



# Connecticut Department of Energy and Environmental Protection



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



**40 CFR 63 Subpart ZZZZ**  
**Area Source Existing Non-Emergency Spark Ignition 4-Stroke Lean**  
**Burn Engine >500 Horsepower (>24 hours/year)**



Connecticut Department of Energy and Environmental Protection

# Engines in remote areas

Your stationary RICE is remote if it meets any of the following criteria:

- It is located in an offshore area of the coast of the U.S. (as defined)
- It is located on a gas pipeline segment meeting the criteria in the rule
- It is not located on gas pipelines and has five or fewer buildings intended for human occupancy and no buildings with four or more stories within a 0.25 mile radius around the engine. A building is intended for human occupancy if its primary use is for a purpose involving the presence of humans.



# To comply with this rule, you must meet the following requirements:

## If your engine is located in a *remote area*, you must adhere to the following management practices.

- Change oil and filter every 2,160 hours of operation or annually, whichever comes first
  - Can use oil analysis program in order to extend the oil change requirement
  - Perform analysis at the same frequency specified for changing the oil (2,160 hours of operation or annually)
  - Analysis program must at a minimum analyze: Total Acid Number, viscosity, and percent water content.
  - Condemning limits for these parameters are: Total Acid Number increases by >3.0 mg of potassium hydroxide per gram from Total Acid Number of the oil when new; viscosity of the oil has changed by >20% from the viscosity of the oil when new; or percent water content (by volume) is >0.5.
  - If none of these condemning limits are exceeded, you are not required to change the oil.
  - If any of the limits are exceeded, change oil within two business days of receiving the results of the analysis; if the engine is not in operation when the results are received, change oil within two business days or before commencing operation, whichever is later.
  - Keep records of parameters analyzed, results of the analysis, and oil changes.
  - Analysis program must be part of the engine maintenance plan.



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

**If your engine is located in a *remote area*, you must adhere to the following management practices.**

- Inspect spark plugs, hoses, and belts every 2,160 hours of operation or annually, whichever comes first; replace as necessary.
- Operate/maintain RICE and aftertreatment control device (if any) according to manufacturer's instructions or develop your own maintenance plan, which must provide for the maintenance and operation of the engine in a manner consistent with good air pollution control practice for minimizing emissions.
- Conduct a review of the surrounding area every 12 months to determine if the nearby population has changed. If your engine no longer meets the criteria for a remote area, you must within 1 year comply with the emission standards for non-remote areas. Keep records of the initial and annual evaluations.



# To comply with this rule, you must meet the following requirements:

## If your engine is *not* located in a remote area, you must adhere to the following:

- Install an oxidation catalyst

  - Estimated capital cost of catalyst:  $\$12.8 \cdot \text{HP} + \$3,069$

  - Estimated annual cost of catalyst:  $\$1.81 \cdot \text{HP} + \$3,442$

    - (where HP = horsepower of the engine)

- Conduct initial test

- Conduct annual checks of the catalyst

- Either use a high temperature shutdown device that detects if the catalyst inlet temperature is too high, **OR**

- Install a CPMS to monitor catalyst inlet temperature continuously and maintain the temperature  $\geq 450^\circ\text{F}$  and  $\leq 1,350^\circ\text{F}$ .

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



# What are my testing requirements?

COMPLYING WITH THE REQUIREMENT TO...	YOU MUST...	USING...	ACCORDING TO THE FOLLOWING REQUIREMENTS...
Reduce CO emissions	Measure the O <sub>2</sub> at the inlet and outlet of the control device; and	Method 3 or 3A or 3B of 40 CFR part 60, appendix A, or ASTM Method D6522-00 (Re-approved 2005) <sup>a</sup>	Measurements to determine O <sub>2</sub> must be made at the same time as the measurements for CO concentration.
	Measure the CO at the inlet and the outlet of the control device	ASTM D6522-00 (Re-approved 2005) <sup>a b</sup> or Method 10 of 40 CFR part 60, appendix A	The CO concentration must be at 15% O <sub>2</sub> , dry basis.
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 <sub>2</sub> 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) <sup>a</sup>	Measurements to determine O <sub>2</sub> 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 <sup>a</sup>	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), <sup>a</sup> Method 320 of 40 CFR part 63, Appendix A, or ASTM D6348-03 <sup>a</sup>	CO concentration must be at 15% O <sub>2</sub> , 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.

b. You may also use Method 320 of 40 CFR part 63, Appendix A, or ASTM D6348-03.



