

**QUESTIONS AND ANSWERS REGARDING
APPLICATION OF THE NTE REQUIREMENTS
TO MARINE DIESEL ENGINES**

March 17, 2003

Question 1

For commercial and recreational marine diesel engines subject to the Tier 2 emissions standards, the regulations require that a manufacturer's application for certification include a statement that the marine engine family will comply with the applicable Not-To-Exceed (NTE) limits when operated under all conditions which may reasonably be expected to be encountered in normal vessel operation and use (40 CFR 94.203(d)(14)). Does this require manufacturers to obtain or submit different or additional certification test data or information beyond the manufacturer's statement of compliance with the NTE?

Answer

EPA expects manufacturers to provide a statement of NTE compliance at the certification stage for commercial marine engines subject to the MY 2007 standards and recreational marine engines subject to the MY 2009 standards. Under section 94.203(d)(14), the manufacturer should also provide a detailed description summarizing the testing, engineering analyses, and other information which provides the basis for this statement. The manufacturer would not need to submit the underlying data and information unless requested by EPA under 40 CFR 94.203(e).

EPA believes that there is a variety of information that a manufacturer could use as a reasonable basis for a statement that engines are expected to meet NTE requirements. For example, a reasonable basis could include data from the duty cycle specified in 40 CFR 94.106, steady-state testing over a robust engine emissions map derived from laboratory testing utilizing prescribed test methods, and technical analyses relying on good engineering judgment which are sufficient, in combination, to project emissions levels under NTE conditions reasonably expected to be encountered in normal vessel operation and use. One example of such an engine emissions map would be a number of steady-state speed and load points spaced throughout the applicable NTE zone, including testing near the boundaries of the NTE zone as well as near the theoretical propeller curve used in the E3 duty cycle (if applicable). Examples of acceptable test points are shown in Attachment A for each of the marine NTE zones. Data generated from onboard testing to determine emission levels could, at the manufacturer's option, also be part of this combination. However, a reasonable basis for the manufacturer's statement does not require onboard emissions test data. This statement could reasonably be based solely on laboratory test data, analysis, and other information reasonably sufficient to support a conclusion that the engine will meet the NTE limits under conditions reasonably expected to be encountered in normal vessel operation and use. If a manufacturer has relevant onboard emissions test data, it should be taken into consideration by the manufacturer in developing the basis for its statement.

Question 2

EPA's Part 94 regulations for marine CI engines include NTE emissions requirements, and to facilitate in-use emissions testing the regulations require that the engine be equipped with a connection in the exhaust system for the temporary attachment of gaseous and/or particulate emissions sampling equipment (40 CFR 94.7(d)). The preambles to the final rules for commercial and recreational marine engines also discuss in-use testing of marine engines by EPA, including for compliance purposes (64 FR 73300, 73309 (December 29, 1999) and 67 FR 68242, 68311 (November 8, 2002)). While the regulations include provisions requiring production line testing by engine manufacturers, they do not include provisions for a manufacturer run in-use test program. EPA should clarify the following issues:

- (a) Are or will manufacturers be required to perform a manufacturer run in-use emissions testing program for these diesel marine engines?
- (b) Under what conditions would EPA conduct in-use emissions tests, and if such tests are performed under what conditions would the results trigger an administrative recall order?
- (c) Who is responsible for providing the exhaust system connection specified in 40 CFR 94.7(d)?

Answers

(a) As noted in the question, EPA's regulations do not include provisions requiring manufacturer run in-use testing of these marine CI engines. EPA currently plans to initiate a rulemaking to adopt a program for manufacturer run in-use testing of on-highway diesel truck engines. EPA does not have current plans to adopt such a regulatory program for these diesel marine engines. If we were to require such an in-use test program in the future, we would reevaluate the production line testing program for marine engines and, if appropriate, consider limiting this testing.

(b) When EPA tests in-use diesel marine engines to confirm compliance with emissions standards, the tests would be performed on the engine using either an engine dynamometer or onboard emissions sampling equipment capable of performing in the marine environment. EPA intends to use onboard sampling equipment that produces accurate and reliable emissions results, as any compliance action based on such emissions results would have to be premised on the accuracy and precision of the testing performed by EPA.

