Calculating ppm (parts per million) of Active Ingredient in Herbicide Working Solution

Parts per million (ppm) is unitless and is similar to a per cent. For the purpose of calculating ppm of active ingredient in determining the concentration of herbicide working solution, it is equivalent to mg/L or µg/mL when stock herbicide is a solution.

To calculate the concentration of the Stock Solution, you must convert the concentration as indicated on the product label to mg/L.

For Example, the product insert for Roundup PowerMax indicates the following:

48.7 % ACTIVE INGREDIENT Glyphosate, N-(phosphonomethyl)glycine, in the form of its potassium salt
51.3% OTHER INGREDIENTS

Contains 660 grams per liter or 5.5 pounds per U.S. gallon of the active ingredient glyphosate in the form of its potassium salt. Equivalent to 540 grams per liter or 4.5 pounds per U.S. gallon of the acid, glyphosate.

To calculate the concentration of Stock Solution:

$$\frac{540\text{g ai}}{1\text{L}} \times \frac{1000\text{mg}}{1\text{g}} = 540{,}000 \text{ mg/L} = 540{,}000\text{ppm}$$

The ppm in the stock solution may also be calculated from 4.5 lbs/gallon, but it adds more steps. You must convert the pounds active to micrograms active and the gallons to liters as follows:

$$\frac{4.5\text{ lbs. ai}}{1\text{gal}} \times \frac{454\text{g}}{1\text{ lbs.}} \times \frac{1000\text{mg}}{1\text{g}} \times \frac{1\text{gal}}{3.785\text{L}} = 539{,}762\text{mg/L} = 540{,}000\text{ppm (rounded)}$$

There are 540,000ppm of glyphosate acid in the stock solution. Remember this is like a percent, so no matter the volume of the stock solution, the fraction of active vs. inactive is the same.

To calculate the concentration in the working solution, now use the following equation:

$C_1V_1 = C_2V_2$

Where:
C_1=Concentration of the Stock Solution
V_1=Volume of the Stock Solution
C_2=Concentration of the Working Solution
V_2=Volume of the Working Solution

If you are trying to prepare 1000mL of a 750ppm of glyphosate active working solution using this example:
C_1=Concentration of the Stock Solution=540,000ppm
V_1=Volume of the Stock Solution=Volume of this stock solution you will add to your diluent
C_2=Concentration of the Working Solution=750ppm
V_2=Volume of the Working Solution=1000mL

$540{,}000\text{ppm} \times V_1 = 750\text{ppm} \times 1000\text{mL}$

$$V_1 = \frac{750\text{ppm} \times 1000\text{mL}}{540{,}000\text{ppm}}$$

$V_1 = 1.388889\text{mL} = 1.39\text{mL}$ (rounded) of Stock Solution in the Working Solution

Note: It is critical that the units in each volume are the same. If you input 1000mL for V_2, then the results you calculate for V_1, the amount of stock you will add to the diluent, will be in mL.