

CENTER PIVOT CHEMIGATION OR FERTIGATION INJECTION RATE WORKSHEET FOR VOLUME-BASED APPLICATIONS

Chemigation Calculation Worksheet Series

By

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Center Pivot Chemigation or Fertigation Injection Rate Worksheet for Volume-Based Applications

This worksheet helps growers, consultants, and fieldmen to calculate the necessary **liquid fertilizer or chemical** injection rate for center pivots or linear moves when the targeted application is specified on the label in **ounces, pints, quarts, or gallons per acre**.

Required Information:

1. Distance from the pivot center to the edge of effective wetted area, in feet. (Effective wetted area is considered to be 75% of the throw radius of the outermost sprinkler or nozzle on the last span. This last sprinkler can be the end gun, but an end gun that cycles on and off requires a variable rate injection pump that is not covered here.)
2. Distance from the pivot center to the wheel track of the last tower, in feet.
3. Last tower travel distance (in feet) in a given amount of time (in minutes) while running at the application speed. (The system should be fully charged with water and operating in an existing wheel track. Do not conduct this measurement with a system operating in the $\frac{1}{2}$ dry mode. $\frac{1}{2}$)
4. Product application rate in ounces, pints, quarts, or gallons per acre (refer to the product label).
5. Percentage of a full circle pivot that will be used during the application.

Example: Applying a pesticide at 2 pints per acre to a half pivot (50% of a full circle) with an effective wetting radius of 1,315 feet. The end tower wheel track is 1,280 feet from the pivot center point. The application depth (pivot speed, or % setting) was chosen to comply with label requirements. At this setting, the last tower traveled a measured 52 feet in 7 minutes and 44 seconds (7:44).

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Note: Although some can, many agricultural chemigation pumps cannot accurately inject at very low injection rates such as this. In this case, water is added to the chemical (diluted) to increase the total injected volume to a more convenient total volume. In this example, water is added to the calculated 15.6 gallons of chemical to increase the total volume (including the chemical) to 150 gallons. This volume is then used to calculate the new injection rate:

150 gal 1/2 10.0 hr **15.0 gal/hr.**

Additional Useful Information:

Some helpful conversions for calibration testing:

Many pivots only have a percentage timer as a speed setting. Application depth, or the run time at other percentage settings can be calculated if the application depth or run time at one percentage setting is known. For both of these a constant must be calculated or measured which is the equivalent to the application depth or full rotation time at the 100% setting.

Center Pivot Percentage Timer Settings for Application Depth

where:

C_d = Application depth at 100% (inches). *Constant*

d = Application depth at % setting (inches)

% = Pivot % setting (as a decimal, or % setting divided by 100)

Once C_d is known, the application depth at other % settings can be calculated by:

Center Pivot Percentage Timer Settings for Full Rotation Time

where:

C_t = Full rotation time at 100% (hours)

H = Full rotation time at % setting (hours)

% = Pivot % setting (as a decimal, or % setting divided by 100)

Once C_t is known, the full rotation times at other % settings can be calculated by:

Additional Resources

Burt, C., K. Oiler, and T. Ruehr. 1998. *Fertigation*. San Luis Obispo: California Polytechnic State University.

Carpenter, J., and W.S. Johnson. 1997. [Pesticide Chemigation through Pumped Irrigation Systems](#). *University of Nevada Cooperative Extension Publication FS-97-37*. University of Nevada.

DeValerio, J., D. Nistler, R. Hochmuth, and E. Simonne. 2015. [Fertigation for Vegetables: A Practical Guide for Small Fields](#). *University of Florida IFAS Extension Publication HS1206*. University of Florida.

Haman, D. Z., and F. Zazueta. 2014. [Chemigation Injection Methods for Irrigation](#). *University of Florida IFAS Extension Publication CIR864*. University of Florida.

Kranz, W., C. Burr, J. Hay, J. Schild, and D. Yonts. 2016. [Using Chemigation Safely and Effectively: Training Manual](#). University of Nebraska Extension.

Liu, G., and G. McAvoy. 2015. [How to Reduce Clogging Problems in Fertigation](#). *University of Florida IFAS Extension Publication HS1202*. University of Florida.

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Use pesticides with care. Apply them only to plants, animals, or sites as listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

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