**Importance of Calibration**

You can avoid the potential adverse effect on ground and surface water caused by over fertilization by applying only the amount of waste and wastewater necessary to maintain soil fertility for crop production.

The calibration of liquid manure spreading equipment is important because it lets you know the amount of waste and wastewater you are applying to an area.

The calibration rate and the nutrient concentration level of the liquid manure lets you know the amount of plant nutrients you are applying.

Then, you can adjust your fertilization rate to avoid over fertilization.

**Calibration**

The wastewater application rate from a stationary big gun sprinkler depends on the flow rate, coverage diameter, the amount of time it operates at a location, and the sprinkler location pattern. To attain acceptable application uniformity with multiple sprinkler setups the sprinkler spacing should be 70 to 85 percent of the sprinkler’s coverage diameter (see Figure 1). The necessary steps to calibrate stationary big gun sprinklers are given in the example below.

1) Determine flow rate in gallons per minute (GPM) from available manufacturer’s literature or Table 1.

   **Example:** From Table 1: 0.75” nozzle at 90 PSI has a flow rate of 155 GPM

   **Your Numbers:** _____” nozzle at ___ PSI has a flow rate of ____ GPM

2) Determine the coverage diameter (DIA) in feet from available manufacturer’s literature or Table 1.

   **Example:** From Table 1: 0.75” nozzle at 90 PSI has a 306 ft coverage diameter (DIA)

   **Your Numbers:** _____” nozzle at ___ PSI has a ___ ft coverage diameter (DIA)

3) Calculate the needed sprinkler spacing (SS) as 70 to 85% of the coverage diameter (DIA) from Step 2. Refer to Figure 1 for a diagram of a stationary gun setup.

   **Example:** 306 ft x 77% + 100 = 236 ft sprinkler spacing (SS);
   use 230 to 240 ft

   **Your Numbers:** ___ ft x ___% + 100 = ____ ft sprinkler spacing (SS);
   use _________ ft
4) To calculate the average application rate (in/hr), multiply 96 by the GPM from Step 1 then divide by the Step 3 sprinkler spacing (SS) twice.

Example:  
\[
96 \times \frac{155 \text{ GPM}}{236 \text{ ft} SS} = 0.27 \text{ in/hr}
\]

Your Numbers:  
\[
96 \times \frac{\text{____ GPM}}{\text{____ SS} \times \text{____ SS}} = \text{____ in/hr}
\]

5) To determine the inches of wastewater to apply for a given N rate, divide the desired number of pounds of N per acre by the number of pounds of N in a 1000 gallons of wastewater\(^1\). Then divide the result by 27 to get the inches of wastewater.

Example:  
\[
150 \text{ lb N/ac} \div \frac{5 \text{ lb N/1000 gal}}{27} = 1.1 \text{ in}
\]

Your Numbers:  
\[
\text{____ lb N/ac} \div \frac{\text{____ lb N/1000 gal}}{27} = \text{____ in}
\]

6) To determine the number of hours to operate the sprinkler at each location divide the inches of wastewater from Step 5 by the application rate from Step 4.

Example:  
\[
1.1 \text{ in} \div 0.27 \text{ in/hr} = 4 \text{ hr}
\]

Your Numbers:  
\[
\text{____ in} \div \text{____ in/hr} = \text{____ hr}
\]

OR

5) To determine the inches of wastewater that were applied multiply the application rate from Step 4 by the number of hours the sprinkler operated at a location.

Example:  
\[
0.27 \text{ in/hr} \times 4 \text{ hrs} = 1.1 \text{ in}
\]

Your Numbers:  
\[
\text{____ in/hr} \times \text{____ hrs} = \text{____ in}
\]

6) The N applied per acre (lb N/ac) is calculated by multiplying the inches of wastewater applied from Step 5 by the pounds of N in a 1000 gallons of wastewater and then multiply this result by 27.

Example:  
\[
1.1 \text{ in} \times 5 \text{ lb N/1000 gal} \times 27 = 150 \text{ lb N/ac}
\]

Your Numbers:  
\[
\text{____ in} \times \text{____ lb N/1000 gal} \times 27 = \text{____ lb N/ac}
\]

\(^1\)Refer to the University of Arkansas Extension publications Liquid Animal Waste Sampling (FSA 3006) and Understanding Your Animal Waste Nutrient Analysis (FSA 3008) for information on having your liquid manure analyzed and interpreting the analysis.

Table 1. General Flow Rates and Coverage Diameters for Big Gun Sprinklers. Nozzle size is in inches. Flow rate is in gallons/minute (GPM). Operating pressure is in pounds/square inch (PSI). Coverage diameter (DIA) is in feet (ft).

<table>
<thead>
<tr>
<th>PSI</th>
<th>Nozzle 0.5” GPM</th>
<th>Nozzle 0.5” DIA</th>
<th>Nozzle 0.75” GPM</th>
<th>Nozzle 0.75” DIA</th>
<th>Nozzle 1” GPM</th>
<th>Nozzle 1” DIA</th>
<th>Nozzle 1.25” GPM</th>
<th>Nozzle 1.25” DIA</th>
<th>Nozzle 1.5” GPM</th>
<th>Nozzle 1.5” DIA</th>
<th>Nozzle 1.75” GPM</th>
<th>Nozzle 1.75” DIA</th>
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<th>Nozzle 2” DIA</th>
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</table>

NOTE: If your exact numbers are not in the table, then estimate your value based on the numbers nearest yours.
Figure 1. Typical Stationary Gun Layout

SPRINKLER SPACING
(70% to 85% of DIA)