# Testing Procedures

- Use the following equation to determine compliance with the percent reduction requirement:

$$(C_i - C_o) / C_i \times 100 = R$$

$C_i$  = concentration of CO at the control device inlet,

$C_o$  = concentration of CO at the control device outlet, and

R = percent reduction of CO emissions.



# Testing Procedures

•You must normalize the CO concentrations at the inlet and outlet of the control device to a dry basis and to 15% O<sub>2</sub>, or an equivalent percent CO<sub>2</sub>. If pollutant concentrations are to be corrected to 15% O<sub>2</sub> and CO<sub>2</sub> concentration is measured in lieu of O<sub>2</sub> concentration measurement, a CO<sub>2</sub> correction factor is needed. Calculate the CO<sub>2</sub> correction factor as described in (i) through (iii):

(i) Calculate the fuel-specific F<sub>O</sub> value for the fuel burned during the test using values obtained from Method 19, section 5.2, and the equation:

$$F_O = (0.209F_d) / F_c$$

F<sub>O</sub> = Fuel factor based on the ratio of O<sub>2</sub> volume to the ultimate CO<sub>2</sub> volume produced by the fuel at 0% excess air.

0.209 = Fraction of air that is O<sub>2</sub>, percent/100.

F<sub>d</sub> = Ratio of the volume of dry effluent gas to the gross calorific value of the fuel from Method 19, dsm<sup>3</sup> / J (dscf/10<sup>6</sup> Btu).

F<sub>c</sub> = Ratio of the volume of CO<sub>2</sub> produced to the gross calorific value of the fuel from Method 19, dsm<sup>3</sup> / J (dscf/10<sup>6</sup> Btu).

(ii) Calculate the CO<sub>2</sub> correction factor for correcting measurement data to 15% O<sub>2</sub>, as follows:  $X_{CO_2} = 5.9/F_O$

X<sub>CO<sub>2</sub></sub> = CO<sub>2</sub> correction factor, percent.

5.9 = 20.9% O<sub>2</sub> - 15% O<sub>2</sub>, the defined O<sub>2</sub> correction value, percent.

(iii) Calculate the CO gas concentrations adjusted to 15% O<sub>2</sub> using CO<sub>2</sub> as follows:  $C_{adj} = C_d(X_{CO_2}/\%CO_2)$

C<sub>adj</sub> = Calculated concentration of CO adjusted to 15% O<sub>2</sub>.

C<sub>d</sub> = Measured concentration of CO, uncorrected.

%CO<sub>2</sub> = Measured CO<sub>2</sub> concentration measured, dry basis, percent.



# What are my monitoring requirements?

**If required to install a CPMS, you must install, operate, and maintain each CPMS according to the following:**

(1) Prepare a monitoring plan that addresses the monitoring system design, data collection, and the quality assurance and quality control elements outlined in (1)(i) through (v) of this section and in §63.8(d). You may request approval of monitoring system quality assurance and quality control procedures alternative to those specified in (1) through (6) of this section in your site-specific monitoring plan.

