



# Reciprocating Internal Combustion Engines

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- *The Bottom Line*
- *Summary of Main Requirements for Compression-Ignition RICE*

If you own or operate a stationary generator, pump, compressor or some other piece of stationary equipment then you probably need to retrofit its engine to comply with federal National Emission Standards for Hazardous Air Pollutants (NESHAP) covering stationary reciprocating internal combustion engines (RICE).

Nearly one million existing, stationary diesel RICE are covered by the federal standards and must comply with emission limits or be fitted with emission controls to reduce carbon monoxide (CO) emissions by 70 percent.

This fact sheet is intended to help AGC members evaluate their stationary diesel equipment for compliance with federal RICE NESHAP rule.

*fact sheet*

## *The Bottom Line*

The U.S. Environmental Protection Agency's (EPA) final NESHAP for stationary RICE appear in the *Code of Federal Regulations* at [40 CFR 63, Subpart ZZZZ](#). EPA is accepting, until November 4, 2013, public comment on three specific issues related to RICE emergency or back-up power that are currently under review (*see text box next page*).

EPA set these deadlines for compliance with the national *emission limits* and *operating limits* —

- Non-Emergency Diesel (compression-ignition or CI) Engines – compliance deadline *recently passed* on May 3, 2013.
- Non-Emergency Gas, Propane and Natural Gas (spark-ignition or SI) Engines – compliance deadline is *coming up* on Oct. 19, 2013.

In addition to the emission limits, the RICE NESHAP rule also requires owners/operators of affected engines to meet *notification, monitoring, testing, reporting, and recordkeeping requirements*.

The RICE NESHAP requirements vary depending on criteria such as the engine age, size (horsepower or HP), fuel type, application (non-emergency) and the source type (major/area). This fact sheet is focused on requirements for existing stationary diesel CI RICE that may be used at construction sites, quarries and asphalt/concrete plants.

Do not wait to review the legal requirements, consider options, explore technical issues and establish an appropriate budget. The federal Clean Air Act has severe penalties for non-compliance, including costly fines of up to \$37,500 per day per violation and criminal penalties.

There are a number of technology challenges involved with trying to retrofit an older diesel or gasoline engine with modern emissions controls, new sensors and operating controls. Leading engine manufacturers warn that compliance with numerical limits is not going to be cheap, easy or quick. There are a limited number of RICE consultants, equipment suppliers and installers. [Caterpillar Emissions Solutions](#) continues to offer finance deals for its customers and [Johnson Matthey Station Emissions Control Group](#) (JMI) and [Cummins Emissions Solutions](#) (CES) have formed an alliance to provide their customers with [products](#) to meet the RICE requirements.

## Opportunity to Comment

In response to petitions for reconsideration of the requirements on RICE emergency or back-up power, EPA is accepting comment on these three issues:

- Timing for compliance with the ULSD fuel requirement for certain emergency compression ignition engines,
- Timing and required information for the reporting requirement for certain emergency engines, and
- Conditions for operation for up to 50 hours per year for certain non-emergency situations.

Comments are due on or before November 4, 2013.

In early 2013, EPA published amendments to the RICE NESHAP rule, mainly focused on RICE used for emergency or back-up power (78 *Federal Register* 6674, January 30, 2013). The amendments established, among other things, fuel and reporting requirements for certain emergency engines used for emergency demand response and system reliability. The biggest dispute over the rule was the extent to which it would allow backup diesel generators to run for emergency demand response purposes and be considered emergency engines. In the final revisions and summarized in EPA's Fact Sheets, EPA will allow backup stationary engines that generate electricity to run without emissions controls for 100 hours per year during electricity peak-use periods and emergencies, but the engines must use ultra-low sulfur diesel (ULSD) fuel beginning in 2015, according to the final rule.

## *Summary of Main Requirements for CI RICE*

- **Engine Type** - This rule applies to all stationary engines at area sources of hazardous air pollutants if the engine is constructed/reconstructed (*i.e.*, installed) before July 2006. Mobile or non-road engines as well as most existing emergency stationary RICE are exempt from the federal rule.
- **Deadline** - Full compliance is required by May 3, 2013 – for non-emergency diesel CI RICE.
- **Numeric Emission and Operating Limits** - Non-emergency engines greater than 300 brake HP must reduce emissions by 70 percent, mainly through the use of exhaust after-treatment devices (or meet a CO ppmvd @ 15 percent O<sub>2</sub> limit); install a clean crank case ventilation; monitor inlet temperature and pressure drop (>500 HP only).
- **Management Practice Requirements** - Non-emergency engines 300 HP and below and all emergency engines must meet management practice standards.
- **Fuel Requirements** - Non-emergency engines greater than 300 HP must use ULSD (except in rural Alaska).
- **Idling Limits** - All regulated engines need to limit engine idle during startup to less than 30 minutes per event.

