

US EPA ARCHIVE DOCUMENT

To compare GHG emissions of supplemental natural gas to methanol loading vapor the emissions are calculated from each gas using Equation C-5 ($CO_2 = 44/12 * Fuel * CC * MW / MVC * 0.001$) from 40 CFR §98.33(a)(3)(iii) as follows:

$$\begin{array}{l}
 \text{Natural gas} \quad \frac{44 \text{ kg CO}_2}{12 \text{ kg C}} \times \frac{1,000,000 \text{ scf}}{\text{yr}} \times \frac{0.7488 \text{ kg C}}{\text{kg Methane}} \times \frac{16.04 \text{ kg}}{\text{kg-mole}} \times \frac{1 \text{ kg-mole}}{849.5 \text{ scf}} \times \frac{0.001}{1} = 51.84 \text{ CO}_2 \text{ tonne/yr} \\
 \\
 \text{Methanol loading vapor} \quad \frac{44 \text{ kg CO}_2}{12 \text{ kg C}} \times \frac{1,000,000 \text{ scf}}{\text{yr}} \times \frac{0.3748 \text{ kg C}}{\text{kg Methanol}} \times \frac{32.04 \text{ kg}}{\text{kg-mole}} \times \frac{1 \text{ kg-mole}}{849.5 \text{ scf}} \times \frac{0.001}{1} = 51.84 \text{ CO}_2 \text{ tonne/yr}
 \end{array}$$

Because natural gas's CC is off-set equally by methanol's MW (both one-carbon compounds), equivalent GHG emissions would be determined per the same volume of gas (1 MMscf).

Where:

CO_2 = Annual CO_2 mass emissions from combustion of the specific gaseous fuel (metric tons).

Fuel = Annual volume of the gaseous fuel combusted (scf). The volume of fuel combusted must be measured directly, using fuel flow meters calibrated according to § 98.3(i). Fuel billing meters may be used.

CC = Annual average carbon content of the gaseous fuel (kg C per kg of fuel).

MW = Annual average molecular weight of the gaseous fuel (kg/kg-mole).

MVC = Molar volume conversion factor at standard conditions, as defined in § 98.6. Use 849.5 scf per kg mole if you select 68 °F as standard temperature and 836.6 scf per kg mole if you select 60 °F as standard temperature.

44/12 = Ratio of molecular weights, CO_2 to carbon.

0.001 = Conversion factor from kg to metric tons.

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