



Universal Emission Technologies
A Division of Universal

**QuietShield™ with
GreenShield® technology**

Compliance Guide to EPA's 40CFR Part 63



**CI (Diesel) RICE NESHAP
Compliance Guide**

Exhaust System Considerations
Serviceable Catalyst Systems
Maintenance Free Catalyst Systems
Compliance Catalyst Monitor

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RICE NESHAP CATALOG
FOR CI ENGINES

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Note

- : All dimensions in inches and weights in pounds, unless otherwise indicated.

Exhaust System Considerations

Diesel Engine Exhaust System Considerations

If your operation requires the use of stationary diesel reciprocating engines as a prime source of power, you need to recognize that this ruling may require some modifications of your work practices and engine(s). The ruling, issued in February 2010, covers existing non-emergency stationary diesel engines. Compliance to the ruling takes effect May 3, 2013. EPA states there are over 900,000 stationary engines in the United States that are affected by this ruling.

Though compliance is a few years away, it doesn't hurt to start planning early, especially if your operation consists of many engines. The first step is to determine your requirements to meet the ruling. The second step is to bring your engine(s) into compliance.

Exhaust System Evaluation

To begin the analysis you need to gather the following data:

1. Horsepower of the engine
2. Annual hours of operation
3. Annual hours of operation for non-emergency purposes
4. Annual hours of operation for maintenance checks and readiness purposes

This information is required to determine if your application is emergency or non-emergency, and whether you fall into a Major Source or Area Source of Hazardous Air Pollutants. A Major Source is an area that produces over 10 tons of Hazardous Air Pollutants (HAPs) annually. An Area Source is considered to be any area that is not a Major Source. Next, take this data to page 1.3 or page 1.6 or to an online RICE NESHAP calculator. There is one located on Universal's website at www.UniversalAET.com. The calculator will use the data to determine the steps needed to bring your engine into compliance.

There are several categories that may require attention to bring your engine into compliance. They are:

- Allowable emission levels
- Low sulfur diesel fuel requirements
- Standard work practices
- Metallic HAP reduction (crankcase)
- Engine operating limitations
- Start-up requirements
- Compliance demonstration
- EPA reporting requirements

Study the requirements generated by the calculator with your maintenance staff. Some requirements do not require a lot of resources. Keeping maintenance and operating records may already be a part of your daily routine. However, there are other requirements that may require additional resources. Some engines may require testing, monitoring equipment and a catalyst system. Contact your engine supplier or an emission control specialist to help facilitate these needs, as their sizing and installation can be quite complex.

If you think you have the resources to handle the more complex requirements, there are some items you need to consider:

- Type of control technology
- Backpressure requirements
- Catalyst placement
- Supportive structure
- Catalyst sizing
- Service requirements
- Enclosed engines
- Compliance testing
- Compliance monitoring
- Labor time

Type of Control Technology

Emission control technology that will be used is Diesel Oxidation Catalysts. See sections 2, 3, and 4. One needs to be aware of the type of coating on the catalyst element's substrate. Platinum coated substrates are more durable than Palladium. Platinum lasts longer and is more robust to poisons like sulfur. RICE NESHAP requires CO reduction by 70%. Most catalysts on the market today are calibrated on the order of 90% CO reduction and therefore would be more expensive. Look for a catalyst provider



Figure 1: Universal provides a combination catalyst/silencer system that causes less engine backpressure.

that can adapt to these lower CO reduction requirements.

Backpressure

Engine backpressure also needs to be considered when adding a catalyst to an existing engine. Adding a catalyst will add backpressure that may exceed the engine exhaust backpressure threshold. A catalyst can add an additional 3-4" of water to engine backpressure. Replacing the silencer with a combination silencer/catalyst unit is a solution to minimize the additional backpressure. They are designed for lower backpressure by reducing the number of expansion and contractions of the exhaust gases. Another option is the catalyst itself can be designed for lower backpressure.