At this time, EPA does not anticipate conducting a large number of in-use emissions tests. If EPA does obtain in-use emissions data, and there are indications of noncompliance, then EPA will evaluate whether it can and should pursue an administrative recall order. In determining whether to pursue such remedial action, EPA will consider all data available to it, including any data submitted by the manufacturer. EPA would also consider the margin by which any exceedences violated the NTE, the number of engines that showed exceedences, the frequency and duration of any exceedences as compared with the aggregate amount of time that test engines were operated within the NTE zone, the emissions of the test engines over the entire test route, including average(s), the projected emissions impact of the exceedences, and the

relationship of the exceedences at issue to the engine family's ability to comply with the applicable standards or FELs. EPA would also consider any other data or factors relevant to determining whether to pursue some form of remedial action.

(c) The marine regulation requires that the engine be equipped with a connection in the exhaust system for the temporary attachment of gaseous and/or particulate emissions sampling equipment (40 CFR 94.7(d)). This provision is intended to facilitate in-use emissions testing. Where the engine manufacturer does not add a sample port, for example when an inadequate amount of the exhaust system is supplied to make such an installation practical, the engine manufacturer would have to provide installation instructions for the sample port. If the engine manufacturer properly supplies such instructions, the engine would be covered by the applicable engine certificate when the engine manufacturer provides the engine to the vessel manufacturer for the purposes of installation. The vessel manufacturer would then have to follow these installation instructions or the vessel manufacturer's sale or placement of the vessel into service could be a violation of the prohibited acts. See 68 FR 9746 (February 28, 2003).

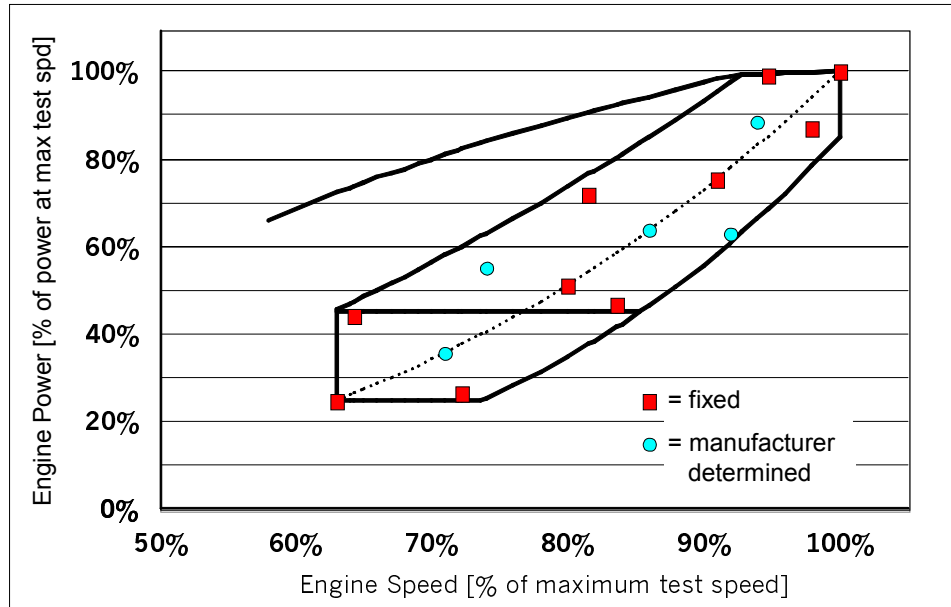
Attachment B contains model installation instructions that engine manufacturers may use for their specific applications. These model instructions are detailed enough to adequately describe the required port size, physical configuration, access needs, and potential vessel manufacturer liability under the prohibited acts of the applicable federal requirements.

ATTACHMENT A

Examples of Acceptable Engine Test Points for Response to Question 1

1. Category 1 engines certified using the duty cycle specified in 40 CFR 94.105(b).
[propulsion marine engines with fixed-pitch propellers, E3 duty cycle]

a. Illustration of 15 test points within the NTE zone:



b. Table of 10 fixed test points:

