

Environmental Protection Agency

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impingers should be minimized to prevent any losses.

(k) For the supplemental two-diurnal test sequence (see § 86.1230-96), the hot soak test described in § 86.1238-90 shall be conducted immediately following the dynamometer run. This test requires ambient temperatures between 68° and 86 °F at all times. The equipment and calibration specifications of §§ 86.1207-90 and 86.1207-90 may apply for this testing. Enclosures meeting the requirements of §§ 86.1207-96 and 86.1217-96 may also be used. This hot soak test is followed by two consecutive diurnal heat builds, described in § 86.1233-96(p).

(l) If the vehicle is to be tested for diurnal emissions, follow the procedure outlined in § 86.1233-96.

[58 FR 16061, Mar. 24, 1993, as amended at 59 FR 48524, Sept. 21, 1994; 60 FR 43906, Aug. 23, 1995]

§ 86.1242-90 Records required.

The following information shall be recorded with respect to each test:

- (a) Test number.
- (b) System or device tested (brief description).
- (c) Date and time of day for each part of the test schedule.
- (d) Instrument operator.
- (e) Driver or operator.
- (f) Vehicle: ID number; Manufacturer; Model Year; Engine family; Evaporative emissions family; Basic engine description (including displacement, number of cylinders, and catalyst usage); Engine maximum power rating and rated speed; Fuel system (including number of carburetors, number of carburetor barrels, fuel injection type, fuel tank(s) capacity and location, and number and size (volume and working capacity)) of evaporative control canisters, Engine code; Gross vehicle weight rating; Actual curb weight at zero miles; Actual road load at 50 mph; Transmission configuration; Axle ratio; Vehicle line; Odometer reading; Idle rpm; and Drive wheel tire pressure, as applicable.

(g) Indicated road load power absorption at 50 mph (80 km/hr) and dynamometer serial number. As an alternative to recording the dynamometer serial number, a reference to a vehicle test cell number may be used, provided

the test cell records show the pertinent information.

(h) All pertinent instrument information such as tuning, gain, serial number, detector number and range. As an alternative, a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided test cell calibration records show the pertinent instrument information.

(i) Recorder charts: Identify zero, span and enclosure gas sample traces.

(j) Test cell barometric pressure and ambient temperature.

NOTE: A central laboratory barometer may be used: *Provided*, That individual test cell barometric pressures are shown to be within ± 0.1 percent of the barometric pressure at the central barometer location.

(k) Fuel temperatures as prescribed.

(l) *For methanol-fueled vehicles:* (1) Volume of sample passed through the methanol sampling system and the volume of deionized water in each impinger.

(2) The concentration of the GC analyses of the test samples (methanol).

(m) *For natural gas-fueled vehicles.* Composition, including all carbon containing compounds; e.g. CO₂, of the natural gas-fuel used during the test. C₁ and C₂ compounds shall be individually reported. C₃ and heavier hydrocarbons, and C₆ and heavier hydrocarbons may be reported as a group.

(n) *For liquefied petroleum gas-fueled vehicles.* Composition of the liquefied petroleum gas-fuel used during the test. Each hydrocarbon compound present, through C₄ compounds, shall be individually reported. C₅ and heavier hydrocarbons may be reported as a group.

[54 FR 14570, Apr. 11, 1989, as amended at 59 FR 48524, Sept. 21, 1994; 60 FR 34363, June 30, 1995]

§ 86.1243-90 Calculations; evaporative emissions.

(a) The calculation of the net hydrocarbon, methanol and hydrocarbon plus methanol mass change in the enclosure is used to determine the diurnal and hot soak mass emissions. The mass changes are calculated from initial and final hydrocarbon and methanol concentrations in ppm carbon, initial and final enclosure ambient temperatures, initial and final barometric pressures,

and net enclosure volume using the following equations:

(1) For methanol:

$$M_{\text{CH}_3\text{OH}} = V_n \times \frac{T_{\text{Ef}}}{(V_E \times T_{\text{SHEDf}})} \times \left[(C_{\text{MS1f}} \times AV_{1f}) + (C_{\text{MS2f}} \times AV_{2f}) \right] - \frac{T_{\text{Ei}}}{(V_E \times T_{\text{SHEDi}})} \times \left[(C_{\text{MS1i}} \times AV_{1i}) + (C_{\text{MS2i}} \times AV_{2i}) \right]$$

Where:

- (i) $M_{\text{CH}_3\text{OH}}$ =Methanol mass change, μ g.
- (ii) V_n =Net enclosure volume, ft^3 , as determined by subtracting 50 ft^3 (1.42 m^3) (volume of vehicle with trunk and windows open) from the enclosure volume. A manufacturer may use the measured volume of the vehicle (instead of the nominal 50 ft^3) with advance approval by the Administrator: *Provided*, the measured volume is determined and used for all vehicles tested by that manufacturer.
- (iii) T_E =Temperature of sample withdrawn, $^{\circ}\text{R}$.

