(iii) $K_H=1/[1-0.0047(50-75)]=0.8951$.

(iv) $CO_e=[1-(0.01+0.005\times3.487)\times0.469)-0.000323(37.5))\times98.8=96.332$ ppm.

(v) $CO_d=(1-0.000323(37.5))\times1.195=1.181$ ppm.

(vi) $C_{CH3OHe}=(3.813\times10^{-2})(527.67)[(7.101)(15.0)+(0.256)(15.0)]/(725.42)(0.2818)=10.86$ ppm.

(vii) $HCe=14.65-(0.788)(10.86)=6.092$.

(viii) $DF=100(1/[1+(3.487/2)+3.76(1+(3.487/4)-(0.763/2))])/0.469+(6.092+96.332+10.86+0.664)(10^{-4})=24.939$.

(ix) $C_{CH3OHd}=(3.813\times10^{-2})(527.67)[(0.439)(15.0)+(0.0)(15.0)]/(725.42)(1.1389)=0.16$ ppm.

(x) $CH_3OH_{conc}=10.86-0.16(1-1/24.939)=10.71$ ppm.

(xi) $CH_3OH_{mass}=6048.1\times37.71\times(10.71/1{,}000{,}000)=2.44$ grams per test phase.

(xii) $HC_{conc}=[14.65-(0.788)(10.86)]-[2.771-(0.788)(0.16)](1-1/24.94)=3.553$ ppm.

(xiii) $HC_{mass}=(6048.1)(16.33)(3.553/1{,}000{,}000)=0.35$ grams per test phase.

(xiv) $C_{HCHOe}=4.069\times10^{-2}(8.970)(5.0)(0.1429)(527.67)/(0.2857)(725.42)=0.664$ ppm.

(xv) $C_{HCHOd}=4.069\times10^{-2}(0.39)(5.0)(0.1429)(527.67)/(1.1043)(725.42)=0.0075$ ppm.

(xvi) $HCHO_{conc}=0.664-0.0075(1-1/24.939)=0.6568$ ppm.

(xvii) $HCHO_{mass}=(6048.1)(35.36)(0.6568/1{,}000{,}000)=0.1405$ grams per test phase.

(xviii) THCE=0.35+(13.8756/32.042)(2.44)+(13.8756/ 30.0262)(0.1405)=1.47 grams per test phase.

(xix) $NO_{Xconc}=5.273-(0.146)(1-1/24.939)=5.13$ ppm.

(xx) $NO_{Xmass}=(6048.1)(54.16)(5.13/1{,}000{,}000)(0.8951)=1.505$ grams per test phase.

(xxi) $CO_{conc}=96.332-1.181(1-1/24.939)=95.2$ ppm.

(xxii) $CO_{mass}=(6048.1)(32.97)(95.2/1{,}000{,}000)=18.98$ grams per test phase.

(xxiii) $CO2_{conc}=0.469-0.039(1-1/24.939)=0.432$ percent.

(xxiv) $CO2_{mass}=(6048.1)(51.85)(0.432/100)=1353$ grams.

(xxv) $CH4_{conc}=2.825-2.019(1-1/24.939)=0.89$ ppm.

(xxvi) $NMHC_{conc}=3.553$ ppm -0.89 ppm $=2.67$ ppm.

(xxvii) $NMHC_{mass}=(6048.1)(16.33)(2.67/1{,}000{,}000)=0.263$ grams per test phase.

(xxviii) $NMHCE_{mass}=0.263+(13.8756/32.042)(2.44)+(13.8756/30.0262)(0.1405)=1.39$ grams per test phase.

(2) For the stabilized portion of the cold start test assume that similar calculations resulted in the following:

(i) THCE=0.143 grams per test phase.

(ii) $NO_{Xmass}=0.979$ grams per test phase.

(iii) $CO_{mass}=0.365$ grams per test phase.

(iv) $CO_{2mass}=1467$ grams per test phase.

(v) $D_s=3.854$ miles.

(vi) NMHCE=0.113 grams per test phase.

(3) For the ''transient'' portion of the hot start test assume that similar calculations resulted in the following:

(i) THCE=0.488 grams as carbon equivalent per test phase.

(ii) $NO_{Xmass}=1.505$ grams per test phase.

(iii) $CO_{mass}=3.696$ grams per test phase.

(iv) $CO_{2mass}=1179$ grams per test phase.

(v) $D_{ht}=3.577$ miles.

(vi) NMHCE=0.426 grams per test phase.

(4) Weighted emission results:

(i) $THCE_{wm}=(0.43)\times(1.473+0.143)/(3.583+3.854)+(0.57)\times(0.488+0.143)/(3.577+3.854)=0.142$ grams as carbon equivalent per mile.

(ii) $NOx_{wm}=(0.43)\times(1.505+0.979)/(3.583+3.854)+(0.57)\times(1.505+0.979)/3.577+3.854)=0.344$ grams per mile.

(iii) $CO_{wm}=(0.43)\times(18.983+0.365)/(3.583=3.854)+(0.57)\times(3.696+0.365)/(3.577+3.854)=1.43$ grams per mile.