Catalyst Placement

Placement of the catalyst in the exhaust system is critical as the exhaust gas temperature needs to be managed so the catalyst works properly. Most catalysts need to operate above 250° C. The further the gas path is from the source, the lower the temperature. In some applications, this may require additional insulation around the exhaust system in order to maintain the proper exhaust temperature. The system should be optimized for the lowest temperature seen throughout the

Exhaust System Considerations

Diesel Engine Exhaust System Considerations



Figure 2: Proper positioning of catalyst access doors at the site is important for easy service.

year. For example, colder climates may need additional insulation because of winter temperatures. Also, proper attention needs to be paid to the components upstream from the catalyst system. If you are using a packed silencer in sequence with the catalyst system, fibers may come loose that may coat or plug the catalysts element and reduce its effectiveness. In these instances, the catalyst system should be located upstream from the packed silencer.

Supportive Structure

Before installation of the catalyst system, the physical support structure needs to be considered. For larger catalyst systems, the connecting pipe will not be able to support the catalyst's weight. A steel ladder system may be required to support the catalyst

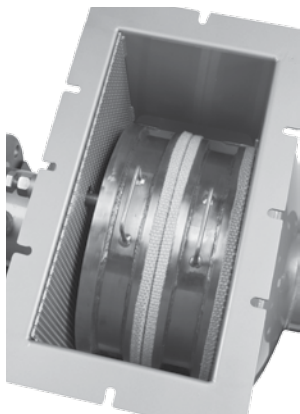


Figure 3: This catalyst housing, offered by Universal, provides a system that eliminates exhaust bypass by forcing the catalyst against the downstream side.

from the package's base. The supportive structures should be fabricated before on-site installation to minimize service time.

Catalyst Sizing

Proper attention needs to be given to catalyst sizing. The volume of the catalyst must be properly sized for the exhaust flow rate to meet the required emissions reduction target. If it is undersized, you won't meet the emissions target. And if it is oversized, the catalyst may be overpriced and uncompetitive when selling to an end user.

Service Requirements

Catalysts require periodic servicing, typically every 8,700 hours of operation. The catalyst system needs to be placed where it can be easily accessed, whether near a service panel or open area. Engines less than 500 HP may utilize a more economical disposable/non-service catalysts housing. See section 4. For larger HP engine applications, it is more cost effective to utilize a removable catalyst element housing design. See sections 2 and 3. This design should allow easy access and removal to the catalyst element without special tools or cumbersome capture mechanisms. The quicker to remove and replace the catalyst element, the more time your technicians have for other jobs. Exhaust bypass is a common problem in some catalyst housing designs. This is where the exhaust gas is not forced through the catalyst. This issue will impact the effectiveness of the catalyst system. Seek a housing and catalyst design that includes a positive seal against the side of the housing, forcing the exhaust gas to flow through the catalyst element.

Enclosed Engines

Many engines that will be affected by the RICE NESHAP ruling will come in enclosed skid-mounted packages. Space inside the enclosures is at a premium. Finding a location to fit a catalyst can be difficult. However, by utilizing an integrated silencer/catalyst system, you may be able to place it in the same footprint as the current silencer. Also, you will need catalyst housings that have different mounting configurations, such as end-in/end-out, side-in/end-out, and high-side in/end-out.

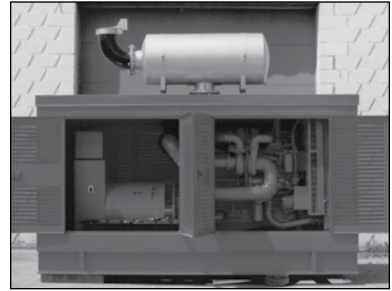


Figure 4: Enclosed packages could present space problems for a "bolt in" catalyst system.

Compliance Testing

Existing stationary engines that require the addition of a catalyst system require before and after emissions testing to validate compliance. To make this requirement easier for your organization, work with an emissions control supplier who can provide the testing. In this way, the emission control supplier can receive information immediately if changes need to be made to meet compliance.

Compliance Monitoring

The RICE NESHAP ruling requires engines that are larger than 500 hp and are a major source of hazardous air pollutants to maintain a service log of catalyst differential pressure and temperature. See page 5.1. A continuous monitoring system can be installed to make this documentation requirement easier for your staff. Use a continuous monitoring device that allows the storage of multiple readings. Also, a monitoring device with CANBUS capabilities will allow integration into your facility's Building Automation System. Or, you may want to consider using a monitoring service that will handle the data tracking requirements for a monthly or yearly fee.