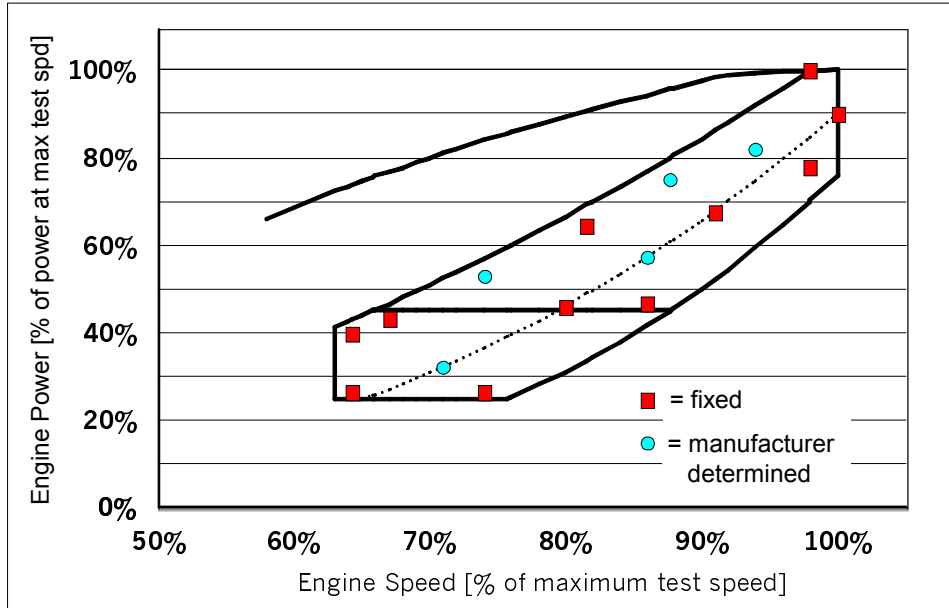
% of maximum test speed	% of maximum power at maximum test speed
63%	25%
64%	44%
72%	27%
80%	50%
82%	72%
84%	47%
91%	75%
98%	87%
100%	100%

The tenth test point is 1.02 times the speed at the intersection of upper NTE boundary and power curve and the maximum power at this speed.

c. The manufacturer would also determine 5 additional test points within the NTE zone. These test points should be spaced, based on good engineering judgement, in a reasonably even manner throughout the NTE zone (or otherwise spaced) in such a way as to allow emissions to be interpolated throughout the NTE zone with reasonable assurance of linearity.

2. Category 2 engines certified using the duty cycle specified in 40 CFR 94.105(b).
 [propulsion marine engines with fixed-pitch propellers, E3 duty cycle]

a. Illustration of 16 test points within the NTE zone:



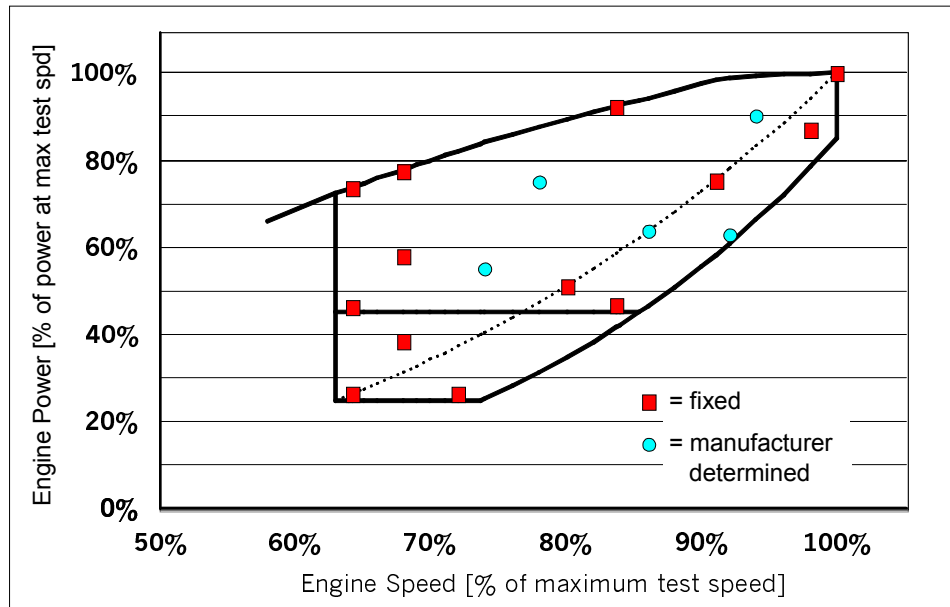
b. Table of 11 fixed test points:

% of maximum test speed	% of maximum power at maximum test speed
64%	26%
64%	40%
67%	44%
74%	27%
80%	45%
82%	65%
86%	47%
91%	68%
98%	78%
98%	100%
100%	90%

c. The manufacturer would also determine 5 additional test points within the NTE zone. These test points should be spaced, based on good engineering judgement, in a reasonably even manner throughout the NTE zone (or otherwise spaced) in such a way as to allow emissions to be interpolated throughout the NTE zone with reasonable assurance of linearity.

