

over a prescribed duty cycle of speeds and loads, typically using an engine dynamometer. The nature of the duty cycle used for determining compliance with emission standards during the certification process is critical in evaluating the likely emission-control performance of engines designed to those standards.

To address operational differences between engines, we are adopting two different duty cycles for different types of Category 3 marine engines. Engines that operate on a fixed-pitch propeller curve must be certified using the E3 duty cycle adopted by the International Organization for Standardization (ISO). This is a four-mode steady-state cycle developed to represent in-use operation of marine diesel engines. The four modes lie on an average propeller curve based on the vessels surveyed in the development of this duty cycle. We are adopting the ISO E2 duty cycle for propulsion engines that operate at a constant speed. These are the same cycles specified by Annex VI.

2. How Do I Account for Variable Test Conditions?

We are not limiting certification testing based on barometric pressure or ambient humidity. We limit the allowable ambient air temperature for laboratory testing to a range between 13°C and 30°C and charge air cooling water between 17°C and 27°C. This is somewhat broader than is specified by the NTC. We are adopting the NTC correction factors for temperature and humidity for certification testing in this temperature range. These corrections adjust emission measurements to be equivalent to measurements taken at 25°C and a humidity of 10.71 g/kg. We will allow the use of the corrections for a broader range of test conditions, as long as the manufacturer verifies the accuracy of the correction factors outside of the range of test conditions for certification.

3. How Does Laboratory Testing Relate to Actual In-Use Operation?

If done properly, laboratory testing can provide emission measurements that are the same as measurements taken from in-use operation. However, improper measurements may be unrepresentative of in-use operation. We are therefore adopting regulatory provisions to ensure that laboratory measurements accurately reflect in-use operation. The regulations include a general requirement that manufacturers must use good engineering judgment in applying the NO_x Technical Code test procedures to ensure that the emission measurements accurately represent

emission-control performance from in-use engines. We are adding specific requirements for manufacturers to ensure that intake air and exhaust restrictions and coolant and oil temperatures are consistent with in-use operation. Most importantly, we require that manufacturers' simulation of charge-air cooling replicate the performance of in-use coolers within $\pm 3^\circ\text{C}$.

The definition of maximum test speed, (the maximum engine speed in revolutions per minute, or rpm) is an important aspect of the test cycles. Under the NO_x Technical Code, engine manufacturers are allowed to declare the rated speeds for their engines, and to use those speeds as the maximum test speeds for emission testing. However, we are concerned that a manufacturer might declare a rated speed that is not representative of the in-use operating characteristics of its engine in order to influence the parameters under which their engines may be certified. We are therefore applying the current definition of "maximum test speed", which is already specified for Category and Category 2 engines 40 CFR 94.107, to Category 3 engines. We will also allow manufacturers to ask us to use the maximum in-use engine speed as the maximum test speed.

D. Comparison to NO_x Technical Code Compliance Requirements

1. How Are EPA's Compliance Requirements Different From the NO_x Technical Code Requirements?

We have attempted to define compliance requirements that are sufficiently consistent with the NO_x Technical Code (NTC) to allow manufacturers to use a single harmonized compliance strategy to certify under both systems. This has involved making several changes to proposal to align the certification and compliance program with that specified by NTC. For example, (1) the final rule specifies a test fuel based on engine operation with cleaner-burning distillate fuel; (2) we are not requiring engine manufacturers to test engine emissions to verify compliance after engines are installed in vessels; and (3) operators do not need to conduct onboard emission measurements after adjusting the engines (or before they enter U.S. territorial waters) to demonstrate that the engine continues to meet the standards after such adjustments. We intend to revisit these issues in our future rulemaking.

We are adopting several provisions in our compliance program that are different from the NTC requirements.

The differences are based on certain Clean Air Act-specific compliance provisions and the related need to adopt test procedures designed to achieve the emission reductions called for under Clean Air Act section 213. These differences are discussed in detail in Section V.A.2 above and are summarized as follows:

- **Liability for in-use compliance**—We require that the engine manufacturer be responsible for designing and producing an engine that will comply with the emission standards for the full useful life of the engine, while the NTC program makes the ship operators solely responsible for ensuring in-use compliance. Both the EPA regulations and the NTC provisions require ship operators to properly maintain their engines and to keep records of the maintenance and engine adjustment throughout the service life of the engine. Under NTC, these records are referred to as the Record Book of Engine Parameters.

- **Durability demonstration**—We require that the engine manufacturer demonstrate prior to production that a properly maintained and used engine will comply with the emission standards for the full useful life of the engine (*see* Section V.B.5). The NTC program only requires manufacturers to demonstrate that the engine meets the standards when it is installed in the vessel; there is no durability demonstration under NTC.

- **Witness testing**—We allow, but do not require, witness testing for U.S. compliance. Some other countries require witness testing for marine engines. Manufacturers must take this into consideration if they plan to sell the same engines in the United States and those other countries.

- **Test conditions**—We certify Category 3 marine engines using the NTC test procedures with certain modifications. Annex VI specifies narrow ranges for air and water temperature. This can make it easier for manufacturers to certify, because they might not design for the wide ranges of conditions that actually occur. We believe it is necessary to specify wider temperatures to achieve the level of emission reductions called for under the Act. Test procedures based on real operating parameters provide a robust method of measuring emissions. To address the concern for varying emission levels under extreme conditions, we correct emissions back to standard conditions using Annex VI correction factors.

- **Test parameters**—NTC allows manufacturers full discretion to adjust certain engine parameters to appropriate