Connecticut Department of Energy and Environmental Protection

Connecticut Department of
ENERGY & ENVIRONMENTAL PROTECTION

National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines (RICE Rule)

40 CFR 63 Subpart ZZZZ
Major Source Existing Non-Emergency Spark Ignition 4-Stroke Lean Burn Engine 100 ≤Horsepower ≤500

Connecticut Department of Energy and Environmental Protection

To comply with this rule, you must meet the following emission standards:

- 47 ppm CO at 15% O_2
  - Compliance with the limit is based on the results of testing the average of three 1-hour runs using the specified testing requirements and procedures.

- Engine will probably require an emissions control retrofit in order to achieve this standard. For 4-stroke lean burn engines, this is an oxidation catalyst.
  - Estimated capital cost of catalyst: $12.8*HP +$3,069
  - Estimated annual cost of catalyst: $1.81*HP + $3,442

    (HP = horsepower of the engine)

- Comply with emission limits and operating limits at all times

- At all times you must operate/maintain all equipment in a manner consistent with safety and good air pollution control practices for minimizing emissions.

To comply with this rule, you must perform the following tests:

–Initial emission performance test within 180 days after October 19, 2013

•You may not be required to conduct an initial test on units for which a test has been previously conducted, but the test must meet the following:

–Test must have been conducted using the required methods, and methods must have been followed correctly.

–Test must not be older than 2 years.

–Test must be reviewed and accepted by EPA.

–Test must be conducted at any load condition within ±10% of 100% load.

–Either no process or equipment changes must have been made since the test was performed, OR you must be able to demonstrate that the results of the performance test, with or without adjustments, reliably demonstrate compliance despite process or equipment changes.

If your RICE is currently non-operational:

-Do not startup the engine solely to conduct the performance test; conduct the test when the engine is started up again.

Photo credit: EPA

What are my testing requirements?

COMPLYING WITH THE REQUIREMENT TO…	YOU MUST…	USING…	ACCORDING TO THE FOLLOWING REQUIREMENTS…
Limit the concentration of CO in the engine exhaust	Select the sampling port location and the number of traverse points; and	Method 1 or 1A of 40 CFR part 60, appendix A 63.7(d)(1)(i)	If using a control device, the sampling site must be located at the outlet of the control device.
	Determine the O_2 concentration of the engine exhaust at the sampling port location; and	Method 3 or 3A or 3B of 40 CFR part 60, appendix A, or ASTM Method D6522-00 (Re-approved 2005)[a]	Measurements to determine O_2 concentration must be made at the same time and location as the measurements for CO concentration.
	Measure moisture content of the engine exhaust at the sampling port location; and	Method 4 of 40 CFR part 60, appendix A, or Test Method 320 of 40 CFR part 63, appendix A, or ASTM D 6348-03[a]	Measurements to determine moisture content must be made at the same time and location as the measurements for CO concentration.
	Measure CO at the exhaust of the engine	Method 10 of 40 CFR part 60, appendix A, ASTM Method D6522-00 (2005),[a] Method 320 of 40 CFR part 63, Appendix A, or ASTM D6348-03[a]	CO concentration must be at 15% O_2, dry basis. Results of this test consist of the average of the three 1-hour or longer runs.

a. Incorporated by reference, see 40 CFR 63.14. You may also obtain copies from University Microfilms International, 300 North Zeeb Road, Ann Arbor, MI 48106.

You must use the following testing procedures:

•Conduct three separate test runs for each performance test required. Each run must last at least 1 hour.

•You must normalize the CO concentrations at the inlet and outlet of the control device to a dry basis and to 15% O_2, or an equivalent percent CO_2. If pollutant concentrations are to be corrected to 15% O_2 and CO_2 concentration is measured in lieu of O_2 concentration measurement, a CO_2 correction factor is needed. Calculate the CO_2 correction factor as described in (i) through (iii):

(i) Calculate the fuel-specific F_O value for the fuel burned during the test using values obtained from Method 19, section 5.2, and the equation:

$$\mathbf{F_O = (0.209F_d)/F_c}$$

F_O= Fuel factor based on the ratio of O_2 volume to the ultimate CO_2 volume produced by the fuel at 0% excess air.

0.209= Fraction of air that is O_2, percent/100.