3. Engines certified using the duty cycle specified in 40 CFR 94.105(c)(2).
 [variable speed propulsion marine engines with variable-pitch or electronically coupled propellers, C1 duty cycle]

a. Illustration of 18 test points within the NTE zone:



b. Table of 13 fixed test points:

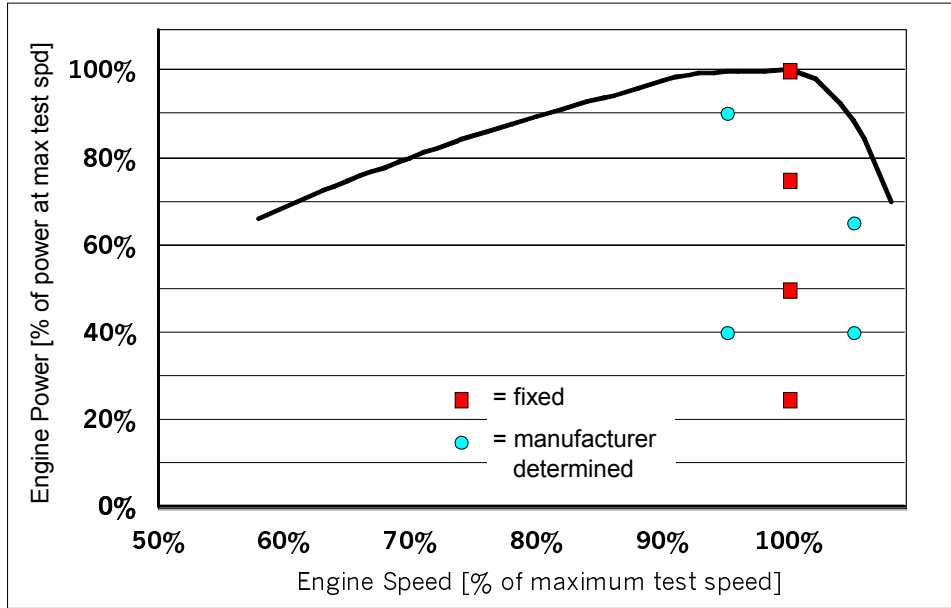
% of maximum test speed	% of maximum power at maximum test speed
64%	26%
64%	46%
64%	intersection with power curve
72%	27%
80%	50%
84%	47%
84%	intersection with power curve
91%	75%
98%	87%
100%	100%
intermediate speed*	50% of max power at int. spd.
intermediate speed*	75% of max power at int. spd.
intermediate speed*	intersection with power curve

* If this mode is not within the NTE zone, it would be excluded; however, a manufacturer-determined test point, as described below, would be added.

- c) The manufacturer would also determine 5 additional test points within the NTE zone. An additional manufacturer-determined test point would be added for any fixed test point that does not lie within the NTE zone. These test points should be spaced, based on good engineering judgement, in a reasonably even manner throughout the NTE zone (or otherwise spaced) in such a way as to allow emissions to be interpolated throughout the NTE zone with reasonable assurance of linearity.

4. Engines certified using the duty cycle specified in 40 CFR 94.105(c)(1).
 [constant speed propulsion marine engines, non-propeller law operation, E2 duty cycle]

a. Illustration of 8 test points within the NTE zone:



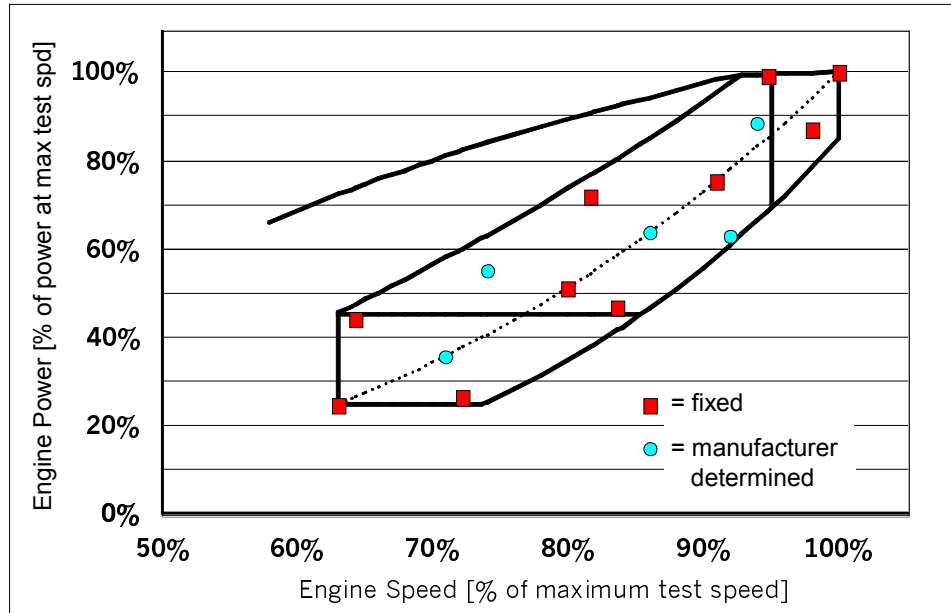
b. Table of 4 fixed test points:

