Equipment Calibration

Practice preventative maintenance of your equipment. Properly calibrated and maintained equipment ensures a more uniform distribution of nutrients and crop residue. This, combined with other conservation practices reduces 1) crop production costs, 2) soil surface runoff, and 3) nutrient movement to nearby surface waters.

Anhydrous ammonia

When anhydrous ammonia moves through an applicator, some of it changes from liquid to gas. Gas takes up more space in the hoses and valves, and can make it difficult to get uniform distribution through manifold outlet ports. Some applicator knives, therefore, could apply more anhydrous ammonia than other knives on the same tool bar. The result could be a non-uniform application of nitrogen.

Research showed that 44 applicators, without electronic controllers, had an average variation of 16 percent for total output. Those with electric controllers had a 7 percent variation. Another study found that even greater variation was possible among knives on the same applicator. Iowa State University (ISU) researchers found that the manifold used on most anhydrous ammonia applicators is the primary reason for this knife-to-knife variation.

ISU researchers have found that the type of manifold used and the way hoses are connected can greatly effect variation across the swath. Adjacent knives should be connected to different regions around the manifold perimeter. Researchers also found that knife-to-knife variability in anhydrous ammonia application tends to decline as the manifold pressure increases. New manifolds may give you a more uniform nitrogen application, but be sure the manufacturers support their claims with sound data.

Use equal-length hoses between each manifold outlet port and knife. Coil the hoses horizontally to knives near the manifold. Make sure the knives are all of the same make, and are free of flow obstructions.

Key Points

- Anhydrous ammonia–Update your hoses and knives, and check hose attachment order to manifold for uniform nitrogen application.
- Liquid fertilizer–Update, maintain, and calibrate equipment.
- Dry granular fertilizer–Check the 'spread pattern' and amount being applied.
- Manure application–Check the 'spread pattern' and amount being applied.
- Crop residue–Uniformly spread crop residue helps reduce soil erosion.
- More information/resources

Liquid fertilizer

Update, maintain, and calibrate equipment. Sprayers that have not been maintained or updated may have problems delivering an adequate flow of liquid nitrogen. Pumps that generate a flow of less than 40 gallons per minute and distribution hoses to boom sections that measure one-half inch or less in inside diameter are probably inadequate on larger sprayers. Centrifugal or roller pumps may not be capable of delivering the high-capacity flows that are necessary, without being overhauled or replaced. Rinse and clean application equipment at the end of each day.

Dry granular fertilizer

Check the 'spread pattern' and amount being applied. The physical properties of dry fertilizer can vary widely. Granular material is typically applied with a spinner spreader or custom-applied with a pneumatic spreader. Since larger particles are thrown further than small particles, a product of uniform size should be used to achieve a consistent application pattern. Test the spreader for uniform material distribution across the application zone, as well as the application rate (pounds per acre).

Manure application

Check the 'spread pattern' and amount being applied (gallons or tons per acre). Applying manure (liquid or dry) isn't a simple task. To protect surface water quality and reduce commercial fertilizer costs, prepare and follow a nutrient management plan (see NMEP 8, Nutrient Management Plan). Sample and test the manure for nutrients, then apply to fields based on soil test results and the nitrogen (N), phosphorus (P), and potassium (K) requirements of the crop to be planted (see NMEP 3, Manure Resources).

Crop residue

Uniformly spread crop residue helps reduce soil erosion. Injection of fertilizer, tillage, and planting operations can reduce residue cover (see NMEP 4, Residue Management). Complete residue cover (95 – 98 percent) reduces soil erosion, compared to bare soil surface. In general, residue reduces erosion by minimizing a raindrop's impact on soil particles, thereby slowing surface runoff and allowing for better water infiltration into the soil. Set a management goal of having at least 30 percent crop residue remaining after planting the crop.

More Information/resources

Contact your county Extension office for copies of the following publications, or to make an appointment to visit with an ISU Extension crop and/or agricultural engineering specialist. Your Soil and Water Conservation district office can help you develop a nutrient management plan, and teach you how to determine the percent residue remaining after a planting, nutrient injection or tillage operation.

AE 3049, *Planning–Conservation Tillage*

AE 3050, *Effects on Soil Erosion–Conservation Tillage*

AE 3051, *Effects on Water Quality–Conservation Tillage*

PM 1811, *Managing Manure Nutrients for Crop Production*

PM 1875, *Improving the Uniformity of Anhydrous Ammonia Application*

http://www.ae.iastate.edu/app.pdf, Manure Application, Environmental Issues in Livestock Production Home Study Course

Best Management Practices, or BMPs, utilize the most effective and practical means available to reduce or prevent water pollution from farm operations. BMPs are selected based on assessment, analysis of the impact of alternative practices and their economic considerations. They are implemented using current available technologies, management skills and available resources. BMP information sheets available from ISU Extension include:

NMEP 1, *Soil Testing*
NMEP 2, *Phosphorus Application*
NMEP 3, *Manure Resources*
NMEP 4, *Residue Management*
NMEP 5, *Crop Rotation*
NMEP 6, *Crop Yields*
NMEP 7, *Nitrogen Application*
NMEP 8, *Nutrient Management Plan*
NMEP 9, *Equipment Calibration*
NMEP 10, *Conservation Reserve Program*
NMEP 11, *Conservation Practices*

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