BSFC + (1/7)(4.24) =(6/7)(4.17)/(1/7)(6.945) + (6/7)(7.078) = 0.592 lbs of fuel/BHP − hr

(i) For dilute sampling systems which require conversion of as-measured dry concentrations to wet concentrations, the following equation shall be used for any combination of bagged, continuous, or fuel mass-approximated sample measurements (except for CO measurements made through conditioning columns, as explained in paragraph (d)(3) of this section):

Wet concentration = K_w × dry concentration.

Where:

(1)(i) For English units,

$K_w = 1-(\alpha/200) \times CO_{2e}(') - ((1.608 \times H)/(7000 + 1.608 \times H))$

See paragraph (d)(1) of this section for α values.

(ii) For SI units,

$K_w = 1-(\alpha/200) \times CO_{2e}(') - ((1.608 \times H)/(1000 + 1.608 \times H))$

See paragraph (d)(1) of this section for α values.

(2) $CO_{2e}(')$ = either CO_{2e} or CO_{2e}' as applicable.

(3)(i) H = Absolute humidity of the CVS dilution air, in grains (grams) of water per lb (kg) of dry air.

(ii) For English units,

$H' = [(43.478)R_i' \times P_d']/[P_B - (P_d' \times R_i'/100)]$

(iii) For SI units,

$H' = [(6.211)R_i' \times P_d']/[P_B - (P_d' \times R_i'/100)]$

(4) R_i = Relative humidity of the CVS dilution air, in percent.

(5) P_d = Saturated vapor pressure, in mm Hg (kPa) at the ambient dry bulb temperature of the CVS dilution air.

(6) P_B = Barometric pressure, mm Hg (kPa).

[54 FR 14605, Apr. 11, 1989, as amended at 62 FR 47135, Sept. 5, 1997]

§ 86.1342–94 Calculations; exhaust emissions.

Section 86.1342–94 includes text that specifies requirements that differ from § 86.1342–90. Where a paragraph in § 86.1342–90 is identical and applicable to § 86.1342–94, this may be indicated by specifying the corresponding paragraph and the statement "[Reserved]. For guidance see § 86.1342–90."

(a) introductory text [Reserved]. For guidance see § 86.1342–90.

(a)(1) A_{WM}=Weighted mass emission level (HC, CO, CO_2, or NO_X) in grams per brake horsepower-hour and, if appropriate, the weighted mass total hydrocarbon equivalent, formaldehyde, or non-methane hydrocarbon emission level in grams per brake horsepower-hour.

(a)(2) through (b)(7) [Reserved]. For guidance see § 86.1342–90.

(b)(8) Non-methane hydrocarbon mass:

$NMHC_{mass} = V_{mix} \times Density_{NMHC} \times (NMHC_{conc}/1{,}000{,}000)$

(c) through (d)(1)(i) [Reserved]. For guidance see § 86.1342–90.

(d)(1)(ii) $Density_{HC}$ = Density of hydrocarbons.

(A) For gasoline and the gasoline fraction of methanol-fuel, and may be used for petroleum and the petroleum fraction of methanol diesel fuel if desired; 16.33 g/ft^3-carbon atom (0.5768 kg/m^3-carbon atom).

(B) For #1 petroleum diesel fuel; 16.42 g/ft^3-carbon atom (0.5800 kg/m^3-carbon atom).

(C) For #2 diesel 16.27 g/ft^3-carbon atom (0.5746 kg/m^3-carbon atom). Average carbon to hydrogen ratios of 1:1.85 for gasoline, 1:1.93 for #1 petroleum diesel fuel and 1:1.80 for #2 petroleum diesel fuel are assumed at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.

(D) For natural gas and liquified petroleum gas-fuel; 1.1771 (12.011+H/C (1.008)) g/ft^3-carbon atom (0.04157 (12.011+H/C (1.008)) kg/m^3-carbon atom) where H/C is hydrogen to carbon ratio of the hydrocarbon components of the test fuel, at 68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.

(d)(1)(iii) through (d)(1)(iv)(A) [Reserved]. For guidance see § 86.1342–90.

(d)(1)(iv)(B) For petroleum-fueled, natural gas-fueled and liquified petroleum gas-fueled engines, HC_e is the FID measurement.

(d)(1)(iv)(C) through (d)(3)(v)(A) [Reserved]. For guidance see § 86.1342–90.

(d)(3)(v)(B) $CO_e = [1 - (0.01 + 0.005HCR)\ CO_{2e} - 0.000323R]\ CO_{em}$ for methanol-fuel, natural gas-fuel and liquified petroleum gas-fuel where HCR is hydrogen to carbon ratio as measured for the fuel used.

Where:

(d)(3)(vi) through (d)(5)(iii)(B) [Reserved]. For guidance see § 86.1342–90.

(d)(5)(iv)(A) C_{CH3OHe}=Methanol concentration in the dilute exhaust, in ppm.

(B)

$$C_{CH3OHe} = \frac{3.813 \times 10^{-2} \times T_{EM}\left[\left(C_{S1} \times AV_{S1}\right) + \left(C_{S2} \times AV_{S2}\right)\right]}{P_B \times V_{EM}}$$

(v)(A) C_{CH3OHd}=Methanol concentration in the dilution air, in ppm

(B)

$$C_{CH3OHd} = \frac{3.813 \times 10^{-2} \times T_{DM}\left[\left(C_{D1} \times AV_{D1}\right) + \left(C_{D2} \times AV_{D2}\right)\right]}{P_B \times V_{DM}}$$

(vi) T_{EM}=Temperature of methanol sample withdrawn from dilute exhaust, °R

(vii) T_{DM}=Temperature of methanol sample withdrawn from dilution air, °R

(viii) P_B=Barometric pressure during test, mm Hg.