Labor Time

Labor time to retrofit an existing stationary engine is quite variable. One needs to consider the catalyst system's size, weight, site accessibility, lifting equipment, if the package is enclosed or open and installation complexity. Because compliance requirements aren't until May 3, 2013, you have time to work through some of these issues.

Exhaust System Considerations

RICE NESHAP Applicability Guide – Major Sources of HAP

A major source of HAP emissions is generally a stationary source that emits or has the potential to emit any single HAP at a rate of 10 tons or more per year or any combination of HAP at a rate of 25 tons or more per year.

	Non-Emergency CI			Emergency CI	
	Non-Emergency CI <100 HP	Non-Emergency CI 100≤HP≤300	Non-Emergency CI 300<HP≤500	Non-Emergency CI > 500 HP	Emergency CI <500 HP
Emission Levels (Except during periods of start-up)	N/A	230 ppmvd CO at 15% O ₂	49 ppmvd CO at 15% O ₂ or 70% CO reduction	23 ppmvd CO at 15% O ₂ or 70% CO reduction	N/A
Requires Low Sulfur Diesel?	No	No	Yes, if cylinder displacement is less than 30 liters/cylinder	Yes, if cylinder displacement is less than 30 liters/cylinder	N/A
Work Practice Standard	<ol style="list-style-type: none"> 1. Change oil and filter every 1,000 hours of operation, or annually, whichever comes first. 2. Inspect air cleaner every 1,000 hours of operation or annually. 3. Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, replace as necessary. 	N/A	N/A	N/A	<ol style="list-style-type: none"> 1. Change oil and filter every 500 hours of operation, or annually, whichever comes first. 2. Inspect air cleaner every 1,000 hours of operation or annually, whichever comes first. 3. Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, replace as necessary.
Metallic HAP Reduction	N/A	N/A	If not equipped with a closed crankcase ventilation system: <ol style="list-style-type: none"> a. Install a closed ventilation system that prevents crankcase emissions from being emitted to the atmosphere. OR b. Install an open crankcase filtration emission control system that reduces emissions from the crankcase by filtering the exhaust stream to remove oil mist, particulates and metals. 	If not equipped with a closed crankcase ventilation system: <ol style="list-style-type: none"> a. Install a closed ventilation system that prevents crankcase emissions from being emitted to the atmosphere. OR b. Install an open crankcase filtration emission control system that reduces emissions from the crankcase by filtering the exhaust stream to remove oil mist, particulates, and metals. 	N/A
Operating Limitations	N/A	N/A	<ol style="list-style-type: none"> 1. Must maintain the oxidation 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. Must maintain the temperature of the stationary RICE exhaust so that the catalyst inlet temperature is between 450° and 1350° F. 3. Follow the manufacturer's specified maintenance requirements for operating and maintaining the open or closed crankcase ventilation systems and replacing the crankcase filters. 	<ol style="list-style-type: none"> 1. Must maintain the oxidation 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. Must maintain the temperature of the stationary RICE exhaust so that the catalyst inlet temperature is between 450° and 1350° F. 3. Follow the manufacturer's specified maintenance requirements for operating and maintaining the open or closed crankcase ventilation systems and replacing the crankcase filters. 	N/A
Start-up Requirements	Minimize idle time and engine's start-up to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes.	Minimize idle time and engine's start-up to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes.	Minimize idle time and engine's start-up to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes.	Minimize idle time and engine's start-up to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes.	Minimize idle time and engine's start-up to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes.

Exhaust System Considerations

RICE NESHP Applicability Guide – Major Sources of HAP

A major source of HAP emissions is generally a stationary source that emits or has the potential to emit any single HAP at a rate of 10 tons or more per year or any combination of HAP at a rate of 25 tons or more per year.

	Non-Emergency CI			Emergency CI	
	Non-Emergency CI <100 HP	Non-Emergency CI 100≤HP≤300	Non-Emergency CI 300<HP≤500	Non-Emergency CI > 500 HP	Emergency CI <500 HP
Demonstrating Compliance	Must maintain the stationary RICE and after treatment control device (if any) according to the manufacturer's emission-related written instructions or develop their own maintenance plan. Do not have to conduct any performance testing.	Must conduct an initial performance test to demonstrate that the unit achieves the required emission standards.	Must conduct an initial performance test to demonstrate that the unit achieves the required emission standards.	<ol style="list-style-type: none"> 1. Must conduct an initial performance test 2. Must test every 8,760 hours of operation or 3 years, whichever comes first, to demonstrate that the unit achieves the required emission standards. 3. 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. 4. 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. (Currently there are no performance specifications for the continuous parametric monitoring systems (CPMS) that are required for continuously monitoring the catalyst inlet temperature - will be in August 2010 ruling). 	Must maintain the stationary RICE and after treatment control device (if any) according to the manufacturer's emission-related written instructions or develop their own maintenance plan. Do not have to conduct any performance testing.