F_d= Ratio of the volume of dry effluent gas to the gross calorific value of the fuel from Method 19, dsm^3/J ($dscf/10^6$ Btu).

F_c= Ratio of the volume of CO_2 produced to the gross calorific value of the fuel from Method 19, dsm^3/J ($dscf/10^6$ Btu).

(ii) Calculate the CO_2 correction factor for correcting measurement data to 15% O_2, as follows:

$$\mathbf{X_{CO2} = 5.9/F_O}$$

X_{CO2}= CO_2 correction factor, percent.

5.9= 20.9% O_2–15% O_2, the defined O_2 correction value, percent.

(iii) Calculate the CO concentrations adjusted to 15% O_2 using CO_2 as follows:

$$\mathbf{C_{adj} = C_d(X_{CO2}/\%CO_2)}$$

C_{adj}= Calculated concentration of CO adjusted to 15% O_2.

C_d= Measured concentration of CO, uncorrected.

$\%CO_2$= Measured CO_2 concentration measured, dry basis, percent.

Testing Procedures

•Engine percent load during a performance test must be determined by documenting the calculations, assumptions, and measurement devices used to measure or estimate the percent load in a specific application. A report of the average percent load determination must be included in the Notification of Compliance Status. The following must be included in the report:

–Engine model number

–Engine manufacturer

–Year of purchase

–Manufacturer's site-rated brake HP

–Ambient temperature, pressure, and humidity during the performance test

–Explanation of all assumptions that were made to estimate or calculate percent load during the performance test

–If measurement devices such as flow meters, kilowatt meters, beta analyzers, stain gauges, etc. are used, the model number of the measurement device, and an estimate of its accuracy in percentage of true value

How do I demonstrate initial compliance with the emission limits and operating limits?

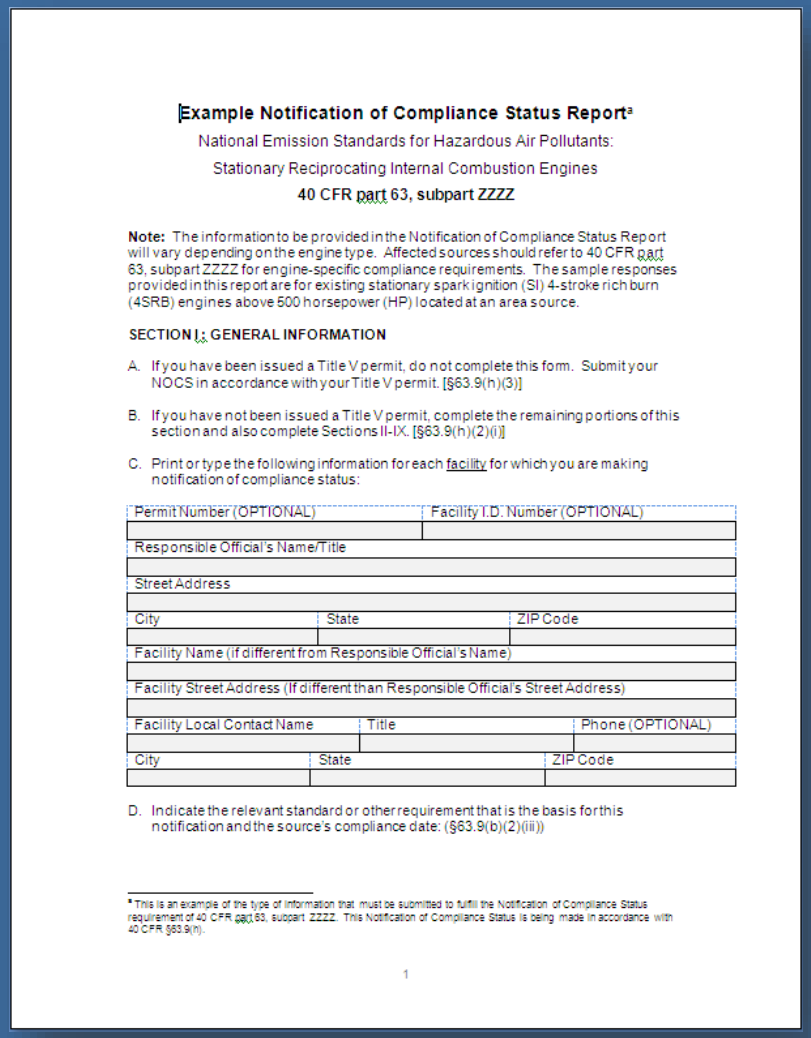
Complying with the requirement to limit the concentration of CO in the engine exhaust:

You have demonstrated initial compliance if the average CO concentration, corrected to 15% O_2, dry basis, from the three test runs is ≤ the emission limit.

