used during the test. C_1 and C_2 compounds shall be individually reported. C_3 and heavier hydrocarbons, and C_6 and heavier compounds may be reported as a group.

(r) *Additional required records for liquefied petroleum gas-fueled vehicles.* Composition of the liquefied petroleum gas-fuel used during the test. Each hydrocarbon compound present, through C_4 compounds, shall be individually reported. C_5 and heavier hydrocarbons may be reported as a group.

[54 FR 14533, Apr. 11, 1989, as amended at 58 FR 58422, Nov. 1, 1993; 59 FR 48510, Sept. 21, 1994; 60 FR 34348, June 30, 1995]

§ 86.143–90 Calculations; evaporative emissions.

(a) The calculation of the net hydrocarbon, methanol and hydrocarbon plus methanol (total hydrocarbon equivalent) 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:

$$M_{CH3OH} = V_n X \times \frac{T_{Ef}}{\left(V_{Ef} \times T_{SHEDf}\right)} \times \left[\left(C_{MS1f} \times AV_{1f}\right) + \left(C_{MS2f} \times AV_{2f}\right)\right]$$

$$- \frac{T_{Ei}}{\left(V_{Ei} \times T_{SHEDi}\right)} \times \left[\left(C_{MS1i} \times AV_{1i}\right) + \left(C_{MS2i} \times AV_{2i}\right)\right]$$

Where:

(i) M_{CH3OH} = Methanol mass change, μg.

(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(iii) T_E = Temperature of sample withdrawn, °R.

(iv) V_E = Volume of sample withdrawn, ft^3.

(v) T_{SHED} = Temperature of SHED, °R

(vi) C_{MS} = GC concentration of sample, μg/ml.

(vii) AV = Volume of absorbing reagent in impinger.

(viii) P_B = Barometric pressure at time of sampling, in. Hg.

(ix) i = Initial sample.

(x) f = Final sample.

(xi) 1 = First impinger.

(xii) 2 = Second impinger.

(2) For hydrocarbons:

$$M_{HC} = \left(kV_n \times 10^{-4}\right)\left[\frac{\left(C_{HCf} - rC_{CH3OHf}\right)P_{Bf}}{T_f} - \frac{\left(C_{HCi} - rC_{CH3OHi}\right)P_{Bi}}{T_i}\right]$$

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_{CH3OH} = Methanol concentration as ppm carbon.

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

(iv) V_n=Net enclosure volume ft³ (m³), as determined by subtracting 50 ft³ (1.42 m³) (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 ft³) 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).

(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=Total Diurnal Emissions+Total Hot Soak Emissions

$$= \left(M_{HC} + \frac{14.3594}{32.042} \times 10^6 M_{CH3OH} \right) + \left(M_{HC} + \frac{14.2284}{32.042} \times 10^6 M_{CH3OH} \right), g$$

(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 14534, Apr. 11, 1989, as amended at 60 FR 34348, June 30, 1995]

§ 86.143–96 Calculations; evaporative emissions.

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

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

Where:

(A) M_{CH3OH} = Methanol mass change, μg.

(B) V_n = Net enclosure volume, ft³, as determined by subtracting 50 ft³ (1.42 m³) (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 ft³) 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, ft³. Sample volumes must be corrected for differences in temperature to be consistent