

ANNEX II

PROCEDURES FOR CONDUCTING THE TEST FOR DURABILITY OF EMISSION CONTROL SYSTEMS

3. ESTABLISHING USEFUL LIFE DETERIORATION FACTORS

3.1. General

Deterioration factors applicable to an engine-aftertreatment system family are developed from the selected engines based on a distance and service accumulation procedure that includes periodic testing for gaseous and particulate emissions over the ESC and ETC tests.

3.2. Service accumulation schedule

Service accumulation schedules may be carried out at the choice of the manufacturer by running a vehicle equipped with the selected parent engine over an “in-service accumulation” schedule or by running the selected parent engine over a “dynamometer service accumulation” schedule.

3.2.1. In-service and dynamometer service accumulation

3.2.1.1. The manufacturer shall determine the form and extent of the distance and service accumulation for engines, consistent with good engineering practice.

3.2.1.2. The manufacturer will determine when the engine will be tested for gaseous and particulate emissions over the ESC and ETC tests.

3.2.1.3. A single engine-operating schedule shall be used for all engines in an engine-aftertreatment system family.

3.2.1.4. At the request of the manufacturer and with the agreement of the type-approval authority, only one test cycle (either the ESC or ETC test) need be run at each test point with the other test cycle run only at the beginning and at the end of the service accumulation schedule.

3.2.1.5. Operating schedules may be different for different engine-aftertreatment system families.

3.2.1.6. Operating schedules may be shorter than the useful life period provided that the number of test points allows for a proper extrapolation of the test results, according to section 3.5.2. In any case, the service accumulation shall not be shorter than shown in the table in section 3.2.1.8.

3.2.1.7 The manufacturer has to provide the applicable correlation between minimum service accumulation period (driving distance) and engine dynamometer hours, for example, fuel consumption correlation, vehicle speed versus engine revolutions correlation etc.

3.2.1.8. Minimum service accumulation

Category of vehicle in which engine will be installed	Minimum service accumulation period	Useful life(Article of this Directive)
Category N1 vehicles	100 000 km	Article 3(1)(a)
Category N2 vehicles	125 000 km	Article 3(1)(b)
Category N3 vehicles with a maximum technically	125 000 km	Article 3(1)(b)

Status: This is the original version (as it was originally adopted).

permissible mass not exceeding 16 tonnes		
Category N3 vehicles with a maximum technically permissible mass exceeding 16 tonnes	167 000 km	Article 3(1)(c)
Category M2 vehicles	100 000 km	Article 3(1)(a)
Category M3 vehicles of classes I, II, A and B, with a maximum technically permissible mass not exceeding 7,5 tonnes	125 000 km	Article 3(1)(b)
Category M3 vehicles of classes III and B, with a maximum technically permissible mass exceeding 7,5 tonnes	167 000 km	Article 3(1)(c)

- 3.2.1.9. The in-service accumulation schedule shall be fully described in the application for type-approval and reported to the type-approval authority before the start of any testing.
- 3.2.2. If the type-approval authority decides that additional measurements need to be carried out on the ESC and ETC tests between the points selected by the manufacturer it shall notify the manufacturer. The revised in-service accumulation schedule or dynamometer service accumulation schedule shall be prepared by the manufacturer and agreed by the type-approval authority.
- 3.3. Engine testing
- 3.3.1. Start of the service accumulation schedule
- 3.3.1.1. For each engine-aftertreatment system family, the manufacturer shall determine the number of hours of engine running after which the operation of the engine-after-treatment system has stabilised. If requested by the approval authority the manufacturer shall make available the data and analysis used to make this determination. As an alternative, the manufacturer may elect to run the engine for 125 hours to stabilise the engine-aftertreatment system.
- 3.3.1.2. The stabilisation period determined in section 3.3.1.1 will be deemed to be the start of the service accumulation schedule.
- 3.3.2. Service accumulation testing
- 3.3.2.1. After stabilisation, the engine will be run over the service accumulation schedule selected by the manufacturer, as described in section 3.2 above. At the periodic intervals in the service accumulation schedule determined by the manufacturer, and, where appropriate, also stipulated by the type-approval authority according to section 3.2.2, the engine shall be tested for gaseous and particulate emissions over the ESC and ETC tests. In accordance with section 3.2, if it has been agreed that only one test cycle (ESC or ETC) be run at each test point, the other test cycle (ESC or ETC) must be run at the beginning and end of the service accumulation schedule.