- **Compliance Testing** - Performance testing to demonstrate compliance must be conducted within six (6) months of installation. Re-test engine every 8,760 hours of operation or every three (3) years (>500 HP only); log data and report that the standard is being met. The RICE rule requires all notifications to be submitted to EPA at least 60 days after completing a performance testing. (See "Reporting" below.)
- **Initial Notification** - An initial notification to U.S. EPA is required immediately for non-emergency existing compression ignition (CI) engines subject to numerical emission standards - [Sample Initial Notification- Compression Ignition](#).
- **Reporting** – A Notification of Compliance Status must be sent within 60 days following completion of the initial performance test, or 30 days after completion of performance evaluation of a continuous emission monitoring system (CEMS). Semiannual or annual compliance reports are required after the compliance date for the engine, depending on the engine size.
- **Recordkeeping** - Keep records of pressure drop across the DOC and continuous records of exhaust temperature at the inlet of catalyst to demonstrate compliance. Keep records of the results of any performance testing conducted. Keep records of maintenance on all engines. Records must be kept for five (5) years.

## Emission limits and management practice requirements – existing area source CI RICE

Engine Type – Constructed before June 2006	Requirement
<b>Non-emergency CI ≤300 HP</b>	<b>Management Practice*</b> <ul style="list-style-type: none"> <li>• Change oil and filter annually or every 1,000 hours of operation or use oil analysis program to extend oil change frequencies (see below)</li> <li>• Inspect the air cleaner (filter) annually or every 1,000 hours of operation and replace as needed</li> <li>• Inspect the hoses and belts annually or every 500 hours of operation and replace if needed</li> <li>• Operate and maintain according to manufacturer’s emission-related instructions or implement maintenance plan for operation and maintenance (O&amp;M) consistent with good pollution control practices</li> </ul>
<b>Non-emergency CI 300-500 HP</b>	<b>Emission Limit (<i>except during startup</i>)**</b> <ul style="list-style-type: none"> <li>• Limit CO in exhaust to 49 ppmvd @ 15 percent O<sub>2</sub> or 70 percent CO reduction (except in rural Alaska)</li> </ul>

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Engine Type – Constructed before June 2006	Requirement
<b>Non-emergency CI &gt;500 HP</b>	Emission Limit ( <i>except during startup</i> )** <ul style="list-style-type: none"> <li>Limit CO in exhaust to 23 ppmvd @ 15 percent O<sub>2</sub> or 70 percent CO reduction</li> </ul>
<b>Emergency CI</b>	Management Practice* <ul style="list-style-type: none"> <li>Change oil and filter annually or every 500 hours of operation or use oil analysis program to extend oil change frequencies (see below)</li> <li>Inspect the air cleaner (filter) annually or every 1,000 hours of operation and replace as needed</li> <li>Inspect the hoses and belts annually or every 500 hours of operation and replace if needed</li> <li>Operate and maintain according to manufacturer’s emission-related instructions or implement maintenance plan for O&amp;M consistent with good pollution control practices</li> </ul>

\* Owners/operators of engines subject management practice standards must keep records of oil and filter change dates and the corresponding hour on the hour meter, inspection and replacement dates for air cleaners, hoses and belts, and records of other emission-related repairs and maintenance performed per manufacturer’s instructions or owner-developed maintenance plan. Records must be kept for five years. They must be available on site for at least two years and can be stored (but available) off-site for the remaining three years.

\*\* EPA allows Tier 1 and Tier 2 certified stationary CI engines that are scheduled to be replaced due to state or local rules to meet management practices rather than emissions limits until January 1, 2015 (or 12 years after installation date, but not later than June 1, 2018). In addition, existing stationary area source Tier 3 certified CI engines installed before June 12, 2006, are in compliance with the NESHAP.

## Oil analysis program

Engines subject to the work practices requirements may use the oil analysis program to extend the specified oil change frequencies. The oil analysis must be performed at the same frequency as required by the work practice standard. The following parameters must be analyzed: total base number, viscosity, and percent water content. The oil must be changed if the total base number is less than 30 percent of the total base number of the oil when new; the viscosity of the oil has changed by more than 20 percent from the viscosity when new; or the percent water content by volume is greater than 0.5. If none of these parameters have been exceeded then an oil change is not required. Records must be kept of the parameters that are analyzed as part of this program.