- (iv) V_E =Volume of sample withdrawn, ft^3 .
- (v) T_{SHED} =Temperature of SHED, $^{\circ}\text{R}$
- (vi) P_B =Barometric pressure at time of sampling, in. Hg.
- (vii) C_{MS} =GC concentration of sample.
- (viii) AV =Volume of absorbing reagent in impinger.
- (ix) i =Initial sample.
- (x) f =Final sample.
- (xi) 1=First impinger.
- (xii) 2=Second impinger.
- (2) For hydrocarbons:

$$M_{\text{HC}} = (kV_n \times 10^{-4}) \frac{(C_{\text{HCf}} - rC_{\text{CH}_3\text{OHf}})P_{\text{Bf}}}{T_f} - \frac{(C_{\text{HCi}} - rC_{\text{CH}_3\text{OHi}})P_{\text{Bi}}}{T_i}$$

Where:

- (i) M_{HC} =Hydrocarbon mass change, g.
- (ii) C_{HC} =FID hydrocarbon concentration as ppm carbon including FID response to methanol in the sample.
- (iii) $C_{\text{CH}_3\text{OH}}$ =Methanol concentration as ppm carbon.

$$= \frac{1.501 \times 10^{-3} \times T}{P_B \times V_E} \times \left[(C_{\text{S1}} \times AV_1) + (C_{\text{S2}} \times AV_2) \right]$$

- (iv) V_n = Net enclosure volume ft^3 (m^3), as determined by subtracting 50 ft^3 (1.42 m^3) (volume of vehicle with trunk and windows open) from the enclosure volume. A manufacturer may use the measured volume of the vehicle (instead of the nominal 50 ft^3) with advance approval by the Administrator:

- Provided*, the measured volume is determined and used for all vehicles tested by that manufacturer.
- (v) r = FID response factor to methanol.
- (vi) P_B = Barometric pressure, in Hg (kPa).

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- (vii) T = Enclosure temperature, °R(°K).
- (viii) i = initial reading.
- (ix) f = final reading.
- (x) 1 = First impinger.
- (xi) 2 = Second impinger.
- (xii)(A) k = 0.208 (12 = H/C).

- (B) For SI units, k = 1.2 (12 = H/C).
- Where:
 - (xiii) H/C = hydrogen carbon ratio.
 - (A) H/C = 2.33 for diurnal emissions.
 - (B) H/C = 2.2 for hot soak emissions.
 - (3) For total evaporative emissions:
 - Total Evaporative Emissions =

$$\left(M_{HC} + \frac{14.3594 \times 10^6}{32.042} M_{CH_3OH} \right) + \left(M_{HC} + \frac{14.2284 \times 10^6}{33.042} M_{CH_3OH} \right) \text{g.}$$

(b) The final reported results shall be computed by summing the individual evaporative emission results determined for the diurnal breathing-loss test, running-loss test and the hot-soak test.

[54 FR 14570, Apr. 11, 1989, as amended at 60 FR 34363, June 30, 1995]

§ 86.1243-96 Calculations; evaporative emissions.

(a) The following equations are used to calculate the evaporative emissions

$$M_{CH_3OH} = V_n \times \left[\frac{(C_{MS1f} \times AV_{1f}) + (C_{MS2f} \times AV_{2f})}{V_{E_f}} \right] - \left[\frac{(C_{MS1i} \times AV_{1i}) + (C_{MS2i} \times AV_{2i})}{V_{E_i}} \right] + (M_{CH_3OH, out} - M_{CH_3OH, in})$$

Where:

- (A) M_{CH_2OH} = Methanol mass change, μ g.
- (B) V_{F_n} = Net enclosure volume, ft^3 , as determined by subtracting 50 ft^3 (1.42 m^3) (volume of vehicle with trunk and windows open) from the enclosure volume. A manufacturer may use the measured volume of the vehicle (instead of the nominal 50 ft^3) with advance approval by the Administrator: Provided, the measured volume is determined and used for all vehicles tested by that manufacturer.
- (C) [Reserved]
- (D) V_E = Volume of sample withdrawn, ft^3 . Sample volumes must be corrected for differences in temperature to be consistent with determination of V_n , prior to being used in the equation.

from gasoline- and methanol-fueled vehicles, and for gaseous-fueled vehicles.

(b) Use the measurements of initial and final concentrations to determine the mass of hydrocarbons and methanol emitted. For testing with pure gasoline, methanol emissions are assumed to be zero.

- (1) For enclosure testing of diurnal, hot soak, and running loss emissions:
 - (i) Methanol emissions:

- (E) [Reserved]
- (F) AC_{MS} = GC concentration of sample.
- (G) AV = Volume of absorbing reagent in impinger.
- (H) P_B = Barometric pressure at time of sampling, in. Hg.
- (I) i = Initial sample.
- (J) f = Final sample.
- (K) 1 = First impinger.
- (L) 2 = Second impinger.
- (M) $M_{CH_3OH, out}$ = mass of methanol exiting the enclosure, in the case of fixed volume enclosures for diurnal emission testing, μ g.
- (N) $M_{CH_3OH, in}$ = mass of methanol entering the enclosure, in the case of fixed volume enclosures for diurnal emission testing, μ g.
- (ii) Hydrocarbon emissions: