Delaware Nutrient Management Program

DELAWARE CONSERVATION PRACTICE STANDARD

CALIBRATING FERTILIZER APPLICATORS

(Reported for each spreader as pounds per acre and effective swath width in feed)

DEFINITION

The measurement of the distribution pattern and weight of discharged granular fertilizer over a known area from a spreader to determine the actual application rate per acre.

PURPOSES

For purposes of this standard, calibrate fertilizer spreaders for the following reasons:

1. Spreader manufacturers provide recommendations (either in the user's manual or printed on the spreader) for the spreader settings and travel speeds required for different fertilizer application rates. However, for a given spreader setting, application rates can vary significantly due to particle size distribution, the density and adhesion of granular particles. Therefore, the recommendations from spreader manufacturers are only estimates and will not be correct for most farming operations. Only by using field calibration can the correct spreader settings be determined; to achieve the required application rate.

2. Results will show the type of spread pattern, including the degree of uniformity obtained across the swath, the effective swath width, and the rate of application of fertilizer nutrients.

3. Calibration of a fertilizer spreader will help achieve the maximum economic value of land applied nutrients.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all farming operations that land apply commercial fertilizers.

CONSIDERATIONS

Calibration should be performed each season. Spreaders should be calibrated for each application rate required under calm conditions. The discharge and distribution of dry, granular fertilizers can be significantly affected by wind. Calibration should be performed under conditions less than 15 MPH, and preferably less than 5 MPH.

Keeping the conveyor chain, endgate, and spinners clean from build-up is important to achieve consistent application rates. Also, check and maintain recommended spinner speeds to insure a good spread pattern. Typically, spinner speeds should be at least 300 RPM, but may need to be higher depending on manufacture's recommendations.

Several companies make GPS-based guidance devices for agricultural equipment. These devices provide operators with precision guidance for accurate driving in either straight or curved fields during operation. Use of this tool will help maintain proper swath width between each spreader pass.

CRITERIA

General Criteria Applicable to All Purposes

Fertilizer spreaders can be calibrated by collecting multiple samples across the width of the spread pattern. One method to accomplish this requires the following items:

- Nine to fifteen collecting trays or pans with a grid baffle in the bottom.
- Same number of cans or test tubes.
- A rack or fixture to keep the cans or tubes in the proper order once collected.
- Funnel.
- A measuring tape.

All trays must be of identical size and shape. They should be shallow (1" to 2½" deep) with a collecting area of 1 to 3 square feet per tray. Typically, 15 trays are placed at a maximum of five foot intervals across the width of the spreader. The distance between trays can be changed, depending on swath width. The spreader is adjusted for a given rate of application and operated at normal field speed in a direction perpendicular to the line of trays while straddling the middle tray. Material collected in each tray is then poured into the corresponding test tube in the rack.

The amount of material in the test tubes provides a quick, visible evaluation of the spread pattern. If the spread pattern is uniform across the swath, and the proper swath width is used, the material will be deposited uniformly in the field.

Once a spread pattern is evaluated, determine what, if any, adjustments can be made to improve the pattern. If the pattern is unacceptable, determine the problem.

The effective swath width can be found by locating the point on the right and left side of the swath where the tubes are filled to about one-half the height found in the center tubes. The distance between these points is the effective swath width and should be used as the distance between spreader passes in the field.

After the spread pattern and width is finalized, the application rate of fertilizer can be calculated by dividing the total weight of fertilizer collected by the total area of all the trays.

Fertilizers vary in moisture content and in size and particle density. These variations will cause slight errors in the indicated rates of application, but this method provides a close approximation. To adjust the application rate, the following can be changed depending on the spreader design:

- Height of the Endgate - This is usually the most effective way to make changes in the application rate.
- Driving Speed - This approach can be used for spreaders equipped with PTO-driven conveyors. Ground speed should be changed by choosing a different tractor gear, not by increasing or decreasing engine speed. For spreaders that are ground-driven, changing driving speed is not an effect method for adjusting the application rate.
- Speed of the Conveyor - If the spreader is equipped with multiple drive sprockets or has a hydraulic conveyor drive, use this method to increase or decrease the conveyor speed.

For more information on spreader calibration methods, contact one of the University of Delaware Cooperative Extension offices or your County Conservation District. Additional details are provided in the references at the end of this document.

PLANS AND SPECIFICATIONS

Plans and specifications for this practice shall be prepared in accordance with the previously listed criteria. Plans and specifications shall contain sufficient detail to ensure successful implementation of this practice. Documentation shall be in accordance with the section "Supporting Data and Documentation" in this standard.

OPERATION AND MAINTENANCE

A Site specific operation and maintenance (O&M) plan shall be developed and reviewed with the operator and owner prior to implementation of the practice. The O&M plan shall be consistent with the purposes of the practice, safety considerations, and other instructions provided by the equipment manufacturer.

Equipment shall be operated at speeds and conditions recommended by the manufacturer, and maintenance schedules will be based on the schedules recommended in the operator's manual.

The O&M plan shall detail all safety precautions necessary when operating spreader equipment

The O&M plan shall provide for record keeping in sufficient detail to document the product used, the date, location, rate, method of application, and test method performed (including nutrient content of the fertilizer and calibration results).

SUPPORTING DATA AND DOCUMENTATION

The following is a list of the minimum data and documentation to be recorded in the case file:

1. Location of the practice on the conservation map.
2. Calibration results for each spreader and application rate. This should include both the distribution pattern, weights collected from calibration pans, and the computed application rate in pounds per acre.
3. Application methodology, including timing, equipment, instructions, etc.

REFERENCES

1. Sumner, P. 2012 Calibration of Bulk Dry Fertilizer Applicators. University of Georgia Cooperative Extension Service. Circular 798. Revised May, 2012.

2. Walters, R. 2013. Calibrating Large Centrifugal Spreaders for Granular Fertilizers. North Carolina State University. Technical Note 23.