- (i) Performance criteria and design specifications for the monitoring system equipment, including the sample interface, detector signal analyzer, and data acquisition and calculations;*
- (ii) Sampling interface (e.g., thermocouple) location such that the monitoring system will provide representative measurements;*
- (iii) Equipment performance evaluations, system accuracy audits, or other audit procedures;*
- (iv) Ongoing operation and maintenance procedures in accordance with provisions in §63.8(c)(1)(ii) and (c)(3); and*
- (v) Ongoing reporting/recordkeeping procedures in accordance with provisions in §63.10(c), (e)(1), and (e)(2)(i).*



# What are my monitoring requirements?

**If required to install a CPMS, you must install, operate, and maintain each CPMS according to the following:**

- (2) Install, operate, and maintain each CPMS in continuous operation according to the procedures in your monitoring plan.
- (3) CPMS must collect data at least once every 15 minutes.
- (4) For a CPMS for measuring temperature range, temperature sensor must have a minimum tolerance of 2.8°C (5°F) or 1% of the measurement range, whichever is larger.
- (5) Conduct the CPMS equipment performance evaluation, system accuracy audits, or other audit procedures specified in your monitoring plan at least annually.
- (6) Conduct a performance evaluation of each CPMS in accordance with your monitoring plan.



# How do I demonstrate initial compliance?

## Conduct initial test:

- Must consist of 3 test runs, each run of at least 15 min duration, except that each test run conducted using appendix A of the rule must consist of 1 measurement cycle as defined by the method and include at least 2 min of test data phase measurement.
- Measure CO and O<sub>2</sub> using one of the CO measurement methods and one of the O<sub>2</sub> measurement methods specified in the Testing Requirements table.
- If you are demonstrating compliance with the CO percent reduction requirement, measure CO and O<sub>2</sub> emissions simultaneously at the inlet and outlet of the control device.
- Achieve 93% CO reduction or 47 ppmvd CO



# How do I demonstrate Continuous Compliance?

## Conduct annual checks of the catalyst to ensure proper catalyst activity:

- At a minimum, check must consist of one 15 min run using the methods discussed earlier, except that each test run conducted using appendix A to the rule must consist of one measurement cycle as defined by the method and include at least 2 min of test data phase measurement.
- Measure CO and O<sub>2</sub> using one of the CO measurement methods and one of the O<sub>2</sub> measurement methods specified in the Testing Requirements table.
- If demonstrating compliance with the CO percent reduction requirement, measure CO emissions and O<sub>2</sub> emissions simultaneously at the inlet and outlet of the control device.
- Catalyst activity test must demonstrate that catalyst achieves 93% reduction in CO emissions or that engine exhaust CO emissions are no more than 47 ppmvd @ 15% O<sub>2</sub>.
- If emissions from the engine do not exceed the levels required for the initial test or annual checks of the catalyst, then the catalyst is working properly.
- If emissions exceed the specified pollutant levels, the exceedances are not considered a violation, but you are required to shut down the engine and take appropriate corrective action (e.g., repairs, clean or replace the catalyst, as appropriate). A follow-up test must be conducted within 7 days of the engine being started up again to demonstrate that the emission levels are being met. If the retest shows that emissions continue to exceed the specified levels, the unit must again be shut down as soon as safely possible, and the engine may not operate, except for purposes of start-up and testing, until you demonstrate through testing that emissions do not exceed the levels specified.