How do I demonstrate initial compliance with the emission limits and operating limits?

Submit the Notification of Compliance Status containing the results of the initial compliance demonstration according to the following:

- Notification must be sent before the close of business on the 60th calendar day following the completion of the initial compliance demonstration activity. For example, the Notification shall be sent before close of business on the 60th day following completion of the initial performance test and again before the close of business on the 60th day following the completion of any subsequent required performance test.
- Notifications may be combined as long as the due date requirement for each notification is met.



Example Notification of Compliance Status Report[a]

National Emission Standards for Hazardous Air Pollutants:

Stationary Reciprocating Internal Combustion Engines

40 CFR part 63, subpart ZZZZ

Note: The information to be provided in the Notification of Compliance Status Report will vary depending on the engine type. Affected sources should refer to 40 CFR part 63, subpart ZZZZ for engine-specific compliance requirements. The sample responses provided in this report are for existing stationary spark ignition (SI) 4-stroke rich burn (4SRB) engines above 500 horsepower (HP) located at an area source.

SECTION I: GENERAL INFORMATION

A. If you have been issued a Title V permit, do not complete this form. Submit your NOCS in accordance with your Title V permit. [§63.9(h)(3)]

B. If you have not been issued a Title V permit, complete the remaining portions of this section and also complete Sections II-IX. [§63.9(h)(2)(i)]

C. Print or type the following information for each facility for which you are making notification of compliance status:

Permit Number (OPTIONAL)		Facility I.D. Number (OPTIONAL)
Responsible Official's Name/Title		
Street Address		
City	State	ZIP Code
Facility Name (if different from Responsible Official's Name)		
Facility Street Address (If different than Responsible Official's Street Address)		
Facility Local Contact Name	Title	Phone (OPTIONAL)
City	State	ZIP Code

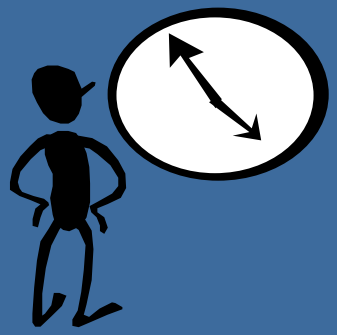
D. Indicate the relevant standard or other requirement that is the basis for this notification and the source's compliance date: (§63.9(b)(2)(iii))

[a] This is an example of the type of information that must be submitted to fulfill the Notification of Compliance Status requirement of 40 CFR part 63, subpart ZZZZ. This Notification of Compliance Status is being made in accordance with 40 CFR §63.9(h).

1

Monitoring Requirements

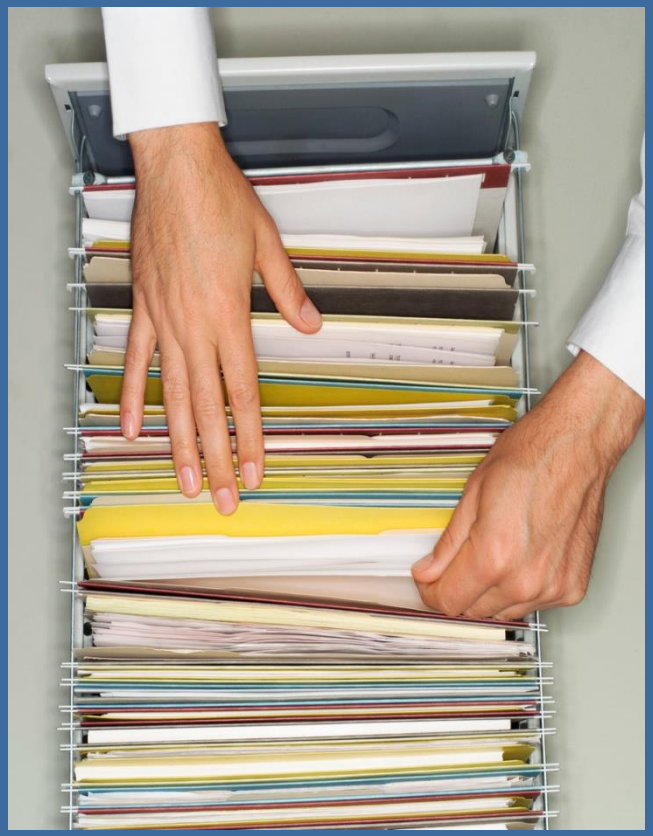
Minimize the engine's time spent at idle during startup and minimize the engine's startup time to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes, after which time the non-startup emission limits apply.



