

any point within the physically adjustable ranges (see § 1039.115(e)).

(4) Calibrate the test engine within normal production tolerances for anything we do not consider an adjustable parameter (see § 1039.205(q)).

(d) You may ask to use emission data for an equivalent engine family from previous model years instead of doing new tests, but only if the data show that the test engine would meet all the requirements applicable for the engine family covered by the application for certification. For the purpose of this paragraph, equivalent engine families are engine families that differ only with respect to model year.

(e) We may require you to test a second engine in addition to the engine tested under paragraph (b) of this section.

(f) If you use an alternate testing procedure under 40 CFR 1065.10 and later testing shows that such testing does not produce results that are equivalent to the procedures specified in subpart F of this part, we may reject data you generated using the alternate procedure.

(g) You are not required to provide smoke emission data for engines having a certification PM emission level less than 0.07 g/kW-hr or a PM FEL less than 0.07 g/kW-hr.

**§ 1039.240 How do I demonstrate that my engine family complies with exhaust emission standards?**

(a) For purposes of certification, your engine family is considered in compliance with the applicable numerical emission standards in § 1039.101 (a) and (b) if all emission-data engines representing that family have test results showing deteriorated emission levels at or below these standards. (Note: if you participate in the ABT program in subpart H of this part, your FELs are considered to be applicable emission standards with which you must comply.)

(b) Your engine family is deemed to not comply if any emission-data engine representing that family has test results showing a deteriorated emission level above any applicable emission standard from § 1039.101 for any pollutant.

(c) To compare emission levels from the test engine with the applicable emission standards, apply deterioration factors to the measured emission levels for each pollutant. Section 1039.245 specifies how to test your engine to develop deterioration factors that represent the deterioration expected in emissions over your engines' full useful life. Your deterioration factors must be consistent with emission increases observed from any in-use testing with

similar engines. Small-volume engine manufacturers may use assigned deterioration factors that we establish. Apply the deterioration factors as follows:

(1) If you use aftertreatment technology (other than particulate traps) to control emissions of a pollutant, the deterioration factor for that pollutant is the ratio of exhaust emissions at the end of useful life to exhaust emissions at the low-hour test point. Adjust the official emission results for each tested engine at the selected test point by multiplying the measured emissions by the deterioration factor. If the factor is less than one, use one. This provision does not apply for smoke emissions. Multiplicative DFs must be specified to one more significant figure than the applicable standard.

(2) If you use particulate traps or if you use no aftertreatment technology to control emissions of a pollutant, the deterioration factor for that pollutant is the difference between exhaust emissions at the end of useful life and exhaust emissions at the low-hour test point. Adjust the official emission results for each tested engine at the selected test point by adding the factor to the measured emissions. If the factor is less than zero, use zero. Deterioration factors for smoke emission are always additive. Additive DFs must be specified to one more decimal place than the applicable standard.

(3) If your engine vents crankcase emissions to the exhaust or to the atmosphere, you must account for crankcase emission deterioration, using good engineering judgment. You may use separate factors for crankcase emissions (either multiplicative or additive) or include the effects in combined exhaust and crankcase factors.

(d) After adjusting the emission levels for deterioration, round them to the same number of decimal places as the emission standard. Compare the rounded emission levels to the emission standard for each test engine.

(e) For engines subject to NMHC standards, you may base compliance on total hydrocarbon (THC) emissions. Indicate in your application for certification if you are using this option. If you do, measure THC emissions and calculate NMHC emissions as 98 percent of THC emissions:  $NMHC = (0.98) \times (THC)$ .

**§ 1039.245 How do I determine deterioration factors from exhaust durability testing?**

Determine deterioration factors (DFs) to show that your engines will meet emission standards throughout the

useful life, as described in §§ 1039.101 and 1039.240. This section describes how to determine deterioration factors, either with an engineering analysis, with pre-existing test data, or with new emission measurements. If you are required to perform durability testing, see § 1039.220 for limitations on the maintenance that you may perform on your test engine. You must determine a separate DF for each pollutant.

(a) You may ask us to approve deterioration factors for an engine family with established technology based on engineering analysis instead of testing. Established technology refers to engines for which the applicable NMHC+NO<sub>x</sub> standard or FEL is greater than the Tier 3 NMHC+NO<sub>x</sub> standard described in 40 CFR § 89.112, unless the engines use exhaust-gas recirculation or aftertreatment. Established technology also refers to engines for which the applicable NMHC+NO<sub>x</sub> standard or FEL is less than or equal to the Tier 3 NMHC+NO<sub>x</sub> standard if you can show that the engines do not have technologies other than those generally used on engines meeting NMHC+NO<sub>x</sub> standards less stringent than the Tier 3 standards.

(b) You may ask us to approve deterioration factors for an engine family based on emission measurements from similar highway or nonroad engines if you have already given us this data for certifying the other engines in the same or previous model years. Use good engineering judgment to decide whether the two engines are similar. We will approve your request if you show us that the emission measurements from other engines reasonably represent in-use deterioration for the nonroad engine family.

(c) If you are unable to determine deterioration factors for an engine family under paragraph (a) or (b) of this section, select engines, subsystems, or components for testing. Determine deterioration factors based on service accumulation and related testing to represent the deterioration expected from in-use engines over the full useful life. You must measure emissions from the test engine at least three times with evenly spaced intervals of service accumulation. You may use extrapolation to determine deterioration factors once you have established a trend of increasing emissions with age for each pollutant. You may use an engine installed in nonroad equipment to accumulate service hours instead of running the engine only in the laboratory. Use good engineering judgment for all aspects of the effort to establish deterioration factors under this paragraph (c).