



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NATIONAL VEHICLE AND FUEL EMISSIONS LABORATORY
2565 PLYMOUTH ROAD
ANN ARBOR, MICHIGAN 48105-2498

OFFICE OF
AIR AND RADIATION

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CD-12-07 (Revised)
(LDV/LDT/MDPV/HDV/ICI/LD-AFC)

SUBJECT: Assigned Deterioration Factors

Dear Manufacturer:

This letter provides revised EPA assigned deterioration factors (ADFs) for determining compliance with certain chassis-based exhaust and evaporative emission standards. These revised ADFs apply to vehicles that must meet a Tier 2 or heavy-duty chassis-based exhaust emission standard, and also to vehicles which must meet a Federal LEV-II or heavy-duty evaporative emission standard. The revised ADFs are presented in Tables 1 and 2, which are attached to this letter. The ADFs presented in this guidance letter supersede the ADFs in EPA guidance letter CCD-05-10 for Tier 2 vehicles and are effective immediately.

Applicability

The additive exhaust emission ADFs in Table 1 supersede the multiplicative ADFs in EPA guidance letter CCD-05-10 dated May 26, 2005. The new ADFs must be used by original equipment manufacturers (OEMs) electing to use EPA ADFs for demonstrating compliance under Tier 2 or heavy-duty chassis exhaust emission standards. The revised evaporative/refueling additive ADFs must be used by OEMs electing to use EPA ADFs for demonstrating compliance under Federal LEV II, or heavy-duty evaporative emission standards. Usage of ADFs is contingent on OEMs qualifying under the small volume manufacture and small volume test group provisions of 40 CFR § 86.1826-01 as provided in 40 CFR paragraphs 86.1838-01(b)(1) and 86.1838-01(b)(2).

Qualifying small volume alternative fuel converters and Independent Commercial Importers (ICIs) also use ADFs to demonstrate compliance with exhaust and evaporative emission standards. Fuel converters modify previously certified OEM products and demonstrate compliance with emission standards under EPA regulations in 40 CFR Part 85 subpart F. ICIs bring previously uncertified vehicles into compliance with applicable EPA standards. Thus both alternative fuel converters and ICIs that have need for ADFs must now follow the new guidance provided in this letter.

Given that only recent model year (MY) OEM deterioration factors (DFs) were analyzed using EPA's Verify data system (data from 2009 and later MYs for analysis of Tier 2 and heavy-duty exhaust emission data, and data from 2010 and later MYs for analysis of the evaporative emission data) the ADFs in Tables 1 and 2 apply to only certain MYs of vehicles that must

comply with emission standards under fuel conversion or ICI regulations. For example, it is not appropriate to use the ADFs in Tables 1 and 2 for determining compliance under earlier standards, such as NLEV or Tier 1 emission standards. Therefore, effective with the issuance of this guidance letter, Tables 1 and 2 apply to fuel conversions of OEM 2004 model year (MY) and later chassis tested vehicles certified under Tier 2 standards, and also to fuel conversions of OEM 2005 MY and later chassis certified heavy-duty vehicles. Evaporative emissions ADFs presented in Table 2 apply to fuel conversions of OEM 2009 MY and later light-duty vehicles and heavy-duty chassis certified vehicles. Similar limitations as a function of MY apply to the use of ADFs for ICI vehicles.

Fuel converters and ICIs requesting the use of an EPA ADF outside the MY ranges described above will need to contact EPA. EPA will assign these types of DFs on a case-by-case basis.

Authority

EPA is issuing these new ADFs under the regulatory authority in 40 CFR §86.1826-01, in particular the authority for the Agency to assign deterioration factors, and to periodically update and publish these in a guidance document or advisory circular, provided in paragraph 40 CFR §86.1826-01(b).

Methodology

A recent assessment of the ADFs contained in EPA guidance letter CCD-05-10 suggests that the use of multiplicative ADFs may no longer be appropriate since the original equipment manufacturers (OEMs) primarily have used additive DFs since the beginning of emission compliance under Tier 2 standards.

The ADFs in Tables 1 and 2 are based on an analysis that ranks OEM additive ADFs from lowest to highest, and then finds the 70th percentile value, as contemplated under 40 CFR §86.1826(b)(1)(i). In order to overcome the problem of insufficient gasoline OEM DFs for Tier 2 bins 2, 6, and 7, it was determined reasonable to combine bins 2 and 3, combine bins 4 and 5, and combine bins 6, 7, and 8. EPA vehicle certification regulations are structured such that the DFs associated with a durability group may be used across a number of test groups. Prior to finding the 70th percentile values, data were filtered for a given combination of useful life and manufacturer durability group to eliminate duplicate DFs for the newly combined bins 2-3, 4-5, and 6-8. A similar approach was followed for analysis of additive evaporative ADFs, but understanding that there are no evaporative emission durability groups, only evaporative emission families. Standards for evaporative emission are developed as a function of vehicle class, where each class corresponds to a unique evaporative emission standard. Thus, the ADFs provided in Table 2 are also shown as a function of vehicle class.

The OEM data used for developing the new ADFs are derived from the EPA Verify data base. Records for MYs 2009-2012 were used for analysis of OEM exhaust emission DFs. Records for MYs 2010-2012 were used in the derivation of evaporative emission ADFs. These MY ranges were selected to correspond to final phase-in of the Tier 2 and heavy-duty exhaust emission standards and final phase-in of the LEV-II and heavy-duty evaporative emission standards.

