water spouts

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Revised Publication: AE-97, "Care and Maintenance of Irrigation Wells"

A well that produces water efficiently is a very important part of a groundwater-based irrigation system. Most groundwater in North Dakota contains small amounts of iron, which provide energy for the growth and development of iron bacteria. These bacteria form a slimy, gelatinous mass on the well screen, casing and pump and in the aquifer surrounding the well screen. If your irrigation equipment has a rust color or the water has a rotten-egg smell, then growth of iron bacteria in the well is a good possibility.

As iron bacteria spread in the well, they reduce the amount of open area of the screen and the open area of the spaces in the aquifer formation, thus reducing the well yield. Reduced well yield will affect the operation of the irrigation system and could reduce yields, especially with high value-crops such as potatoes. The only way to control iron bacteria effectively is by chlorinating the well on an annual basis.

Well chlorination should be performed at least once per year, but some wells may need it in the spring and fall. The object of well chlorination is to raise the chlorine level in the well to 500 parts per million (ppm) and hold it there for a period of time to allow the chlorine to attack and kill the bacteria.

Irrigators with oil-lubricated, deep-well turbine pumps should be especially careful if they use concentrated forms of chlorine in their wells. These wells commonly have a layer of oil on top of the water. Mixing chlorine and oil can have explosive repercussions; therefore, if a granulated or pellet form of chlorine is used for chlorination, please mix it with a suitable amount of water before pouring into the well.

A newly revised publication that contains explanations of the different types of chlorine, how to chlorinate a well, causes of well problems, determining well performance and rehabilitation procedures is available. It contains many pictures, drawings and tables to explain important points of irrigation well maintenance. A copy of AE-97, "Care and Maintenance of Irrigation Wells," is available at your local county Extension office or the NDSU Agricultural Communication publication distribution center at (701) 231-7882. You also can find it online at *www.ext.nodak.edu/extpubs/irrigate.htm* .

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Nitrogen Prices, Rates and Strategies for Use

Nitrogen prices are in the news lately because of the disruption of barge traffic on the Mississippi, but even without that factor, nitrogen prices certainly would be higher than ever this fall, and probably into next spring. Natural gas prices before the hurricane were around $10/thousand thousand British thermal unit (MMBTU), about $3 higher than last fall at this time, and f.o.b. prices for ammonia in the area were well in excess of $400, about $100/ton higher than this time last year. Farmers are asking if they even can afford to apply nitrogen (N) this coming year.

Several studies have been conducted to determine how the optimum rate of N changes as N prices and crop prices vary. Generally with low crop prices, N costs must rise well above $1.50/pound (lb) to discourage any application of N to crops such as wheat, corn or any other N-responding crop. However, given some N in the soil and the total optimum rate of N, the optimum N rate decreases when crop prices decrease and/or N prices increase.

In a recent review of studies in the Great Plains (Leikam and Christensen, 2000 Great Plains Soil Fertility Conference Proceedings), with corn prices

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at $1.50/bushel (bu) and the agronomic optimum N rate of about 160 lb N/acre, the break-even N price to go from 120 lb N/acre to 160 lb N/acre was 26 cents/lb N ($431/ton ammonia). Therefore, in a year such as this, when N prices might be upwards of 30 cents/lb N ($500/ton ammonia), applying N higher than 120 bu/acre for the yields of about 155 bu/acre was not economical.

In wheat, two studies, one from Canada and one from Kansas, showed that as the price of N increased from 10 cents/lb N to 30 cents/lb N, the optimum N rate needed to achieve economic benefit decreased about 15 percent. Therefore, if the optimum N rate was 100 lb N at "normal" N prices, the rate that would be practical this year would be about 85 lb N less whatever N credits were applicable from previous crop or soil test N.

In a similar analysis of Illinois optimum N rates (Hoeft and Nafziger, 2001), optimum N rates also are about 15 percent lower when N prices reach 30 cents/ton ($500/ton ammonia) than if they were 14 cents/ton ($230 ammonia). Therefore, if the N rate is normally 1.2 times yield goal, this year at the higher priced N, the formula probably should be 1 times the yield goal.

Several strategies should be implemented to save money on fertilizer.