% of maximum test speed	% of maximum power at maximum test speed
100%	25%
100%	50%
100%	75%
100%	100%

c. The manufacturer would also determine 2 additional test points at 95% of maximum test speed and 2 additional points at 105% of maximum test speed. These test points should be spaced, based on good engineering judgement, in a reasonably even manner (or otherwise spaced) in such a way as to allow emissions to be interpolated within this range with reasonable assurance of linearity.

5. Recreational engines certified using the duty cycle specified in §94.105(e).
 [recreational marine engines, E5 duty cycle]

a. Illustration of 15 test points within the NTE zone:



b. Table of 10 fixed test points:

% of maximum test speed	% of maximum power at maximum test speed
63%	25%
64%	44%
72%	27%
80%	50%
82%	72%
84%	47%
91%	75%
98%	87%
100%	100%

The tenth test point is 1.02 times the speed at the intersection of upper NTE boundary and power curve and the maximum power at this speed.

c. The manufacturer would also determine 5 additional test points within the NTE zone. These test points should be spaced, based on good engineering judgement, in a reasonably even manner throughout the NTE zone (or otherwise spaced) in such a way as to allow emissions to be interpolated throughout the NTE zone with reasonable assurance of linearity.

ATTACHMENT B

Model Instructions For Installation of Sample Port

IMPORTANT NOTICE TO VESSEL MANUFACTURERS CONCERNING INSTALLATION OF SAMPLE PORT

Vessel manufacturers should note that federal regulations require the installation on this engine of an exhaust sampling port in the exhaust system downstream of the marine engine that could be used for connection to an exhaust emissions measuring device. The relevant provisions of the marine engine regulation (40 CFR 94.7(d)) read as follows:

All engines subject to the emission standards of this part shall be equipped with a connection in the engine exhaust system that is located downstream of the engine and before any point at which the exhaust contacts water (or any other cooling/scrubbing medium) for the temporary attachment of gaseous and/or particulate emissions sampling equipment. This connection shall be internally threaded with standard pipe threads of a size not larger than one-half inch, and shall be closed by a pipe plug when not in use. Equivalent connections are allowed.

Where the engine manufacturer does not add a sample port, for example when an inadequate amount of the exhaust system is supplied to make such an installation practical, the engine manufacturer is required to provide instructions to the vessel manufacturer explaining how to meet this requirement. Further, the instructions must note that failure to comply with this requirement may constitute an act that is prohibited under federal law and may subject the vessel manufacturer to federal penalties.

This Notice provides our instructions to you on how to properly install this emissions sampling port on this engine. It is your responsibility as the vessel manufacturer to ensure that the required sample port is installed.

The instructions for the proper installation and location of the required sample port, in addition to those specified above in the quoted federal regulation are as follows:

- (i) the connection should be located as far downstream as reasonably practicable from any sharp bend (of 30° or more) in the exhaust pipe to help ensure that a well-mixed exhaust flow sample may be taken;
- (ii) the requirement that the connection be located before any point at which the exhaust contacts water (or any other cooling/scrubbing medium) does not include contact with water used to cool exhaust manifolds, unless the water is allowed to come into direct contact with the exhaust gases;

(iii) to allow ready access to the sample port, the connection should be located, if possible given the constraints of vessel design, approximately two to six feet above a deck or walkway;

(iv) to facilitate insertion and withdrawal of an exhaust sample probe, there should be no obstructions for at least one and one-half exhaust pipe/stack diameters perpendicular, i.e., 90 degrees, from the sample port; and

(v) if a threaded connection is used, both the internal and external threads should be coated with a high-temperature, anti-seize compound before the initial installation and at every subsequent re-installation to facilitate removal of the connection for testing.

Vessel manufacturers should ensure that they carefully follow these instructions concerning an exhaust sampling port as required under controlling federal regulations. Failure to do so could be a violation of the prohibited acts set forth at 40 CFR 94.1103, potentially subjecting you to federal penalties, and could make it unlawful to sell or place the vessel into service.