Spike Calculations and AQ Software

Spike Calculations

To calculate the spike we use the basic dilution equation from chemistry.

$$C_1V_1 = C_2V_2$$

Where, C_1 is the spiked concentration added
V_1 is the sample volume of the chemistry
C_2 is the stock spiking solution concentration
V_2 is the volume of the spike (should be 10 – 20 µL)

First, determine what concentration level that will be spiked into the samples (C_1), SEAL recommends using half of the top standard concentration. Then, in the method document's test parameters, determine the sample volume that is used in the chemistry (V_1). The volume of the spike stock concentration used should be 10-20 µL in volume (V_2) and must be a whole number volume. This volume along with the other variables are used to calculate the stock spiking solution concentration that must be made.

EXAMPLE: Spiking an unknown with a spiked concentration of 0.5 ppm.

EPA-126 has a sample volume listed as 240 µL. To determine what concentration the stock spiking solution should be, perform the following calculation.

$$C_1V_1 = C_2V_2$$
$$(0.5\ ppm)(240\ \mu L) = (C_2)(10\ to\ 20\ \mu L)$$

If you calculate it with a spike volume of 10 µL (V_2), then the stock spiking solution (C_2) would need to be 12 ppm. If you use 20 µL (V_2), then the stock spiking solution (C_2) would need to be 6 ppm. Therefore, a solution can be made with any concentration between 6 and 12 ppm as long as the volume of the spike (V_2) is a whole number.

Suppose a 10 ppm stock spiking solution was chosen.

$$C_1V_1 = C_2V_2$$
$$(0.5\ ppm)(240\ \mu L) = (10\ ppm)(V_2)$$
$$V_2 = 12\ \mu L$$

This is therefore acceptable, since the spiking volume (12 µL) is a whole number between 10 and 20 µL.

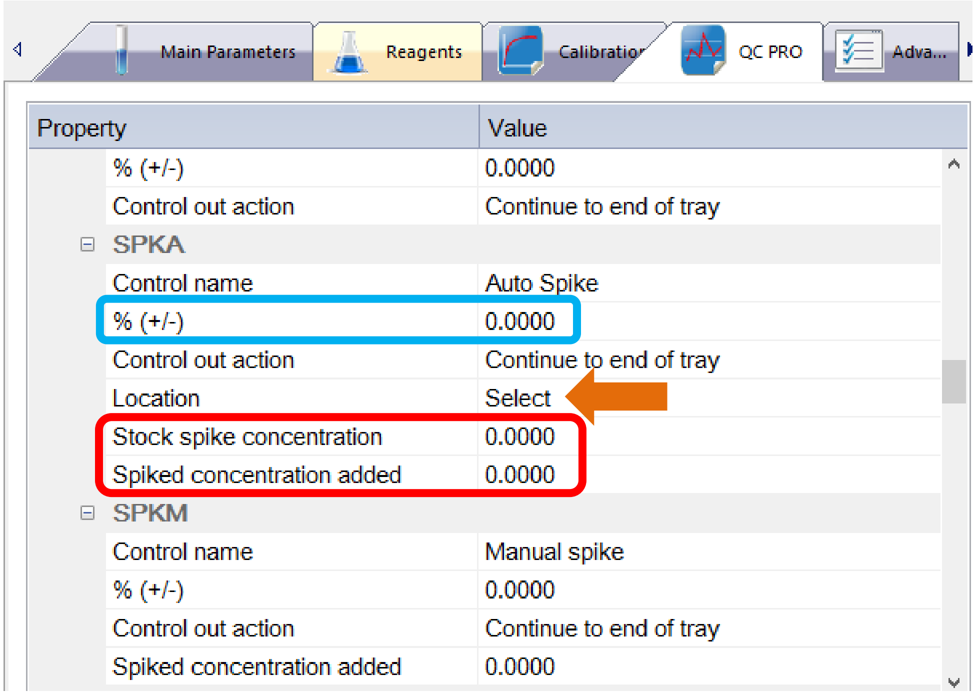
Suppose a 7 ppm stock spiking solution was chosen.

$$C_1V_1 = C_2V_2$$
$$(0.5\ ppm)(240\ \mu L) = (7\ ppm)(V_2)$$
$$V_2 = 17.14\ \mu L$$

This is not acceptable, since the spiking volume (17.14 µL) is not a whole number between 10 and 20 µL.

AQ Software

The information for the spike is input into the AQ software in the test parameters window. The stock spiking solution concentration (C_2) and spiked concentration (C_1) added are entered (red box). The range that is considered acceptable is entered as a plus/minus percentage (blue box).



Property	Value
% (+/-)	0.0000
Control out action	Continue to end of tray
SPKA	
Control name	Auto Spike
% (+/-)	0.0000
Control out action	Continue to end of tray
Location	Select
Stock spike concentration	0.0000
Spiked concentration added	0.0000
SPKM	
Control name	Manual spike
% (+/-)	0.0000
Control out action	Continue to end of tray
Spiked concentration added	0.0000

The last decision that needs to be made is where the stock spiking solution will be located (orange arrow). It can either be poured up into a cup or it can be assigned a reagent position where it would be placed in a wedge. If only a few samples are to be spiked, a cup would be suitable. If a cup is chosen, it is recommended that the cup is located at the end of the tray to avoid confusion. If many samples are to be spiked or if cup positions are not available, a reagent wedge may be the better choice.

EPA- ________ - ____ Chemistry Name: ____

Spiked Conc. Added ____________________________

Sample Volume ____________________________

Stock Spiking Soln Conc ____________________________

Stock SPK Soln Location ____________________________

Range % recovery ____________________________

EPA- ________ - ____ Chemistry Name: ____

Spiked Conc. Added ____________________________

Sample Volume ____________________________

Stock Spiking Soln Conc ____________________________

Stock SPK Soln Location ____________________________

Range % recovery ____________________________

EPA- ________ - ____ Chemistry Name: ____

Spiked Conc. Added ____________________________

Sample Volume ____________________________

Stock Spiking Soln Conc ____________________________

Stock SPK Soln Location ____________________________

Range % recovery ____________________________

EPA- ________ - ____ Chemistry Name: ____

Spiked Conc. Added ____________________________

Sample Volume ____________________________

Stock Spiking Soln Conc ____________________________

Stock SPK Soln Location ____________________________

Range % recovery ____________________________