1. Soil test for residual nitrate.
2. Soil test in some site-specific manner to avoid overapplication in some areas and provide greater confidence in the soil test numbers received from the lab.
3. Believe the soil test.
4. Take advantage of previous crop credit N from field peas, alfalfa, sugar beet leaves, soybeans and other annual legumes.
5. Take advantage of manures and apply as uniformly as possible using reasonable agronomic rates. Leave the dump trucks and chisel plows at home and use a spreader. Fresh manure incorporated quickly contains far more N than composted manures or fresh manure left on the surface for a considerable time.
6. Use wise N application techniques. Anhydrous applied at 4-inch depth or greater is more efficient than shallowly placed anhydrous. Urea 28 percent applied to the surface can be very inefficient if rain does not fall quickly or incorporation is not completed within a few days. Placing N below the soil surface in no-till is the most efficient manner of application and the recommendation tables assume that this is done.
7. Apply ammonia-based fall N based on a combination of calendar and soil temperature. Do not apply N before Oct. 1, and do not apply after Oct. 1 if soil temperatures taken between 6 and 8 a.m. at the 4-inch depth have not lowered to 50 degrees or below. The later the N is applied, the less risk of nitrate conversion and possible losses there is.
8. Seriously consider side dressing for row crops in sands. In a study this summer near Karlsruhe, dramatic differences were found in corn height and yield potential between the preplant treatments and the side-dress treatment applied at five-leaf stage on a sandy loam irrigated soil. From our precision ag work, we have found that producers probably have more need for site-specific N timing and application than site-specific rate adjustments. Sands just cannot hold N for long periods of time. They need to have a midseason N application.
9. Consider crops with low N requirements. These include any legume, barley and flax, and in the east, sugar beet crops. Oilseed crops also give a good-quality response to lower N rates.
10. Finally, consider N at deeper depths. If the soil sampler can avoid rocks and obtain a soil core into the 2- to 4-foot depth before sunflower, try to determine the level of N at that depth and give a credit for anything higher than 30 lb N/acre. In a field near Williston, N levels from 2 to 4 feet were more than 200 lb/acre because of heat and drought in the recent past, leaving high amounts of residual N behind in a nonleaching environment. Certainly some N needs to be in the 0- to 2-foot depth for wheat, but rates in excess of 60 lb/acre would not be justified if high levels of N were found within the deeper rooting zone.

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Stored Grain Management

Grain should not deteriorate significantly in storage if producers use the information and technology available today.

The storage structure needs to be cleaned thoroughly. Any areas that cannot be cleaned, such as below perforated floors, should be fumigated, especially if insects were present last season. The structure should be maintained so no moisture may enter. Provide an aeration system that will cool the grain adequately. This generally is an airflow rate of about 0.1 to 0.2 cubic feet per minute per bushel (cfm/bu) and a distribution system that uniformly distributes the airflow through the grain.

Grain should be dry and cool for best storage. Recommended moisture contents for short-term and long-term storage are available in publication AE-791, "Crop Storage Management," available from the NDSU Extension Service. Cooling the grain is equally important as grain moisture in successful grain storage.

The optimum temperature for insect activity and grain spoilage is 70 to 80 F. Therefore, grain should be cooled to below this temperature as soon as possible. The time to aerate grain is shown on figure 1. Insect reproduction is reduced at temperatures between 50 and 70 F, and insects are dormant at temperatures below 50 F. At the recommended winter grain storage temperature of 20 to 25 F, some insects will die within a few weeks.

By September, outdoor temperatures permit cooling the grain with aeration to reduce insect reproduction. Outdoor temperatures are cool enough in October to cause stored grain insects to become dormant if the grain is aerated.

Mold growth (spoilage) also is reduced as the grain temperature is reduced. The allowable storage time of grain approximately doubles for every 10 F that the grain is cooled. For example, the allowable storage time of 16 percent moisture content wheat is about 70 days at 70 F, 120 days at 60 F and 230 days at 50 F.

Crusting of the grain surface is associated with moisture migration and can be prevented by cooling the grain whenever outdoor temperatures average 10 to 15 F cooler than the grain temperature. Stored grain should be cooled several times using aeration as outdoor temperature decreases.

Cooling grain as outdoor temperatures cool will enhance the storability of the grain greatly.

