping & Reporting
100 – 300	Non-Emergency	Yes <sup>1</sup>
> 300	Non-Emergency	Yes <sup>1,2</sup>

1. Owners and operators of existing stationary RICE, except stationary RICE < 100 HP, existing emergency stationary RICE, and existing stationary RICE that are not subject to numerical emission standards, must submit all of the applicable notifications as listed in the NESHAP General Provisions (40 CFR Part 63, Subpart A), including an initial notification, notification of performance test, and a notification of compliance necessary for each stationary RICE which must comply with the specified emission limitations.
2. Owners and operators of existing non-stationary CI RICE > 300 HP must keep records of the manufacturer's recommended maintenance procedures for the closed crankcase ventilation system or open crankcase filtration system and records of the maintenance performed on the system.

# Record Keeping & Reporting Area Sources

HP	Service	Record Keeping & Reporting
≤ 500	Emergency	Yes <sup>1,2</sup>
≤ 300	Non-Emergency	Yes <sup>2</sup>

1. Must keep records of hours of operation. Owners and operators are required to install a non re-settable hour meter on their engines.
2. Must keep records to show that management practices are being met. These include at minimum:
  - a) Oil & filter change dates and corresponding hour on the hour meter;
  - b) Inspection and replacement dates for air cleaners, hoses, and belts;
  - c) Records of other emission-related repairs and maintenance performed.

# Record Keeping & Reporting Area Sources

HP	Service	Record Keeping & Reporting
> 300	Non-Emergency	Yes <sup>1,2</sup>

1. Owners and operators of existing stationary RICE, except stationary RICE < 100 HP, existing emergency stationary RICE, and existing stationary RICE that are not subject to numerical emission standards, must submit all of the applicable notifications as listed in the NESHAP General Provisions (40 CFR Part 63, Subpart A), including an initial notification, notification of performance test, and a notification of compliance necessary for each stationary RICE which must comply with the specified emission limitations.
2. Owners and operators of existing non-stationary CI RICE > 300 HP must keep records of the manufacturer's recommended maintenance procedures for the closed crankcase ventilation system or open crankcase filtration system and records of the maintenance performed on the system.

# Case Study: Municipal Client



# Generator Sets

- Four CAT 3516 Engines
  - Major source
  - Non-emergency
  - 2,500 BHP
  - 2 units installed 1988, 2 units installed 1994
  - Open CCV
- One CAT 3516B Engine
  - Area source
  - Non-emergency
  - 2,900 BHP
  - Installed 1999
  - Open CCV

# Engine Specs

- Provided Data:
  - BHP
  - Maximum allowable system backpressure
  - Displacement
  - Exhaust Gas Flow Rate
  - Exhaust Gas Stack Temperature
  - Expected CO Emissions at full load



# Additional Data

- Fuel Analysis
  - Ultra low sulfur diesel fuel
- Air Permits
  - Authorized to Install (ATI) dates
  - Stack discharge height
- Initial Stack testing
  - Short samples for CO; not a performance test

# Project Scope for Compliance

- Diesel Oxidation Catalyst (DOC): CO emissions
  - 23 ppmvd @ 15% O<sub>2</sub> OR 70% reduction
- Crankcase Ventilation System (CVS)
  - Open filtration system preferred
- Continuous Parametric Monitoring System (CPMS)
  - Catalyst inlet temperature, pressure drop
- Initial performance test

# Role of Engineer

- Arrange for baseline stack testing
- Develop performance specifications
  - DOC, CVS, CPMS, etc.
- Prepare bid packages
- Identify qualified bidders
- Bid phase support
- Construction phase support

# Role of Contractor

- Turnkey services
- Install DOC, CVS, CPMS, etc.
- Ensure maximum system back pressure is not exceeded
- Initial performance testing
- Guarantee system performance

# Project Summary

- Four contractors are pursuing project
- Bid are due February 15, 2012
- Construction is expected to be complete by October 31, 2012
- Initial performance testing is expected to be complete by January 31, 2013.

# Thank you

Ray Lukkarinen, P.E.

Senior Chemical Engineer

Stanley Consultants, Inc.

563.264.6592

[lukkarinenraymond@stanleygroup.com](mailto:lukkarinenraymond@stanleygroup.com)



**Stanley Consultants** INC.

A Stanley Group Company  
Engineering, Environmental and Construction Services - Worldwide