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# 40 C.F.R. § 1065.365

## Nonmethane cutter penetration fractions.

(a) *Scope and frequency.* If you use a FID analyzer and a nonmethane cutter (NMC) to measure methane ($CH_4$), determine the nonmethane cutter's penetration fractions of methane, $PF_{CH4}$, and ethane, $PF_{C2H6}$. As detailed in this section, these penetration fractions may be determined as a combination of NMC penetration fractions and FID analyzer response factors, depending on your particular NMC and FID analyzer configuration. Perform this verification after installing the nonmethane cutter. Repeat this verification within 185 days of testing to verify that the catalytic activity of the cutter has not deteriorated. Note that because nonmethane cutters can deteriorate rapidly and without warning if they are operated outside of certain ranges of gas concentrations and outside of certain temperature ranges, good engineering judgment may dictate that you determine a nonmethane cutter's penetration fractions more frequently.

(b) *Measurement principles.* A nonmethane cutter is a heated catalyst that removes nonmethane hydrocarbons from an exhaust sample stream before the FID analyzer measures the remaining hydrocarbon concentration. An ideal nonmethane cutter would have a $CH_4$ penetration fraction, $PF_{CH4}$, of 1.000, and the penetration fraction for all other nonmethane hydrocarbons would be 0.000, as represented by $PF_{C2H6}$. The emission calculations in § 1065.660 use the measured values from this verification to account for less than ideal NMC performance.

(c) *System requirements.* We do not limit NMC penetration fractions to a certain range. However, we recommend that you optimize a nonmethane cutter by adjusting its temperature to achieve a $PF_{CH4}$ >0.85 and a $PF_{C2H6}$ <0.02, as determined by paragraphs (d), (e), or (f) of this section, as applicable. If we use a nonmethane cutter for testing, it will meet this recommendation. If adjusting NMC temperature does not result in achieving both of these specifications simultaneously, we recommend that you replace the catalyst material. Use the most recently determined penetration values from this section to calculate HC emissions according to § 1065.660 and § 1065.665 as applicable.

(d) Procedure for a FID calibrated with the NMC. The method described in this paragraph (d) is recommended over the procedures specified in paragraphs (e) and (f) of this section and required for any gaseous-fueled engine, including dual-fuel and flexible-fuel engines. If your FID arrangement is such that a FID is always calibrated to measure $CH_4$ with the NMC, then span that FID with the NMC using a $CH_4$ span gas, set the product of that FID's $CH_4$ response factor and $CH_4$ penetration fraction, $RFPF_{CH4[NMC-FID]}$, equal to 1.0 for all emission calculations, and determine its combined $C_2H_6$ response factor and $C_2H_6$ penetration fraction, $RFPF_{C2H6[NMC-FID]}$, as follows. For any gaseous-fueled engine, including dual-fuel and flexible-fuel engines, you must determine the $CH_4$ penetration fraction, $PF_{CH4[NMC-FID]}$, and $C_2H_6$ response factor and $C_2H_6$ penetration fraction, $RFPF_{C2H6[NMC-FID]}$, as a function of the molar water concentration in the raw or diluted exhaust as described in paragraphs (d)(10) and (12) of this section. Generate and verify the

humidity generation as described in paragraph (d)(11) of this section. When using the option in this paragraph (d), note that the FID's $CH_4$ penetration fraction, $PF_{CH4[NMC-FID]}$, is set equal to 1.0 only for 0% molar water concentration. You are not required to meet the recommended lower limit for $PF_{CH4}$ of greater than 0.85 for any of the penetration fractions generated as a function of molar water concentration.