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Exhaust System Considerations

RICE NESHAP Applicability Guide – Major Sources of HAP

A major source of HAP emissions is generally a stationary source that emits or has the potential to emit any single HAP at a rate of 10 tons or more per year or any combination of HAP at a rate of 25 tons or more per year.

	Non-Emergency CI				Emergency CI
	Non-Emergency CI <100 HP	Non-Emergency CI 100≤HP≤300	Non-Emergency CI 300<HP≤500	Non-Emergency CI > 500 HP	Emergency CI <500 HP
Reporting Requirements	N/A	Must submit all of the applicable notifications as listed in the NESHAP General provisions, including an initial notification, notification of performance test, and a notification of compliance for each stationary RICE which must comply with the specified emission limitations.	<ol style="list-style-type: none"> 1. 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. 2. Must submit all of the applicable notifications as listed in the NESHAP General provisions, including an initial notification, notification of performance test, and a notification of compliance for each stationary RICE which must comply with the specified emission limitations. 	<ol style="list-style-type: none"> 1. 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. 2. Must submit all of the applicable notifications as listed in the NESHAP General provisions, including an initial notification, notification of performance test, and a notification of compliance for each stationary RICE which must comply with the specified emission limitations. 	<ol style="list-style-type: none"> 1. Keep records of hours of operation. 2. Install a non-resettable hour meter. 3. Maintenance checks and readiness testing are limited to 100 hours per year. 4. Keep documentation for reason for emergency use, so it won't count toward maintenance and readiness testing hours. 5. May operate for non-emergency purposes for 50 hours per year, but counts towards 100 hours for operation other than true emergencies. 6. Non-emergency purpose operating can not be for generating income, for example to supply power to an electric grid or supply power as part of a financial arrangement to another entity. 7. May operate the emergency engine for a maximum of 15 hours per year as part of a demand response program if the regional transmission organization or equivalent balancing authority and transmission operator has determined there are emergency conditions that could lead to a potential electrical blackout. 8. The above 15 hours of operation counts toward the 50 hours of non-emergency use.

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Exhaust System Considerations

RICE NESHAP Applicability Guide – Area Sources of HAP

Area sources of HAP emissions are sources that are not major sources.

	Non-Emergency CI				Emergency CI
	Non-Emergency CI <100 HP	Non-Emergency CI 100<HP<300	Non-Emergency CI 300<HP<500	Non-Emergency CI > 500 HP	Emergency CI All HP
Emission Levels (Except during periods of startup)	N/A	N/A	49 ppmvd CO at 15% O2 or 70% CO reduction	23 ppmvd CO at 15% O2 or 70% CO reduction	N/A
Requires Low Sulfur Diesel?	No	No	Yes, if cylinder displacement is less than 30 liters/cylinder	Yes, if cylinder displacement is less than 30 liters/cylinder	
Work Practice Standard	<ol style="list-style-type: none"> 1. Change oil and filter every 1,000 hours of operation, or annually, whichever comes first. 2. Inspect air cleaner every 1,000 hours of operation or annually, whichever comes first. 3. Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, replace as necessary. 	<ol style="list-style-type: none"> 1. Change oil and filter every 1,000 hours of operation, or annually, whichever comes first. 2. Inspect air cleaner every 1,000 hours of operation or annually, whichever comes first. 3. Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, replace as necessary. 	N/A	N/A	<ol style="list-style-type: none"> 1. Change oil and filter every 500 hours of operation, or annually, whichever comes first. 2. Inspect air cleaner every 1,000 hours of operation or annually, whichever comes first. 3. Inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, replace as necessary.
Metallic HAP Reduction	N/A	N/A	If not equipped with a closed crankcase ventilation system: <ol style="list-style-type: none"> a. Install a closed ventilation system that prevents crankcase emissions from being emitted to the atmosphere. OR <ol style="list-style-type: none"> b. Install an open crankcase filtration emission control system that reduces emissions from the crankcase by filtering the exhaust stream to remove oil mist, particulates and metals. 	If not equipped with a closed crankcase ventilation system: <ol style="list-style-type: none"> a. Install a closed ventilation system that prevents crankcase emissions from being emitted to the atmosphere. OR <ol style="list-style-type: none"> b. Install an open crankcase filtration emission control system that reduces emissions from the crankcase by filtering the exhaust stream to remove oil mist, particulates, and metals. 	N/A