(iv) $CO2_{wm}=(0.43)\times(1353+1467)/(3.583+3.854)+(0.57)\times(1179+1467)/(3.577+3.854)=366$ grams per mile.

(v) $NMHCE_{wm}=(0.43)\times(1.386+0.113)/(3.583+3.854)+(0.57)\times(0.426=0.113)/(3.577+3.854)=0.128$ grams per mile.

[56 FR 25777, June 5, 1991, as amended at 59 FR 39649, Aug. 3, 1994; 59 FR 48511, Sept. 21, 1994; 60 FR 34349, June 30, 1995; 62 FR 47122, Sept. 5, 1997; 70 FR 40434, July 13, 2005; 75 FR 22980, Apr. 30, 2010; 76 FR 57377, Sept. 15, 2011]

§ 86.145–82 Calculations; particulate emissions.

(a) The final reported test results for the mass particulate (M_p) in grams/mile shall be computed as follows.

$$M_p = 0.43(M_{p1} + M_{p2})/(D_{ct} + D_s) + 0.57(M_{p3} + M_{p2})/(D_{ht} = D_s)$$

where:

(1) M_{p1} = Mass of particulate determined from the ''transient'' phase of the cold start test, in grams per test

phase. (See § 86.110–82(c)(1) for determination.)

(2) M_{p2} = Mass of particulate determined from the ''stabilized'' phase of the cold start test, in grams per test phase. (See § 86.110–82(c)(1) for determination.)

(3) M_{p3} = Mass of particulate determined from the ''transient'' phase of the hot start test, in grams per test phase. (See § 86.110–82(c)(1) for determination).

(4) D_{ct} = The measured driving distance from the ''transient'' phase of the cold start test, in miles.

(5) D_s = The measured driving distance from the ''stabilized'' phase of the cold start test, in miles.

(6) D_{ht} = The measured driving distance from the ''transient'' phase of the hot start test, in miles.

(b) The mass of particulate for each phase of testing is determined as follows:

$$M_{pj} = \left[V_{mix} + V_{epi}\right]\left[\frac{P_{ei}}{V_{epi}} - \frac{P_b}{V_{bp}}(1 - 1/DF)\right]$$

where:

(1) j = 1, 2 or 3 depending on which phase the mass of particulate is being determined for (i.e., the ''transient'' phase of the cold start test, the ''stabilized'' phase of the cold start test, or the ''transient'' phase of the hot start test).

(2) V_{mix} = Total dilute exhaust volume in cubic meters per test, corrected to standard conditions 528°R (293K) and 29.92 in Hg (101.3 kPa). V_{mix} is further defined in § 86.144.

(3) P_e = mass of particulate per test on the exhaust filter(s), grams.

(4) P_b = mass of particulate on the ''background'' filter, grams.

(i) The background particulate level, P_b, inside the dilution air filter box at EPA is very low. P_b will be assumed = 0, and background particulate samples will not be taken with each exhaust sample. It is recommended that background particulate checks be made periodically to verify the low level.

(ii) Any manufacturer may make the same assumption without prior EPA approval.

(iii) If P_b is assumed = 0, then no background correction is made. The equation for particulate mass emissions then reduces to:

$$M_{pj} = \frac{V_{mix_i} + V_{ep_i} \times P_{e_i}}{V_{ep_i}}$$

(6) V_{ep} = total volume of sample pulled through the filter, cubic feet at standard conditions.

$$V_{ep} = \frac{V_{ap} \times \left(P_{bar} + P_{ip}\right) \times 528}{T_{ip} \times 29.92}$$

where:

(i) V_{ap} = corrected (according to procedure specified in § 85.120) dilute exhaust sample volume, cubic feet.

(ii) P_{bar} = barometric pressure, in Hg.

(iii) P_{ip} = pressure elevation above ambient measured at the inlet to the dilute exhaust sample gas meter or flow instrument, in Hg. (For most gas meters with unrestricted discharge P_{ip} is negligible and can be assumed = 0.)

(iv) T_{ip} = average temperature of the dilute exhaust sample at the inlet to the gas meter or flow instrument, °R.

(7) V_{bp} = total volume of the background sample, cubic feet at standard conditions. (V_{bp} is not required if P_b is assumed = 0.) It is calculated using the following formula:

$$V_{bp} = \frac{V_{ap} \times \left(P_{bar} + P_{ib}\right) \times 528}{T_{ib} \times 29.92}$$

where:

(i) V_{ab} = corrected (according to procedure specified in § 85.120) background sample volume, cubic feet.

(ii) P_{bar} = barometric pressure, in. Hg.

(iii) P_{ib} = pressure elevation above ambient measured at the inlet to the background gas meter or flow instrument, in Hg. (For most gas meters with unrestricted discharge P_{ib} is negligible and can be assumed = 0.)

(iv) T_{ib} = average temperature of the background sample at the inlet to the gas meter or flow instrument, °R.

(8) DF = dilution factor. (DF is not required if P_b is assumed = 0.)

[45 FR 14523, Mar. 5, 1980, as amended at 46 FR 50494, Oct. 13, 1981, and 47 FR 49807, Nov. 2, 1982]