Analyzing OEM additive DFs provides a more robust sample size compared to the number of OEM multiplicative DFs. Nevertheless, the analysis of additive DFs revealed inadequate data samples for alternative fuels. There are very few (none in some cases) additive OEM DFs for vehicles certified on CNG, LNG, LPG, and diesel fuel, and few OEM DFs for vehicles certified to the ethanol bin standards. Based on knowledge of exhaust temperature development data at the catalyst inlet, it is reasonable to conclude that, in general, OEM DFs developed on gasoline would represent a worst case DF relative to DFs developed using CNG, LNG, LPG, and ethanol fuel types. Therefore, OEMs, fuel converters, and ICIs wishing to use ADFs on vehicles that will use alternative fuels, may use the gasoline ADFs presented in Tables 1 and 2. There are also inadequate numbers of OEM DFs for chassis certified heavy-duty vehicles. Given that chassis certified heavy-duty vehicles are sometimes certified to MDPV bin 8 standards, EPA concludes it is reasonable to use bin 6-8 exhaust ADFs for demonstrating compliance with heavy-duty standards.

OEMs, fuel converters, and ICIs that desire to use an EPA ADF for new fuel types and advanced vehicle and emissions control technologies must contact EPA for guidance.

EPA contact

For further questions on this guidance letter contact Martin Reineman at by email at reineman.martin@epa.gov.

Sincerely,



Byron J. Bunker, Acting Director
Compliance Division
Office of Transportation and Air Quality

Enclosures

Enclosure 1 to CD-12-07

Table 1 - Tier 2 Gasoline Exhaust Emission Additive ADFs [1][2][3][4][5]

Tier 2 Bins	Useful Life	NMOG g/mi	CO g/mi	NOx g/mi	HCHO mg/mi
2-3	120K	0.0020	0.12	0.002	0.0
5	50K	0.0049	0.11	0.005	0.1
4-5	120K	0.0123	0.29	0.014	0.3
6-8	50K	0.0118	0.24	0.016	0.2
6-8 [6]	120K	0.0299	0.61	0.040	0.4

[1] For fuel converters and ICIs, these ADFs are applicable to 2004 model year and later vehicles chassis certified under Tier 2 or heavy-duty exhaust emission standards. See EPA if ADFs are needed for earlier model year vehicles. The previous multiplicative ADFs in guidance letter CCD-05-10 may still be appropriate for older vehicles needing to meet standards under pre-Tier 2 compliance programs.

[2] To convert a 120K ADF to an optional 150K ADF, use the following equation:

$$150K \text{ ADF} = (120K \text{ ADF})(146K/116K)$$

[3] Table 1 ADFs are also applicable to gasoline hybrid, ethanol FFVs, CNG, LNG, and LPG vehicles

[4] Not enough PM data were available for development of an assigned DF. Compliance statements may be used in lieu of PM measurement

[5] Table 1 not applicable to diesels – see EPA if necessary

[6] Bin 6-8 ADFs may be applied to heavy-duty chassis test results

Enclosure 2 to CD-12-07
Table 2 - Federal LEV II, HDV Gasoline Evaporative Emission
120K Additive ADFs [1][2][3][4][5]

Evaporative/Refueling Test	Vehicle Class	Additive DF
2 Day Diurnal + Hot Soak	Light-Duty Vehicles	0.010 g
2 Day Diurnal + Hot Soak	Light Light-Duty Trucks	0.007 g
2 Day Diurnal + Hot Soak	Heavy Light-Duty Trucks	0.010 g
2 Day Diurnal + Hot Soak	Medium-Duty Passenger Vehicles	0.000 g
2 Day Diurnal + Hot Soak	Heavy-Duty Vehicles 8500 – 14,000 GVW	0.000 g
3 Day Diurnal + Hot Soak	Light-Duty Vehicles	0.013 g
3 Day Diurnal + Hot Soak	Light Light-Duty Trucks	0.000 g
3 Day Diurnal + Hot Soak	Heavy Light-Duty Trucks	0.000 g
3 Day Diurnal + Hot Soak	Medium-Duty Passenger Vehicles	0.000 g
3 Day Diurnal + Hot Soak	Heavy-Duty Vehicles 8500 – 14,000 GVW	0.000 g
Running Loss [6]	All Classes	0.000 g/mi
ORVR [7]	All Classes	0.005 g/gal

[1] For fuel converters and ICIs, ADFs are applicable to 2009 model year and later light-duty and heavy-duty chassis certified vehicles. The previous additive evaporative emission ADFs in guidance letter CCD-05-10 may still be appropriate for older vehicles needing to meet standards under pre-Tier 2 compliance programs.

[2] To convert a 120K ADF to an optional 150K ADF, use the following equation:

$$150K \text{ ADF} = (120K \text{ ADF})(146K/116K)$$

[3] Evaporative emission test waivers may apply in lieu of testing closed gaseous fuel systems

[4] Evaporative emission/refueling standards do not apply to diesel fueled vehicles

[5] No 2-day standards for dedicated CNG, LNG, or dedicated LPG vehicles

[6] No running loss standards for dedicated CNG, LNG, or dedicated LPG vehicles

[7] No ORVR standards for dedicated CNG or LNG vehicles but industry standard practice must be followed for design of fuel fill receptacles.