Frequently Asked Questions (FAQs) for Method 25A

1. What is the correct calculation method to convert ppm on a weight basis from a Method 25A test from 'as propane' to 'as methane' or from propane to 'as carbon'? Some documents state to multiply by 3 to go from propane to methane since the FID counts carbons. If so, then to convert the same VOC to 'as carbon' the numerical value would be the same expressed 'as methane,' and that does not seem legitimate since the molecular weights of carbon and methane are different.

For gaseous samples, such as those analyzed by Method 25A, ppm is normally a volume/volume fraction, not a weight/weight fraction. I am not aware of anyone expressing Method 25A results as a weight/weight fraction. For ppm on a volume basis, molecular weight is not an issue because a mole of any gas has a volume of 22.4 liters at standard temperature and pressure (STP) regardless of the molecular weight. Because the response of an FIA is approximately proportional to the carbon atoms in a compound, the FIA response to a mole of propane is approximately three times its response to a mole of methane (there are three times as many atoms of carbon in a mole of propane as there are in a mole of methane). The volume of a gas is directly proportional to the number of moles, so if the response of one mole of propane is equivalent to three moles of methane, then the response of a liter of propane is proportional to three liters of methane, and because it's a volume/volume fraction, the response of a ppm of propane is equivalent to three ppm of methane. Therefore, you can convert ppm of propane measured by an FIA to equivalent ppm of methane by multiplying by three. Similarly, as you noted, ppm methane would be equal to ppm carbon.

There are some caveats to this. The response of an FIA is only approximately proportional to the number of carbon atoms in the molecule. For example, methane has an enhanced response on the FIA so that three is not the actual conversion factor if you are comparing measurements based on methane calibration with those based on propane calibration (the actual factor is closer to 2.4). Of course, carbon does not exist as a gas at STP so there is no physical significance to the conversion between ppm as propane and ppm as carbon, but it is useful as an accounting device to express concentrations as an equivalent ppm carbon, because it is easy to convert the ppm carbon response to any other equivalent response by simply dividing the concentration of the ppm carbon by the number of the carbon atoms in the molecule.

If you are converting ppm of any organic compound to a weight/volume fraction such as mg/cubic meter, there is a more complex equation that you must use which does take into account the molecular weight of the compound.

2. How should I span my Method 25A instrument at sources with widely variable concentrations or periodic spikes in concentration tied to typical process conditions which far exceed 2.5 times the applicable emission limit?

The intent of the method is to allow the use of a singular instrument across multiple ranges (see Section 8.4 of the method) during a given test, however the procedures are not well defined. It is our recommendation that in such a scenario the primary instrument span be based on the applicable emission limit as specified in the method and that a secondary instrument span should be based on the full range of expected concentration.

Performance of the calibration error test as required in Section 8.4 of the method is needed to determine the linearity for the primary span. The linearity of the higher span concentration should also be then verified by challenging the secondary instrument span using the appropriate mid-level gas (i.e., 45- 55% the secondary instrument span). It is also consistent with good QA/QC to perform the drift determination for the secondary instrument span in addition to the method-required drift determination for the primary instrument span.