Method 30B Spiked Sample Calculations

Method 30-B requires that 3 runs be conducted where one of the paired traps is spiked with a known quantity of mercury on section-1. These runs are used as the “Field Recovery Test” to demonstrate a suitable recovery for the spiked mercury. These 3 runs can also be used as 3 of the RATA runs if the Relative Deviation of the 2 paired traps is sufficient when the spike amount is subtracted from the spiked trap (and other requirements are met).

Here is an example demonstrating how these results might be calculated in a real world environment:

Suppose for one run of the Field Recovery Test the following data was collected:

Trap A was unspiked, collected 14 dry standard liters of sample and upon analysis was found to contain 58 ng of mercury.

Trap B was initially spiked at 60 ng, collected 15.5 dry standard liters of sample and upon analysis was found to contain 126 ng of mercury.

First we will calculate the spike recovery for the spiked trap. The first step will be to calculate the mercury concentration of the sample gas as indicated by the unspiked trap.

This will be 58 ng/14 Liters = 4.14 ng/L = 4.14 µg/dscm (dry standard cubic meters)

Next we need to subtract an amount from the spiked trap that was due to the gas sample that was deposited on it so we can see what’s left and compare that to the amount that was spiked on to it.

15.5 Liters of sample where placed onto the spiked trap. From the above calculation we know that each liter of this gas should contain 4.14 ng of mercury, for a total of 64.2 ng.

Subtracting this 64.2 ng from the total of 126 ng we get 61.8 ng. This is the 61.8 ng remaining that is due to the 60ng of mercury that was spiked on the trap initially. So, the spike recovery is:

61.8 ng/60 ng x 100% = 103%

If the average recovery of the 3 spiked runs is between 85% and 115%, the field recovery test has passed.

Now, we can see if this example used above can also be used as a valid RATA run.

For the unspiked trap, Trap A, we know from the calculations above that the mercury concentration of the sample was 4.14 µg/dscm. For Trap B we can calculate the sample concentration once we subtract out the amount of mercury that was spiked onto the trap. So, 126 ng minus the 60 ng that was spiked onto the trap equals 66 ng. This 66 ng is the mercury from the 15.5 Liters of sample that passed through the trap. So the indicated concentration from this data is 66 ng per 15.5 Liters (66ng/15.5 L) = 4.4 ng/L = 4.4 µg/dscm.

The Percent Relative Deviation of the 2 traps is 100% times the absolute value of the difference between the 2 concentrations divided by the sum of the 2 concentrations, or 100% x (4.4 µg/dscm – 4.14 dscm)/(4.4 µg/dscm + 4.14 µg/dscm) = 100% x (0.26)/(8.54) = 100% x (0.030) = 3%.

For sources with mercury concentrations > 1 µg/dscm, the maximum allowable Relative Deviation between the 2 traps is 10%, so in this case, with the Relative Deviation at 3%, this run easily meets the requirement for a good RATA run as far as Relative Deviation is concerned. (for sources with mercury concentrations that are less than or equal to 1.0 µg/dscm, the maximum allowable Relative Deviation between the 2 traps is 20%).