## Operating limitations and compliance testing – existing area source CI RICE

Engine Type – Constructed before June 2006	Requirement
<p><b>All Engines with Catalysts (NSCR or Oxidation)*</b></p> <p>* This only applies for non-emergency engines &gt;500 HP</p>	<p>Operating Limits</p> <ul style="list-style-type: none"> <li>Maintain the catalyst so that the pressure drop across the catalyst does not change by more than two (2) inches of water from the pressure drop that was measured during the initial performance test</li> <li>Maintain the catalyst inlet temperature between 450 and 1350 degrees Fahrenheit</li> </ul>
<p><b>Non-emergency CI ≤300 HP and Emergency CI</b></p>	<p>Compliance Testing</p> <ul style="list-style-type: none"> <li>No performance test required</li> </ul>
<p><b>Non-emergency CI 300-500 HP</b></p>	<p>Operating Limits</p> <ul style="list-style-type: none"> <li>Follow manufacturer’s maintenance and filter replacement requirements for crankcase filtration system (see below)</li> </ul> <p>Compliance Testing</p> <ul style="list-style-type: none"> <li>Conduct an initial performance test to demonstrate compliance with numerical emission standards</li> <li>Send a Notification of Compliance Status within 60 days following completion of initial performance test, or 30 days after completion of performance evaluation of continuous emission monitoring system (CEMS)</li> </ul>
<p><b>Non-emergency CI &gt;500 HP</b></p>	<p>Operating Limits</p> <ul style="list-style-type: none"> <li>Follow manufacturer’s maintenance and filter replacement requirements for crankcase filtration system (see below)</li> </ul> <p>Compliance Testing</p> <ul style="list-style-type: none"> <li>Conduct an initial performance test; re-test every 8,7560 hours of operation or three (3) years, whichever comes first (every five (5) years of limited use)</li> <li>Send a Notification of Compliance Status within 60 days following completion of the initial performance test, or 30 days after completion of performance evaluation of a CEMS</li> <li>Continuously monitor/record the catalyst inlet temperature if oxidation catalyst is being used on engine; pressure drop across catalyst also must be measured monthly</li> </ul>

## Minimize engine idle during startup

Owners/operators of existing, stationary, CI engines (non-emergency and emergency) must minimize idle during startup and startup not to exceed 30 minutes, after which the emission standards that apply during normal operation begin applying to the engine. Engine startup is defined as the time from initial start until applied load and engine and associated equipment, including the catalyst if applicable, reach steady state or normal operation.

## Crankcase emissions control

Owners/operators of existing, stationary, non-emergency CI engines greater than 300 HP are required to control crankcase emissions to *reduce metallic HAP emissions*. If the engine is not already equipped with a closed crankcase ventilation system, then install either a closed crankcase ventilation system or an open crankcase filtration emission control system. A closed crankcase ventilation system must prevent crankcase emissions from being emitted to the atmosphere. An open crankcase filtration system must reduce emissions from the crankcase by filtering the exhaust stream to remove oil mist, particulates, and metals. Manufacturer's requirements must be followed for operating and maintaining either type of system and for replacing the crankcase filters.

Keep records of the manufacturer's recommended maintenance procedures for closed crankcase ventilation system or open crankcase filtration system and records of maintenance performed on the system.

## Fuel requirements

Owners/operators of existing, stationary, non-emergency CI engines greater than 300 HP with a displacement of less than 30 liters per cylinder must meet the nonroad diesel fuel requirements of 40 CFR 80.510(b), which limits sulfur content to 15 ppm and either a minimum cetane index of 40 or a maximum aromatic content of 35 volume percent.

## Reporting requirements

Must submit all of the applicable notifications including an initial notification, notification of performance test, and notification of compliance for each stationary RICE that must comply with the specified emission limitations.

Semiannual or annual compliance reports are required after the compliance date for the engine, depending on the engine size and annual hours of operation. Compliance reports must include information on startup, shutdown and malfunctions, and any deviations from emission standards or operating limitations. If the facility has a title V permit, compliance reports should be submitted according to the schedule in the permit.

## Emergency engines

Emergency engines may be used to prevent electrical outages and to test and maintain engines for up to a total of 100 hours per year.

In 2015, emergency engines will be required to use cleaner fuel – namely, ULSD – if they operate, or commit to operate, for more than 15 hours annually as part of blackout and brownout prevention, also known as emergency demand response. EPA’s information shows that only a small percentage of emergency engines currently use ULSD fuel; switching will reduce emissions of HAP, particulate matter and sulfur dioxide, according to EPA.

Starting in 2015, entities with 100 HP or larger engines that operate, or commit to operate, for more than 15 hours and up to 100 hours per year for emergency demand response will need to collect and submit an annual report including location, dates and times of operation. Reporting requirements ensure compliance with the regulations and provide information about the air pollution impacts of the engines.

For a combined total of 100 hours per year, emergency engines can be used for the following purposes:

- maintenance and testing,
- emergency demand response for Energy Emergency Alert Level 2 situations,
  - responding to situations when there is at least a 5 percent or more change in voltage, and
  - operating for up to 50 hours to head off potential voltage collapse, or line overloads, that could result in local or regional power disruption.

The 2013 amendments restate that in an emergency, such as hurricane or ice storm, any engine of any size can operate without meeting control requirements or emission limits.

Emergency engines that commit to run less than 15 hours for emergency demand response can operate without meeting federal control requirements or numeric emission limits.

This fact sheet should not be construed as legal advice or legal opinion on any specific facts or circumstances. The contents are intended for general information purposes only, and you are urged to consult your own lawyer on any specific legal questions you may have concerning your situation. All photographs, courtesy of the U.S. Environmental Protection Agency.

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