(ix) V_{EM}=Volume of methanol sample withdrawn from dilute exhaust, ft^3

(x) V_{DM}=Volume of methanol sample withdrawn from dilution air, ft^3

(xi) C_S=GC concentration of sample drawn from dilute exhaust

(xii) C_D=GC concentration of sample drawn from dilution air

(xiii) AV_S=Volume of absorbing reagent (deionized water) in impinger through which methanol sample from dilute exhaust is drawn, ml

(xiv) AV_D=Volume of absorbing reagent (deionized water) in impinger through which methanol sample from dilution air is drawn, ml

(xv) 1=first impinger.

(xvi) 2=second impinger.

(d)(6)(i) through (d)(7)(i) [Reserved]. For guidance see § 86.1342–90.

(d)(7)(ii) For methanol-fueled vehicles, where fuel composition is $C_X H_y O_z$ as measured, or calculated, for the fuel used:

$$DF = \frac{\dfrac{x}{(100)x + y/2 = 3.76(x + y/2 - z/2)}}{CO_{2e} + \left(HC_e + CO_e + CH_3OH_e + HCHO_e\right)}$$

(d)(8)(i) [Reserved]. For guidance see § 86.1342–90.

(d)(8)(ii) For Otto-cycle engines: K_H=1/[1–0.0047(H–75)] (or for SI units, K_H=1/[1–0.0329(H–10.71)]).

(iii) For diesel engines: K_H = 1/[1–0.0026 (H–75)] (or for SI units = 1/[1–0.0182 (H–10.71)]).

Where:

(d)(8)(iv) through (d)(9)(x) [Reserved]. For guidance see § 86.1342–90.

(d)(10)(i) $NMHC_{conc} = HC_{conc} – CH4_{conc}$

(ii) $Density_{NMHC}$ = The density of non-methane hydrocarbon, is 1.1771(12.011 + H/C (1.008)) g/ft^3-carbon atom (0.04157(12.011 + H/C (1.008))kg/m^3-carbon atom), where H/C is the hydrogen to carbon ratio of the non-methane hydrocarbon components of the test fuel, at

68 °F (20 °C) and 760 mm Hg (101.3 kPa) pressure.

(iii)(A) CH_{4conc} = Methane concentration of the dilute exhaust sample corrected for background, in ppm carbon equivalent.

(B) $CH_{4conc} = r_{CH4} \times (CH_{4e} - CH_{4d}(1-1/DF))$

Where:

(*1*) CH_{4e} = Methane exhaust bag concentration in ppm carbon equivalent.

(*2*) CH_{4d} = Methane concentration of the dilution air in ppm carbon equivalent.

(*3*) r_{CH4} = HC FID response to methane for natural gas-fueled vehicles as measured in § 86.1321 (d).

(e) Through (i) [Reserved]. For guidance see § 86.1342–90.

[59 FR 48534, Sept. 21, 1994, as amended at 60 FR 34375, June 30, 1995; 62 FR 47135, Sept. 5, 1997]

§ 86.1343–88 Calculations; particulate exhaust emissions.

(a) The final reported transient emission test results shall be computed by use of the following formula:

$$P_{wm} = \frac{1/7\,P_C + 6/7\,P_H}{1/7\,BHP-hr_C + 6/7\,BHP-hr_H}$$

(1) P_{wm} = Weighted mass particulate, grams per brake horsepower-hour.

(2) P_C = Mass particulate measured during the cold-start test, grams.

(3) P_H = Mass particulate measured during the hot-start test, grams.

(4) $BHP\text{-}hr_C$ = Total brake horsepower-hour (brake horsepower integrated with respect to time) for the cold-start test.

(5) $BHP\text{-}hr_H$ = Total brake horsepower-hour (brake horsepower integrated with respect to time) for the hot-start test.

(b) The mass of particulate for the cold-start test and the hot-start test is determined from the following equation:

$$P_{mass} = (V_{mix} + V_{sf}) \times \left[\frac{P_f}{V_{sf}} - \left(\frac{P_{bf}}{V_{bf}} \times [1-(1/DF)] \right) \right]$$

(1) P_{mass} = Mass of particulate emitted per test phase, grams per test phase. ($P_H = P_{mass}$ for the hot-start test and $P_C = P_{mass}$ for the cold-start test.

(2) V_{mix} = Total dilute exhaust volume corrected to standard conditions (528° R (293° K) and 760 mm Hg (101.3 kPa)), cubic feet per test phase. For a PDP–CVS:

$$V_{mix} = V_o \times \frac{N(P_B - P_4)(528°\,R)}{(760\ mm\ H_g)(T_p)},$$

in SI units,

$$V_{mix} = V_o \times \frac{N(P_B - P_4)(293°\,K)}{(101.3\ kPa)(T_p)},$$

Where:

(2)(i)(A) For a CFV–CVS: V_{mix} = Total dilute exhaust volume corrected to standard conditions (293 °K (20 °C) and 101.3 kPa (760 mm Hg)), cubic feet per test phase.

(B) For a PDP–CVS:

$$V_{mix} = V_o \times \frac{N(P_B - P_4)(528°\,R)}{(760mmHg)(T_p)},$$

in SI units,

$$V_{mix} = V_o \times \frac{N(P_B - P_4)(293°\,K)}{(101.3kPa)(T_p)},$$

Where:

(ii) V_o = Volume of gas pumped by the positive displacement pump, cubic feet (cubic meters) per revolution. This volume is dependent on the pressure