THE KEY TO SUCCESSFUL APPLICATIONS – SPREADER CALIBRATION

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Fertilizers and pesticides are often applied in granular form. Understanding the differences in spreader performance and calibration procedures can improve the accuracy and uniformity of granular applications. Investing time into adjusting application equipment will result in accurate and uniform granular applications.

Inaccurate applications of granular materials can often result in damage to the turf or increase the potential for environmental harm. Under-application of materials decreases the effectiveness of the application and may require a repeat application. Over-application of materials can cause turf damage and increase application cost. Precise applications maximize the effectiveness of the application and can decrease labor and material costs.

Drop spreaders are the most accurate type of spreaders to use for granular applications. They are exceptional for applying lightweight materials such as seed or pesticides on corncob or vermiculite carriers. For very uniform applications, the application rate should be cut in half and the material should be spread in two directions.

Broadcast spreaders are good to treat large areas with high-density materials. Since the impellers are further from the ground, as compared to drop spreaders, they are more susceptible to drift caused by wind. The distribution patterns of broadcast spreaders should always be evaluated and optimized prior to calibration.

Most spinner spreaders use one impellar for material distribution. This causes the uniformity of spreader's pattern to be slightly skewed to one side of the pattern. Adjustments to impellars or other spreader components can eliminate or at least reduce the amount of skewing.

Determining Spreader Pattern Uniformity

The first step in setting up a spreader for application is to determine the uniformity of the spreader's pattern for the material being applied. This procedure will indicate if the pattern is skewed or if there are any other problems with the spread pattern.

To determine the distribution pattern, use cake pans or other similar style containers and place them in a straight line across the width of the spreader's distribution path. The pans can be spaced a few feet apart. Keep all the spaces between pans and pan dimensions equal.

Ideally, this procedure should be done on a turf similar to the area receiving the application. However, repeated passes will have to be made over the pans in order to collect enough material to weigh, which could result in significant turf damage from excessive rates of fertilizer or pesticides.

A parking lot or other large flat surface can be used for this procedure, but efforts should be made to minimize the bouncing into and out of the collection pans. Lining the pans with thin carpet and/or placing the pans on a 6 to 10 foot strip of carpet can significantly minimize particle bounce.

Once the pans have been positioned, the spreader should be pushed over the pans until sufficient material has been collected in the pans at the edge of the pattern. The direction of travel for each pass should always be in the same direction. Otherwise, distortions in the pattern could be covered up by reversing the travel direction.

After enough material has been captured in all of the pans, collect and weigh the material from each pan. The weights can then be entered into a computer graphing package or drawn on graph paper. The graphs will provide a visual estimate of the spreader's distribution pattern. The graph will determine if the pattern is skewed or if there are any other deviations in the pattern.

If there are problems with the spread pattern, adjustments should be made to the spreader to try to improve the pattern. The types of adjustments that can be made depend on the make and model of the spreader. The pattern should be re-evaluated after the adjustments.

If after all adjustments have been made and the pattern is still distorted, the application should be done in two directions. This can be done by calibrating the spreader to deliver half of the desired rate and making the application in two directions, using a criss-cross pattern. This is the best procedure to reduce striping and turf damage.

The graphs of pattern distribution will also help determine the appropriate overlap to use for the application. Usually it is recommended that a 100% overlap be used. The 100% overlap means material being thrown back to the center (i.e., wheel marks) of the previous pass. This means that any individual pass is overlapped on the left and right sides, after the application is complete. Hence, 100% of a single pass is overlapped (50% from the passes on each side). The overlapped to be used must be known and used as part of the calibration procedures.

Calibrating Spreaders

Once the spread pattern of the spreader has been determined and optimized, the spreader must be calibrated in order to provide the desired application rate of material. The first thing to do for calibration is determine the calibration area. This is the effective width of coverage (determined from the collection pans) multiplied by the distance the spreader is to be pushed during the calibration procedure.

For example, if the effective width of coverage is 10 ft wide and the spreader is going to be pushed 50 ft during calibration, the calibration area would be 500 sq ft. The next step is to determine how much material should be delivered to the calibration area. This can be done using a proportion and the known product application rate.

For our same example, suppose the application rate of the desired product is 2 lbs of material per 1,000 sq ft. The proportion could be set up as follows, with the unknown amount of product (X) in the upper right hand position:

$$\frac{2 \text{ lbs of material}}{1{,}000 \text{ sq ft}} = \frac{X \text{ lbs of material}}{500 \text{ sq ft}}$$

by cross-multiplying, we end up with

$$\left(\frac{2 \text{ lbs of material}}{1{,}000 \text{ sq ft}}\right)(500 \text{ sq ft}) = X \text{ lbs of material.}$$

After multiplication and division, we end up with 1 lb of material needed for 500 sq ft. The 1 lb is the amount of material that we need to collect from the calibration area.

Before we begin to spread material on the calibration area, we need to take the amount of overlap into consideration. Calibration is done with a single pass, and the actual application is completed with several overlapping passes. So the actual rate coming out of the spreader must be corrected for overlap.

For our example, the spreader should be calibrated to deliver 0.5 lbs of material per 1,000 sq ft. That will provide 0.5 lbs per pass, plus 0.25 lbs for the overlaps on each side of that pass, for a total of 1.0 lb of material per 1,000 square feet after the application has been completed.

The final step is to get the spreader to deliver the calculated amount to the calibration area. There are a few different ways to accomplish this. One way is to put a known weight of material in the hopper, deliver material to the calibration area, and reweigh the remaining material in the hopper. The difference between the initial weight and the remaining weight is the amount delivered to the calibration area.

Another method is to deliver the material to an impervious area, such as a parking lot, and sweep up the distributed material. This process is inaccurate because not all of the delivered material is collected, as well as contaminates can add to the weight of collected materials.

There are devices on the market, such as the PSB Accurate Calibrator, that enclose the impeller and collect the distributed material in a weighing pan. This is the most efficient and accurate method to calibrate a broadcast spreader.

After the material has been dispersed, it should be collected and weighed. Care should be taken to minimize the collection of contaminants and to maximize the recovery of all of the material. The correct spreader setting is achieved when the calculated weight (plus or minus 10%) is recovered.

Calibration is an essential component of material application. If calibration is not done for either liquid or granular applications, then it is impossible to determine if the materials are being applied at the correct rates. Not knowing what the application rate is could result in product failure, damage to the turf, unexpected response, or a combination of any of these problems. Considering the costs of material and labor, the calibration of equipment is a very insignificant expenditure of the entire process. It's a man-hour or two of investment to insure that you get the return of an expensive application.