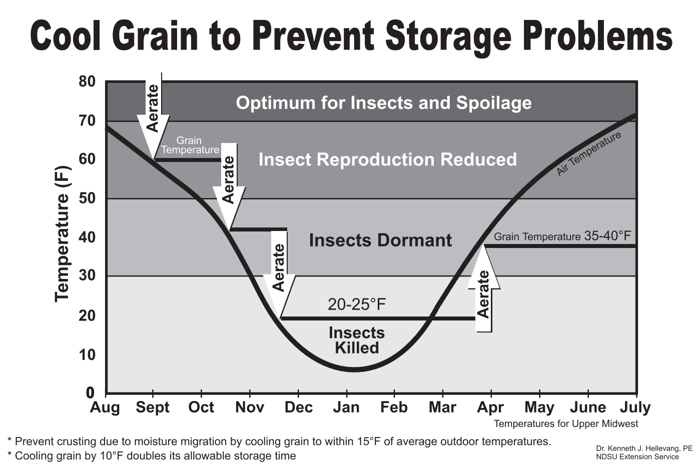

Figure 1.

Check stored grain every two weeks during the critical fall months when outside air temperatures are changing, and at least monthly after the grain has been cooled to the winter storage temperature and it has a storage history without problems. Get into the bin to check the stored grain. Search for small changes that are indicators of potential problems. Check and record the moisture content and temperature of the grain at several locations. Probe the grain for insects and other problems.

More information is available on the NDSU Grain Drying, Handling and Storage Web site *(www.ag.ndsu.nodak.edu/abeng/postharvest.htm)*. Some of the more useful information includes:

1. NDSU publications; MidWest Plan Service postharvest publications
2. Links to about 100 online publications at other universities
3. Fan selection software that estimates required fan horsepower and operating static pressure for various crops, bin sizes, grain depths and airflow rates
4. Links to an equipment buyers guide that includes an extensive listing of grain and feed equipment and services
5. Links to agencies, associations and other information

If you would like an 11-by-17-inch color copy of figure 1, please contact me or call NDSU Extension Agricultural Engineering at (701) 231-7236 and leave your name and address.

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Don't Rush When Handling Anhydrous Ammonia

Fall fieldwork always creates a feeling of "hurry, hurry." Some years it isn't so rushed, but the feeing still is there. Fall tillage, moving bales, combining the last of the crop, getting machinery moved home for winter repairs and applying anhydrous ammonia for next year's crops - it all has to be done yesterday. Often enough, rushing is a major factor in farm accidents.

Handling and applying anhydrous ammonia is a job that cannot be rushed. Some people do get in a rush and get by without problems, but that won't last forever. They probably will have trouble some time in their future. Be sure of what you are doing.

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Follow all the disconnection and reconnection steps in their proper order.

Before stopping in the field to replace an empty nurse tank, line up the equipment so you can work on it while upwind of all connections you need to make. Being upwind helps move any escaping ammonia away from you. Make sure you know where to find the closest water supply for an emergency dip if something really goes wrong. Have an escape route from the scene planned ahead of time so you don't have to use up valuable time in deciding which way to run and what will be in your way.

Always be sure to have your squirt bottle of water in your shirt pocket before you leave the tractor or pickup cab. If you should need the water and it isn't there, you painfully will use valuable time looking for it – if you can see at all. Replace the water daily to keep it fresh!

Put on all of the basic protective equipment first, before starting to work on the equipment. The gloves must be long-cuff rubber gloves approved for use with anhydrous ammonia. The goggles have to be snug fitting and nonvented to keep the ammonia from getting to your eyes. If you leave the gloves and goggles in the nurse tank kit or your cab, they can't help you.

Disconnecting the empty nurse tank out in the field is a job that should not be rushed. Be sure to close the liquid withdrawal valve completely on the nurse tank first. If it is not closed completely before disconnecting, the nurse tank hose will remain pressurized – a dangerous condition!

When connecting the fresh nurse tank to the applicator, always be certain the hose end bleeder valve is closed and the hose end is securely plugged into the applicator before opening the liquid withdrawal valve on the tank. Otherwise, an uncontrolled release of anhydrous ammonia probably will occur, placing you at risk!

Do not remove any of the protective equipment until you've made all the connections and found they are safe. Then place the protective equipment back in the nurse tank kit unless you are wearing your own.

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