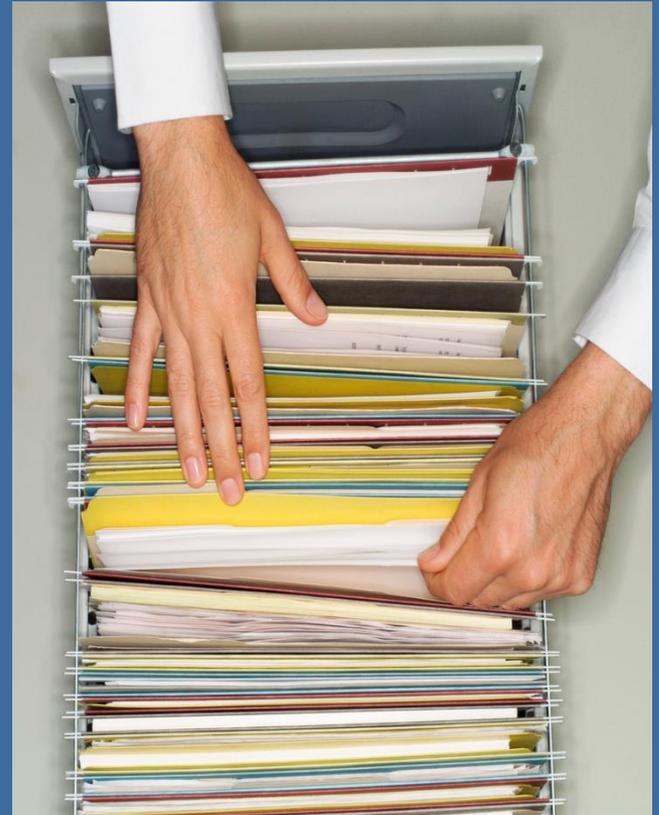


## To demonstrate compliance with all rule requirements, you must keep records of:

- Notifications and reports submitted and all supporting documentation
- Occurrence and duration of each malfunction
- Performance tests and evaluations
- Required maintenance performed on air pollution control and monitoring equipment
- Actions taken during malfunctions to minimize emissions and corrective actions

### If you have a CPMS, keep the following:

- Records:
    - Each period during which a CMS is malfunctioning/inoperative/out-of-control
    - All required measurements needed to demonstrate compliance with a relevant standard
    - All CMS performance test results and evaluations
    - All measurements as may be necessary to determine the conditions of performance tests/evaluations
    - All CMS calibration checks
    - All adjustments and maintenance performed on the CMS
  - Previous versions of the performance evaluation plan
  - Requests for alternatives to the RATA
- 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
- Compliance Status (30 days after compliance demonstrated)

### **Example Notification of Compliance Status Report\***

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))

\* 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(m).



# What reports should I submit?

## Semi-Annual Compliance Report

- Due January 31<sup>st</sup> and July 31<sup>st</sup> 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, the report must *also* include:

- 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, the report must *also* include:
  - 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.
  - Identification of 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.
- Report each instance in which you did not meet the requirements of any of the General Provisions



