

$$x = x_{[\text{emission}]_{\text{meas}}} \cdot \left[\frac{1 - x_{\text{H}_2\text{O}}}{1 - x_{\text{H}_2\text{O}[\text{emission}]_{\text{meas}}}} \right] \quad \text{Eq. 1065.659-1}$$

Example:

$x_{\text{CO}_{\text{meas}}} = 29.0 \mu\text{mol/mol}$
 $x_{\text{H}_2\text{O}x_{\text{CO}_{\text{meas}}}} = 8.601 \text{ mmol/mol} = 0.008601 \text{ mol/mol}$
 $x_{\text{H}_2\text{O}} = 34.04 \text{ mmol/mol} = 0.03404 \text{ mol/mol}$

$$x_{\text{CO}} = 29.0 \cdot \left[\frac{1 - 0.03404}{1 - 0.008601} \right]$$

$x_{\text{CO}} = 28.3 \mu\text{mol/mol}$

§ 1065.660 THC and NMHC determination.

(a) *THC determination.* If we require you to determine THC emissions, calculate x_{THC} using the initial THC contamination concentration $x_{\text{THC}_{\text{init}}}$ from § 1065.520 as follows:

$$x_{\text{THC}_{\text{cor}}} = x_{\text{THC}_{\text{uncor}}} - x_{\text{THC}_{\text{init}}} \quad \text{Eq. 1065.660-1}$$

Example:

$x_{\text{THC}_{\text{uncor}}} = 150.3 \mu\text{mol/mol}$
 $x_{\text{THC}_{\text{init}}} = 1.1 \mu\text{mol/mol}$
 $x_{\text{THC}_{\text{cor}}} = 150.3 - 1.1$
 $x_{\text{THC}_{\text{cor}}} = 149.2 \mu\text{mol/mol}$

(b) *NMHC determination.* Use one of the following to determine NMHC emissions, x_{NMHC} .

(1) Report x_{NMHC} as $0.98 \cdot x_{\text{THC}}$ if you did not measure CH_4 , or if the result of

paragraph (b)(2) or (3) of this section is greater than the result using this paragraph (b)(1).

(2) For nonmethane cutters, calculate x_{NMHC} using the nonmethane cutter's penetration fractions (*PF*) of CH_4 and C_2H_6 from § 1065.365, and using the initial NMHC contamination concentration $x_{\text{NMHC}_{\text{init}}}$ from § 1065.520 as follows:

$$x_{\text{NMHC}} = \frac{\text{PF}_{\text{CH}_4} \cdot x_{\text{THC}} - \text{RF}_{\text{CH}_4} \cdot x_{\text{CH}_4}}{\text{PF}_{\text{CH}_4} - \text{PF}_{\text{C}_2\text{H}_6}} - x_{\text{NMHC}_{\text{init}}} \quad \text{Eq. 1065.660-2}$$

Where:

x_{NMHC} = concentration of NMHC.
 PF_{CH_4} = nonmethane cutter CH_4 penetration fraction, according to § 1065.365.
 x_{THC} = concentration of THC, as measured by the THC FID.
 RF_{CH_4} = response factor of THC FID to CH_4 , according to § 1065.360.
 x_{CH_4} = concentration of methane, as measured downstream of the nonmethane cutter.
 $\text{PF}_{\text{C}_2\text{H}_6}$ = nonmethane cutter CH_4 penetration fraction, according to § 1065.365.
 $x_{\text{NMHC}_{\text{init}}}$ = initial NMHC contamination concentration, according to § 1065.520.

Example:

$\text{PF}_{\text{CH}_4} = 0.990$

$x_{\text{THC}} = 150.3 \mu\text{mol/mol}$
 $\text{RF}_{\text{CH}_4} = 1.05$
 $x_{\text{CH}_4} = 20.5 \mu\text{mol/mol}$
 $\text{PF}_{\text{C}_2\text{H}_6} = 0.020$
 $x_{\text{NMHC}_{\text{init}}} = 1.1 \mu\text{mol/mol}$

$$x_{\text{NMHC}} = \frac{0.990 \cdot 150.3 - 1.05 \cdot 20.5}{0.990 - 0.020} - 1.1$$

$x_{\text{NMHC}} = 130.1 \mu\text{mol/mol}$

(3) For a gas chromatograph, calculate x_{NMHC} using the THC analyzer's response factor (*RF*) for CH_4 , from § 1065.360, and using the initial NMHC contamination concentration $x_{\text{NMHC}_{\text{init}}}$ from § 1065.520 as follows:

$$x_{\text{NMHC}} = x_{\text{THC}} - \text{RF}_{\text{CH}_4} \cdot x_{\text{CH}_4} - x_{\text{NMHC}_{\text{init}}} \quad \text{Eq. 1065.660-3}$$

