

ANHYDROUS AMMONIA APPLICATOR CALIBRATION

Ronald T. Schuler
Extension Agricultural Engineer

With the higher prices for anhydrous ammonia, the benefits of calibrating the applicators properly are greater. The application machine must be accurately calibrated to insure the intended application rate is achieved and that the differences between injectors are minimized. Calibrating an anhydrous applicator can be a challenge due to the hazards associated with handling and applying the material.

Calibration is the procedure for determining the application rate and correcting it to the desired rate if necessary. Properly calibrated anhydrous application equipment should be adjusted to within five percent of the desired application rate. An incorrectly calibrated applicator will adversely impact profits and the environment. In a Nebraska study of 44 applicators, the average error in application was 16 percent. In Wisconsin, while demonstrating the calibration of a seven-injector applicator provided by a fertilizer supplier, one injector had no discharge and another injector was applying about one half of the five remaining injectors.

Although there are some safety risks when doing some of the calibration steps, with proper precautions these risks can be minimized. The personal protective equipment when handling anhydrous ammonia includes proper gloves and face and eye protection.

There are two aspects of anhydrous application equipment calibration: average application rate per acre and knife to knife variation. The average application rate can be checked for each field applied providing the field size is accurately known.

Determining the average application rate for the equipment requires the following steps:

1. weigh the nurse tank,
2. apply anhydrous ammonia to a known area, usually several acres or small field,
3. reweigh the nurse tank,
4. divide the difference of the two weights by the known area in acres to obtain the application rate in pounds of anhydrous ammonia per acre, and
5. multiply by 0.82 to obtain pounds of N per acre.

If the result is within five percent of the desired rate, make no changes. If the result is not within five percent, adjust the regulator and repeat the above steps as many times as required to get within five percent of the desired rate.

The above steps do not address knife to knife variation and another procedure must be used. Appropriate personal protective equipment including eye protection (goggles), respirator and rubber or neoprene gloves must be worn.

Following are the steps for evaluating this variation and they must be done outdoors:

1. prepare five gallon buckets, one per knife, by filling two-thirds full with water,
2. weigh the buckets accurately; suggest using 100 pound capacity scale accurate to one tenth of a pound,
3. place the buckets under the knives and lower the knives into the buckets,
4. discharge anhydrous into the buckets for a pre-determined time, to be accurate select a time such that there is about a ten percent increase in the bucket weights (the water should absorb all the discharged anhydrous), and
5. reweigh the buckets and compare the weight change in each.

If all the weight changes are within ten percent of the average, the system is excellent. If one or more knives have weight changes more than ten percent from the average, the system has a problem which should to be corrected. To insure accuracy, the preceding procedure should be completed two more times with fresh water in the buckets. If the knife to knife variation is excessive, the causes may be:

1. plugged orifice at the knife,
2. damaged orifice at the knife,
3. sharp bends in hoses or tubes, and
4. distribution manifold is not level.

The anhydrous application equipment must be checked periodically to insure the desired application rate is maintained. The equipment operator should monitor and evaluate the application rate for each field. A successful nitrogen program is dependent on the performance of this equipment and accurate application of the anhydrous ammonia. High prices for anhydrous ammonia increase the need for accurate calibration.