# Where do I send notifications and reports?



US Environmental Protection Agency

5 Post Office Square, Suite 100, Mail code: OES04-2

Boston, MA 02109-3912

Attention: Air Clerk



Connecticut Department of Energy and Environmental Protection

# By when must I comply with the rule?

October 19, 2013



Photo credit: EPA

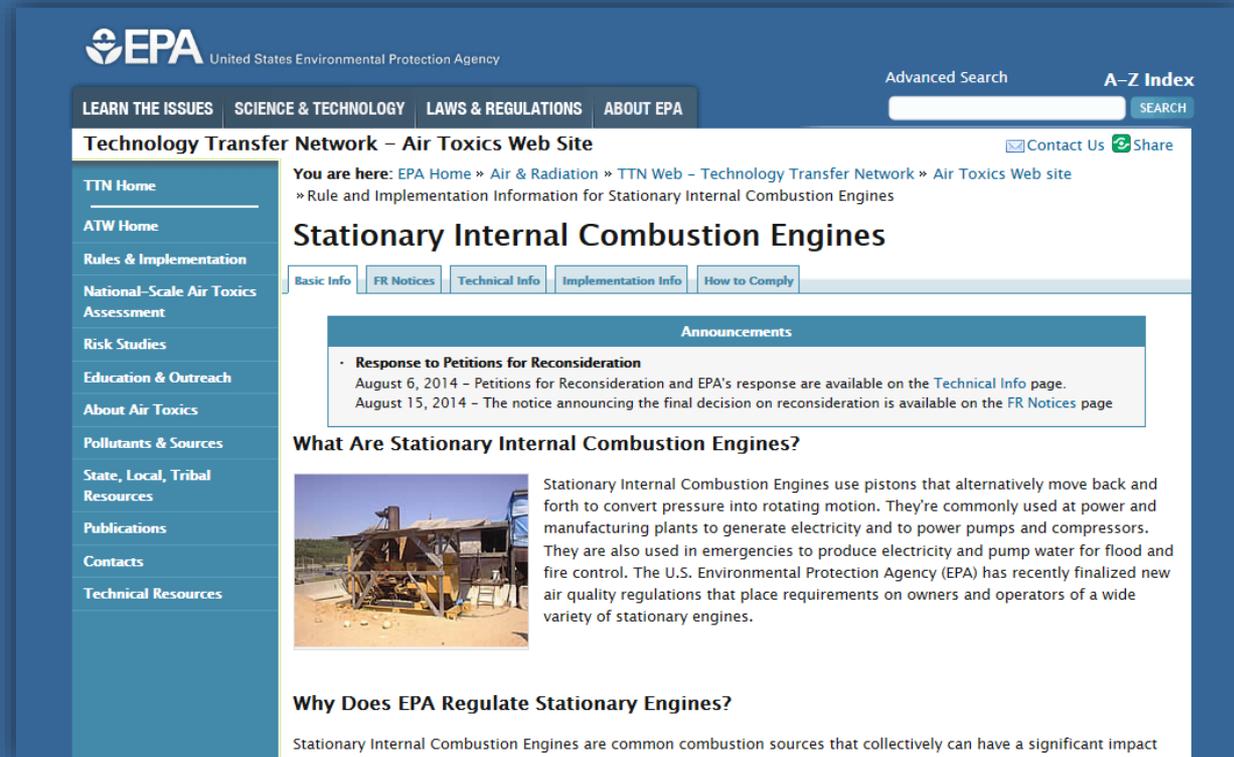


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# Visit the EPA RICE Compliance Page

[www.epa.gov/ttn/atw/icengines/](http://www.epa.gov/ttn/atw/icengines/)

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



The screenshot shows the EPA website's Technology Transfer Network (TTN) Air Toxics Web Site. The page is titled "Stationary Internal Combustion Engines" and is part of the "Rule and Implementation Information for Stationary Internal Combustion Engines" section. The page features a navigation menu on the left with links to TTN Home, ATW Home, Rules & Implementation, National-Scale Air Toxics Assessment, Risk Studies, Education & Outreach, About Air Toxics, Pollutants & Sources, State, Local, Tribal Resources, Publications, Contacts, and Technical Resources. The main content area includes a breadcrumb trail, a search bar, and a "Response to Petitions for Reconsideration" announcement dated August 6, 2014. Below the announcement is a section titled "What Are Stationary Internal Combustion Engines?" which includes a photograph of a stationary internal combustion engine and a brief description of its function. The page also includes a "Why Does EPA Regulate Stationary Engines?" section.



Connecticut Department of Energy and Environmental Protection

# Take Aways

## Engine Type:

- An existing non-emergency spark ignition 4-stroke lean burn engine at an area source with a site rating of greater than 500 HP which is operated more than 24 hours per year

## Engines Located in Remote Areas:

- Every 2,160 hours of operation or annually, whichever comes first:
  - Change oil and filter
  - Inspect spark plugs, hoses, and belts; replace as necessary
- Maintain RICE and control device according to manufacturer's instructions or develop maintenance plan
- Conduct yearly review of surrounding area to determine if population has changed



# Take Aways

## Engines not located in Remote Areas:

- Install catalyst
- Use a high temperature shutdown device or install CPMS to continuously monitor/maintain catalyst inlet temperature

## Testing:

- Initial test- achieve 93% CO reduction or 47 ppmvd CO
- Annual catalyst check

## Recordkeeping:

- Keep records of notifications, reports, malfunctions, corrective actions, tests, maintenance
- Retain records for 5 years

## Reporting:

- Submit notifications of:
  - Applicability
  - Compliance Status
- Submit Semi-Annual Compliance Report

## Compliance Date:

- October 19, 2013

