California Environmental Protection Agency

Air Resources Board

PROPOSED AMENDMENTS TO

Vapor Recovery Test Procedure

TP-201.2

Efficiency and Emission Factor for Phase II Systems

Adopted: April 12, 1996
Amended: February 1, 2001
Amended: July 25, 2001
Amended: _____

Note: The text is shown in ~~strikeout~~ to indicate text that is proposed for deletion and underline to indicate text that is proposed for addition. Only the amended section is shown in context.

12. CALCULATING RESULTS

Data from each test point is used to determine a mass emission factor in lbs/1000 gallons. Efficiency is calculated using the mass emission factors and the mass of vapor returned per 1000 gallons dispensed.

12.1 Test Point 1 - Nozzle Sleeve
An emission factor in lbs hydrocarbon/1000 gallons dispensed is calculated for each fueling. Overall emission factors are also calculated for ORVR vehicles, non-ORVR vehicles and the entire vehicle matrix.

12.1.1 The sample volumes shall be corrected to standard conditions for each dispensing episode as shown in Equation 12.1.1.

$$V = V_m \times \left(\frac{528}{T}\right) \times \left[\frac{P_{bar}\left(\frac{P}{13.6}\right)}{29.92}\right] \qquad \text{Equation 12.1.1}$$

where:

V = volume corrected to standard conditions (ft^3).

V_m = measured volume (ft^3).

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

P = meter pressure (inches water column).

T = meter temperature (^oR).

12.1.2 The mass emission factor for each dispensing episode shall be calculated as follows:

$$M_{rate} = \frac{(V_i)(C_i)(MW)(1{,}000)}{(385)(G_i)} \qquad \text{Equation 12.1.2}$$

where:

M_{rate} = emission factor for dispensing episode *i* (lb HC/1,000 gallons)

V_i = volume for dispensing episode *i* corrected to standard conditions (ft^3).

C_I = hydrocarbon concentration for dispensing episode *i* (volume fraction, i.e. $ppm_v / 10^6$ or Volume % / 10^2)

MW = molecular weight of HC analyzer calibration gas (lb/lb-mole) e.g., 44 for propane

385 = standard volume (ft^3) of one lb-mole of ideal gas at standard temperature and pressure (528^oR and 29.92 in. Hg)

G_i = gallons dispensed for dispensing episode i.

1,000= Conversion factor to 1,000 gallons

12.2 Test Point 2. Vapor Return Line

The vapor return line data is not needed to calculate the emission factor, but is necessary to calculate the system efficiency.

12.2.1 Calculate the standard volume of vapor returned for each dispensing episode as shown in Equation 12.1.1.

12.2.2 Calculate the vapor returned in lbs/1000 gallons dispensed as shown in Equation 12.1.2.

12.3 Test Point 3. Vent Sleeve

The vent emissions shall be calculated over the time periods specified by the ARB Executive Officer. Knowledge of the total station gasoline throughput for the specified time period is necessary to calculate the emission factor.

12.3.1 Calculate the standard volume sampled over the time interval using Equation 12.1.1.

12.3.2 Calculate the emission factor in lbs/1000 gallons dispensed over the time interval selected using Equation 12.1.2.

12.4 Test Point 4 Processor

12.4.1 If a volume meter is used at Test Point 4_{outlet}, calculate the standard volume sampled of the time interval using Equation 12.1.1.

12.4.2 If a volume meter is used at Test Point 4_{inlet}, calculate the exhaust volume flow rate using USEPA Method 2B.

12.5 Test Point 5 Pressure-Related Fugitives: Calculate the emission factor as specified in TP-201.2F.

12.6 Phase II System Emission Factor: Calculate the Phase II system emission factor using Equation 12-6.

$$M_{total} = M_1 + M_3 + M_4 + M_5$$

Where: M_{total} = Phase II emission factor, lbs/1000 gallons
M_1 = Mass emission factor at Test Point 1, lbs/1000 gallons
M_3 = Mass emission factor at Test Point 3, lbs/1000 gallons
M_4 = Mass emission factor at Test Point 4, lbs/1000 gallons
M_5 = Mass emission factor at Test Point 5, lbs/1000 gallons

12.7 Phase II System Efficiency: Calculate the Phase II system efficiency using Equation 12-7.

$$EFF = 1 - \frac{(M_1 + M_3 + M_4 + M_5)}{(M_1 + M_2 + M_3 + M_4 + M_5)} \times 100$$

Where: M_2 = Mass emission factor at Test Point 2, lbs/1000 gallons