

$$\dot{n}_{\text{exh}} = 4.919 \text{ mol/s}$$

(3) *Fuel mass flow rate calculation.*
Based on \dot{m}_{fuel} , calculate \dot{n}_{exh} as follows:

$$\dot{n}_{\text{exh}} = \frac{\dot{m}_{\text{fuel}} \cdot w_c}{M_c \cdot x_{\text{Cproddry}}} \cdot \left(1 + x_{\text{H2Odry}}\right) \cdot \left[1 + \frac{x_{\text{dil}}}{1 - x_{\text{dil}}}\right] \quad \text{Eq. 1065.655-15}$$

Where:

\dot{n}_{exh} = raw exhaust molar flow rate from which you measured emissions.

\dot{m}_{fuel} = intake air molar flow rate including humidity in intake air.

Example:

$$\dot{m}_{\text{fuel}} = 6.023 \text{ g/s}$$

$$w_c = 0.869 \text{ g/g}$$

$$M_c = 12.0107 \text{ g/mol}$$

$$x_{\text{Cproddry}} = 125.58 \text{ mmol/mol} = 0.12558 \text{ mol/mol}$$

$$x_{\text{H2Odry}} = 130.16 \text{ mmol/mol} = 0.13016 \text{ mol/mol}$$

$$x_{\text{dil}} = 0.20278 \text{ mol/mol}$$

$$\dot{n}_{\text{exh}} = \frac{6.0233 \cdot 0.869}{12.0107 \cdot 0.12558} \cdot (1 + 0.13016) \cdot \left[1 + \frac{0.20278}{1 - 0.20278}\right]$$

$$\dot{n}_{\text{exh}} = 4.919 \text{ mol/s}$$

§ 1065.659 Removed water correction.

(a) If you remove water upstream of a concentration measurement, x , or upstream of a flow measurement, n , correct for the removed water. Perform this correction based on the amount of water at the concentration measurement, $x_{\text{H2O[emission]meas}}$, and at the flow meter, x_{H2O} , whose flow is used to determine the concentration's total mass over a test interval.

(b) Downstream of where you removed water, you may determine the amount of water remaining by any of the following:

(1) Measure the dewpoint and absolute pressure downstream of the water removal location and calculate the amount of water remaining as described in § 1065.645.

(2) When saturated water vapor conditions exist at a given location, you may use the measured temperature at that location as the dewpoint for the downstream flow. If we ask, you must demonstrate how you know that saturated water vapor conditions exist. Use good engineering judgment to measure the temperature at the appropriate location to accurately reflect the dewpoint of the flow.

(3) You may also use a nominal value of absolute pressure based on an alarm setpoint, a pressure regulator setpoint, or good engineering judgment.

(c) For a corresponding concentration or flow measurement where you did not remove water, you may determine the amount of initial water by any of the following:

(1) Use any of the techniques described in paragraph (b) of this section.

(2) If the measurement comes from raw exhaust, you may determine the amount of water based on intake-air humidity, plus a chemical balance of fuel, intake air and exhaust as described in § 1065.655.

(3) If the measurement comes from diluted exhaust, you may determine the amount of water based on intake-air humidity, dilution air humidity, and a chemical balance of fuel, intake air, and exhaust as described in § 1065.655.

(d) Perform a removed water correction to the concentration measurement using the following equation:

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

Example:

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

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

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

§ 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:

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

(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:

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

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

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

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

(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: