

F. Compliance Issues To Be Considered for Future Rulemaking

The compliance program being finalized in this final rule is appropriate to implement the Tier 1 standards. However, we continue to believe that additional compliance provisions will be necessary for later standards that require more advanced technology and more challenging calibrations. These include provisions related to (1) parameter adjustment, (2) off-cycle emissions, (3) test fuels, and (4) post-certification testing. These issues were discussed in detail in the proposal for this rule, along with potential compliance provisions that could address our concerns. We intend to assess the need for such compliance provisions in our future rulemaking.

1. What Are EPA's Concerns About Parameter Adjustment?

Given the broad range of ignition properties for in-use residual fuels, we expect that our in-use adjustment allowance for Category 3 engines would result in a broader range of adjustment than is expected for Category 2 engines. Because of this broader allowance, we proposed that operators be required to perform a simple field measurement test to confirm emissions after a parameter adjustment or maintenance operation, using onboard emission measurement systems with electronic-logging equipment. We expect that this issue will be equally important for more advanced engines that rely on water injection or after treatment for emission reductions. In addition, in most cases, these advanced technologies can be turned on and off by the operator. Thus, we expect there to be a need for an onboard verification system for these engines as well.

We envision a simpler measurement system than the type specified in Chapter 6 of NO_x Technical Code. As is described in the Final Regulatory Support Document, we believe that onboard emission equipment that is relatively inexpensive and easy to use could be used to verify that an engine is properly adjusted and is operating to the specifications of the engine manufacturer. Note that Annex VI includes specifications allowing operators to choose to verify emissions through onboard testing, which suggests that Annex VI also envisioned that onboard measurement systems could be of value to operators.

We proposed to allow vessel operators to adjust an engine's operating parameters different from the manufacturer's specification when the vessel is sufficiently far from the U.S.

coastline. This flexibility is not included in the NTC provisions. Under the proposed approach, engine adjustments different from engine manufacturer's specifications would have been conditional on readjusting the engine's parameters within its certified range and confirming that emissions are within the range of emissions to which the engine is certified to comply before a vessel approaches the U.S. coastline. Failure to take these actions would have constituted tampering with the engine in violation of Clean Air Act section 203(a)(3)(A) and 40 CFR 94.1103(a)(3)(i). While we are finalizing our Tier 1 program without this flexibility, we will continue to evaluate whether it is appropriate for more advanced standards.

While we may revisit some of these issues in our future rulemaking, under this final rule ship operators may not adjust the parameters outside of the ranges specified by engine manufacturers in their application for certification. Any adjustment outside of the certification range would be considered tampering (*see* Sections V.B.3 and V.B.14).

2. What Are EPA's Concerns About Off-Cycle Emissions?

We are concerned about emission-control performance when the engine is not operating on the ISO E3 test cycle points. For Category 1 and Category 2 engines, we adopted "not-to-exceed" provisions to define an objective measure to ensure that engines would be reasonably controlling emissions under the whole range of expected normal operation, as well as the defeat-device prohibition. Since these smaller engines are mass produced for a wide range of vessels used in many different applications, we expected "normal operation" for these engines to vary considerably around the ideal propeller curve. Generally, Category 3 engines are intended to operate on a propeller curve matched with a propeller for custom installation on a specific vessel. However, we remain concerned that Category 3 engines may have higher emissions between test modes. While the defeat device provisions prohibit manufacturers from producing their engines to control emissions more effectively at established test points than at other points not included in the test, it can be a difficult prohibition to enforce. We expect to revisit this issue in our future rulemaking. For example we may require manufacturers to develop emission targets to allow the operator to ensure that the engine has been readjusted to have performance

equivalent to the certified configuration. These emission targets would vary with operating conditions and would include targets for engine speeds other than the test points speeds. In the proposal we defined equivalent control to be either the use of the same injection timing map for the tested and nontested engine speeds, or following a linear interpolation between test points for NO_x emissions at nontest speeds.

In addition, we remain concerned that Category 3 engines operate at relatively low power levels when they are operating within range of a port. Ship pilots generally operate engines at reduced power for several miles to approach a port, with even lower power levels very close to shore. Because of the relatively low weighting of the low-power test modes in the ISO E3 test cycle, it is very possible that manufacturers could meet emission standards without significantly reducing emissions at the low-power modes that are more prevalent for these engines as they operate close to commercial ports. This issue would generally not apply to vessels that rely on multiple engines providing electric-drive propulsion, since these engines can be shut down as needed to maintain the desired engine loading. We will consider several options in our future rulemaking to address this concern. We could re-weight the modes of the duty cycle to emphasize low-power operation. This has several disadvantages. For example, we have no information to provide a basis for applying different weighting factors. Also, changing the duty cycle would depart from the historic norm for marine engine testing. This would make it more difficult to make use of past emission data, which is all based on the established modal weighting. An alternative approach would be to cap emission rates at the two low-power modes. We could set the cap at the same level as the emission standard, or allow for a small variation above the emission standard. For mechanically controlled engines, such an approach could dictate the overall design of the engine. On the other hand, it is likely that Tier 2 engines will have electronic controls, which would enable the manufacturer to target emission controls specifically for low-power operation without affecting the effectiveness of emission controls at higher power.

3. What Are EPA's Concerns About the Fuel Used for Emission Testing?

Appropriate test procedures need to represent in-use operating conditions as much as possible, including specification of test fuels consistent with the fuels that compliant engines