To demonstrate compliance with all rule requirements, you must keep records of:

- Each notification and report submitted and all supporting documentation
- Occurrence and duration of each malfunction
- Performance tests and evaluations
- Required maintenance for air pollution control and monitoring equipment
- Actions taken during malfunctions to minimize emissions and corrective actions

- Keep records for 5 years from the date of creation.



What notifications should I submit?

Notification of:

- Applicability (120 days after effective date) or construction/reconstruction – was due 2/16/2011
- Intent to Conduct Performance test (60 days prior to test)
- Compliance Status (60 days after compliance demonstrated)

What reports should I submit?

Semi-Annual Compliance Report (Annual if engine is for limited use)

- Due January 31st and July 31st each year:
  - –First compliance report must cover the period beginning on October 19, 2013 and ending on December 31, 2013.
  - –Covers the period from January 1-June 30 or July 1-December 31
  - –Report must contain:
    - Statement by responsible official certifying the accuracy of the report.
    - If any malfunctions occurred during the reporting period, including the number, duration, and a brief description for each type of malfunction which occurred and which caused or may have caused any limits to be exceeded. Also include actions taken during malfunction to minimize emissions and correct malfunctions.
    - If no deviations occurred, a statement indicating so.
    - If there were no periods during which the CMS was out-of-control, a statement indicating so.

- For each deviation that occurs where you are NOT using a CMS, report must include:
  - Statement by responsible official certifying the accuracy of the report.
  - If any malfunctions occurred during the reporting period, including the number, duration, and a brief description for each type of malfunction which occurred and which caused or may have caused any limits to be exceeded. Also include actions taken during malfunction to minimize emissions and correct malfunctions.
  - Total operating time of the engine at which the deviation occurred.
  - Information on the number, duration, and cause of deviations, and the corrective action taken.

What reports should I submit?

Semi-Annual Compliance Report

- For each deviation that occurs where you are using a CMS, report must include:
  - Statement by responsible official certifying the accuracy of the report.
  - If any malfunctions occurred during the reporting period, including the number, duration, and a brief description for each type of malfunction which occurred and which caused or may have caused any limits to be exceeded. Also include actions taken during malfunction to minimize emissions and correct malfunctions.
  - Date and time each malfunction started and stopped.
  - Date, time, and duration that each CMS was inoperative, except for zero (low-level) and high-level checks.
  - Date, time, and duration that each CMS was out-of-control, using the information in 40 CFR 63.8(c)(8).
  - Date and time that each deviation started and stopped, and whether each deviation occurred during a period of malfunction or during another period.
  - Summary of the total duration of the deviation during the reporting period, and the total duration as a percent of the total source operating time during that reporting period.
  - Breakdown of the total duration of the deviations during the reporting period into those that are due to control equipment problems, process problems, other known causes, and other unknown causes.
  - Summary of the total duration of CMS downtime during the reporting period, and the total duration of CMS downtime as a percent of the total operating time of the engine at which the CMS downtime occurred during that reporting period.
  - Each parameter and pollutant (CO) that was monitored at the engine.
  - Brief description of the engine and CMS.
  - Date of the latest CMS certification or audit.
  - Description of any changes in CMS, processes, or controls since the last reporting period.

What reports should I submit?

Semi-Annual Compliance Report (Annual if engine is for limited use)

•Report each instance in which you did not meet each emission limit or operating limit.

•Report each instance in which you did not meet the requirements of any of the General Provisions.

•If your source has a Title V Operating Permit, you must report all deviations in the Title V Semi-Annual Monitoring Report.

Where do I send notifications and reports?

EPA REGION 1:

US Environmental Protection Agency
5 Post Office Square, Suite 100, Mail code: OES04-2
Boston, MA 02109-3912
Attention: Air Clerk

By when must I comply with the rule?