Example:

$x_{\text{THC}} = 145.6 \mu\text{mol/mol}$
 $\text{RF}_{\text{CH}_4} = 0.970$
 $x_{\text{CH}_4} = 18.9 \mu\text{mol/mol}$
 $x_{\text{NMHC}_{\text{init}}} = 1.1 \mu\text{mol/mol}$
 $x_{\text{NMHC}} = 145.6 - 0.970 \cdot 18.9 - 1.1$
 $x_{\text{NMHC}} = 126.2 \mu\text{mol/mol}$

§ 1065.665 THCE and NMHCE determination.

(a) If you measured an oxygenated hydrocarbon's mass concentration (per mole of exhaust), first calculate its

molar concentration by dividing its mass concentration by the effective molar mass of the oxygenated hydrocarbon, then multiply each oxygenated hydrocarbon's molar concentration by its respective number of carbon atoms per molecule. Add these C₁-equivalent molar concentrations to the molar concentration of NOTHC. The result is the molar concentration of THCE. Calculate THCE concentration using the following equations:

$$x_{\text{THCE}} = x_{\text{NOTHC}} + \sum_{i=1}^N x_{\text{OHC}_i} - x_{\text{THCE}_{\text{init}}} \quad \text{Eq. 1065.665-1}$$

$$x_{\text{NOTHC}} = x_{\text{THC}} - \sum_{i=1}^N (x_{\text{OHC}_i} \cdot \text{RF}_{\text{OHC}_i} \cdot C^{\#}) \quad \text{Eq. 1065.665-2}$$

$$x_{\text{OHC}_i} = \frac{M_{\text{exhOHC}_i} \cdot m_{\text{dexhOHC}}}{M_{\text{OHC}_i} \cdot m_{\text{dexh}}} = \frac{n_{\text{dexhOHC}}}{n_{\text{dexh}}} \quad \text{Eq. 1065.665-3}$$

Where:

x_{OHC_i} = The C₁-equivalent concentration of oxygenated species *i* in diluted exhaust.
 x_{THC} = The C₁-equivalent FID response to NOTHC and all OHC in diluted exhaust.

RF_{OHC_i} = The response factor of the FID to species *i* relative to propane on a C₁-equivalent basis.

$C^{\#}$ = the mean number of carbon atoms in the particular compound.

(b) If we require you to determine NMHCE, use the following equation:

$$x_{\text{NMHCE}} = x_{\text{THCE}} - x_{\text{CH}_4} \cdot \text{RF}_{\text{CH}_4} \quad \text{Eq. 1065.665-4}$$

(c) The following example shows how to determine NMHCE emissions based on ethanol (C₂H₅OH) and methanol (CH₃OH) molar concentrations, and acetaldehyde (C₂H₄O) and formaldehyde (HCHO) as mass concentrations:

$x_{\text{NMHC}} = 127.3 \mu\text{mol/mol}$
 $x_{\text{C}_2\text{H}_5\text{OH}} = 100.8 \mu\text{mol/mol}$
 $x_{\text{CH}_3\text{OH}} = 25.5 \mu\text{mol/mol}$
 $M_{\text{exhC}_2\text{H}_4\text{O}} = 0.841 \text{ mg/mol}$
 $M_{\text{exhHCHO}} = 39.0 \mu\text{g/mol}$
 $M_{\text{C}_2\text{H}_4\text{O}} = 44.05256 \text{ g/mol}$
 $M_{\text{HCHO}} = 30.02598 \text{ g/mol}$
 $x_{\text{C}_2\text{H}_4\text{O}} = 0.841/44.05256 \cdot 1000$
 $x_{\text{C}_2\text{H}_4\text{O}} = 19.1 \mu\text{mol/mol}$

$x_{\text{HCHO}} = 39/30.02598$

$x_{\text{HCHO}} = 1.3 \mu\text{mol/mol}$

$x_{\text{NMHCE}} = 127.3 + 2 \cdot 100.8 + 25.5 + 2 \cdot 19.1 + 1.3$

$x_{\text{NMHCE}} = 393.9 \mu\text{mol/mol}$

§ 1065.667 Dilution air background emission correction.

(a) To determine the mass of background emissions to subtract from a diluted exhaust sample, first determine the total flow of dilution air, n_{dil} , over the test interval. This may be a measured quantity or a quantity calculated from the diluted exhaust flow and the