- 3.3.2.2. During the service accumulation schedule, maintenance will be carried out on the engine according to section 4.
- 3.3.2.3. During the service accumulation schedule, unscheduled maintenance on the engine or vehicle may be performed, for example if the OBD system has specifically detected a problem that has resulted in the malfunction indicator (MI) being activated.
- 3.4. Reporting
 - 3.4.1. The results of all emission tests (ESC and ETC) conducted during the service accumulation schedule shall be made available to the type-approval authority. If any emission test is declared to be void, the manufacturer shall provide an explanation of why the test has been declared void. In such a case, another series of emission tests over the ESC and ETC tests shall be carried out within a further 100 hours of service accumulation.
 - 3.4.2. Whenever a manufacturer tests an engine over a service accumulation schedule for the establishment of deterioration factors, the manufacturer shall retain in its records all information concerning all the emission tests and maintenance carried out on the engine during the service accumulation schedule. This information shall be submitted to the approval authority along with the results of the emission tests conducted over the service accumulation schedule.
- 3.5. Determination of deterioration factors
 - 3.5.1. For each pollutant measured on the ESC and ETC tests and at each test point during the service accumulation schedule, a “best fit” regression analysis shall be made on the basis of all test results. The results of each test for each pollutant shall be expressed to the same number of decimal places as the limit value for that pollutant, as shown in the Tables in section 6.2.1 of Annex I to Directive 2005/55/EC, plus one additional decimal place. In accordance with section 3.2, if it has been agreed that only one test cycle (ESC or ETC) be run at each test point and the other test cycle (ESC or ETC) run only at the beginning and end of the service accumulation schedule, the regression analysis shall be made only on the basis of the test results from the test cycle run at each test point.
 - 3.5.2. On the basis of the regression analysis, the manufacturer shall calculate the projected emission values for each pollutant at the start of the service accumulation schedule and at the useful life that is applicable for the engine under test by extrapolation of the regression equation as determined in section 3.5.1.
 - 3.5.3. For engines not equipped with an exhaust aftertreatment system, the deterioration factor for each pollutant is the difference between the projected emission values at the useful life period and at the start of the service accumulation schedule.

For engines equipped with an exhaust aftertreatment system, the deterioration factor for each pollutant is the ratio of the projected emission values at the useful life period and at the start of the service accumulation schedule.

In accordance with section 3.2, if it has been agreed that only one test cycle (ESC or ETC) be run at each test point and the other test cycle (ESC or ETC) run only at the beginning and end of the service accumulation schedule, the deterioration factor calculated for the test cycle that has been run at each test point shall be applicable also for the other test cycle, provided that for both test cycles, the relationship between the measured values run at the beginning and at the end of the service accumulation schedule are similar.

- 3.5.4. The deterioration factors for each pollutant on the appropriate test cycles shall be recorded in section 1.5 of Appendix 1 to Annex VI to Directive 2005/55/EC.
- 3.6. As an alternative to using a service accumulation schedule to determine deterioration factors, engine manufacturers may choose to use the following deterioration factors: Where appropriate and on the basis of information to be supplied by the Member States, the Commission may propose a revision of the DF's shown in this table in accordance with the procedure laid down in Article 13 of Directive 70/156/EEC.
- | Engine type | Test cycle | CO | H | C | HC | CH ₄ | NO _x | PM | Diesel engine | ESC | 1,1,05 |
|-------------|------------|-----|---------|---|---------|-----------------|-----------------|---------|---------------|-----|--------|
| — | 1,051,1 | ETC | 1,11,05 | — | 1,051,1 | Gas engine | ETC | 1,11,05 | 1,051,21,05 | — | — |
- 3.6.1. The manufacturer may select to carry across the DF's determined for an engine or engine/aftertreatment combination to engines or engine/aftertreatment combinations that do not fall into the same engine family category as determined according to section 2.1. In such cases, the manufacturer must demonstrate to the approval authority that the base engine or engine/aftertreatment combination and the engine or engine/aftertreatment combination for which the DF's are being carried over have the same technical specifications and installation requirements on the vehicle and that the emissions of such engine or engine/aftertreatment combinations are similar.
- 3.7. Checking of conformity of production
- 3.7.1. Conformity of production for emissions compliance is checked on the basis of section 9 of Annex I to Directive 2005/55/EC.
- 3.7.2. At the time of type-approval, the manufacturer may choose to measure at the same time the pollutant emissions before any exhaust aftertreatment system. In so doing, the manufacturer may develop an informal deterioration factor separately for the engine and the aftertreatment system that may be used by the manufacturer as an aid to end of production line auditing.
- 3.7.3. For the purposes of type-approval, only the deterioration factors adopted by the manufacturer from section 3.6.1 or the deterioration factors developed according to section 3.5 shall be recorded in section 1.4 of Appendix 1 to Annex VI to Directive 2005/55/EC.