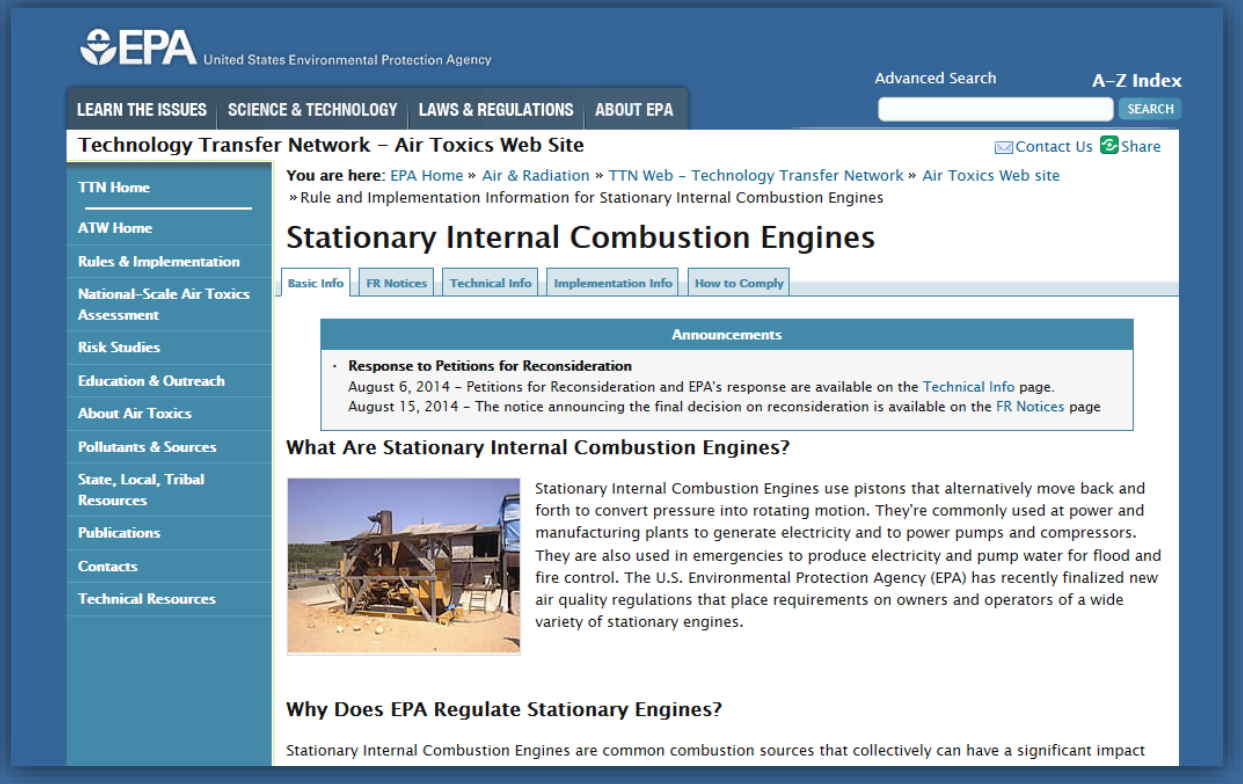
October 19, 2013

Photo credit: EPA

Visit the EPA RICE Compliance Page

www.epa.gov/ttn/atw/icengines

- Fact sheets
- Regulations
- Example notifications
- Announcements
- Q & A documents
- Testing advice
- Recorded webinars
- …and more!



Take Aways

Engine Type:

•An existing non-emergency spark ignition 4-stroke lean burn engine at a major source with a site rating of 100≤HP≤500

Limits:

•Concentration of CO in the engine exhaust must be ≤47 ppm at 15% O_2

Testing:

•Perform initial emission performance test

Take Aways

Monitoring/Recordkeeping:

- Monitor continuously during engine operation
- Keep records of notifications, reports, malfunctions, corrective actions, tests, maintenance, etc.
- Retain records for 5 years

Reporting:

- Submit notifications of:
  - Applicability
  - Intent to Conduct Performance test
  - Compliance Status
- Submit Semi-Annual Compliance Report (annual if engine is limited use)

Compliance Date:

- You must comply by October 19, 2013