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	Non-Emergency CI			Emergency CI	
	Non-Emergency CI <100 HP	Non-Emergency CI 100<HP<300	Non-Emergency CI 300<HP<500	Non-Emergency CI > 500 HP	Emergency CI All HP
Operating Limitations	N/A	N/A	Follow the manufacturer's specified maintenance requirements for operating and maintaining the open or closed crankcase ventilation systems and replacing the crankcase filters.	<ol style="list-style-type: none"> 1. Must maintain the oxidation 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. Must maintain the temperature of the stationary RICE exhaust so that the catalyst inlet temperature is between 450° and 1350° F. 3. Follow the manufacturer's specified maintenance requirements for operating and maintaining the open or closed crankcase ventilation systems and replacing the crankcase filters. 	N/A
Start-up Requirements	Minimize idle time and engine's start-up to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes.	Minimize idle time and engine's start-up to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes.	Minimize idle time and engine's start-up to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes.	Minimize idle time and engine's start-up to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes.	Minimize idle time and engine's start-up to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes.

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	Non-Emergency CI				Emergency CI
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Demonstrating Compliance	Must maintain the stationary RICE and after treatment control device (if any) according to the manufacturer's emission-related written instructions or develop their own maintenance plan. Do not have to conduct any performance testing.	N/A	Must conduct an initial performance test to demonstrate that the unit achieves the required emission standards.	<ol style="list-style-type: none"> 1. Must conduct an initial performance test. 2. Must test every 8, 760 hours of operation or 3 years (5 years for limited use), whichever comes first, to demonstrate that the unit achieves the required emission standards. 3. 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. 4. 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. (Currently there are no performance specifications for the continuous parametric monitoring systems (CPMS) that are required for continuously monitoring the catalyst inlet temperature - will be in August 2010 ruling). 	Must maintain the stationary RICE and after treatment control device (if any) according to the manufacturer's emission-related written instructions or develop their own maintenance plan. Do not have to conduct any performance testing.
Reporting Requirements	None.	Must submit all of the applicable notifications as listed in the NESHAP General provisions, including an initial notification, notification of performance test, and a notification of compliance for each stationary RICE which must comply with the specified emission limitations.	<ol style="list-style-type: none"> 1. Keep records that show that management practices that are required are being met, including oil and filter change dates and 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. 2. 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. 3. Must submit all of the applicable notifications as listed in the NESHAP General provisions, including an initial notification, notification of performance test, and a notification of compliance for each stationary RICE which must comply with the specified emission limitations. 	<ol style="list-style-type: none"> 1. Keep records that show that management practices that are required are being met, including oil and filter change dates and 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. 2. 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. 3. Must submit all of the applicable notifications as listed in the NESHAP General provisions, including an initial notification, notification of performance test, and a notification of compliance for each stationary RICE which must comply with the specified emission limitations. 	<ol style="list-style-type: none"> 1. Keep records of hours of operation. 2. Install a non-resettable hour meter. 3. Maintenance checks and readiness testing are limited to 100 hours per year. 4. Keep documentation for reason for emergency use, so it won't count toward maintenance and readiness testing hours. 5. May operate for non-emergency purposes for 50 hours per year, but counts towards 100 hours for operation other than true emergencies. 6. Non-emergency purpose operating can not be for generating income, for example to supply power to an electric grid or supply power as part of a financial arrangement to another entity. 7. May operate the emergency engine for a maximum of 15 hours per year as part of a demand response program if the regional transmission organization or equivalent balancing authority and transmission operator has determined there are emergency conditions that could lead to a potential electrical blackout. 8. The above 15 hours of operation counts toward the 50 hours of non-emergency use.

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