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water spouts

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In this issue:

Bismarck Irrigation Workshop, Thursday, Dec. 7

The workshop will be at the Best Western Ramkota Hotel in conjunction with the North Dakota Water User Association's annual convention Dec. 6-8. The NDSU Extension Service, North Dakota Irrigation Association and North Dakota Water Users Association sponsor the workshop. The convention will include an irrigation and water products exposition. More information about the workshop will be in the October issue of *Water Spouts*.

Delivery of Water Spouts

For the 2018 season, we are considering only electronic delivery of *Water Spouts*. For several years, we have been delivering a PDF version via email to a number of subscribers. Plus, we post copies to the *Water Spouts* website:

www.ag.ndsu.edu/irrigation/water-spouts

Sending the latest issue of *Water Spouts* via email or posting it to the website is usually seven to 10 working days faster than mailing the printed copy. In the next issue (October), we will ask for your feedback regarding printed copies.

NDSU EXTENSION SERVICE

How to Estimate the Amount of Pumped Water

If you have an irrigation water permit, sometime this winter you will receive a notice from the North Dakota State Water Commission requesting a report of the amount of water you pumped for irrigation this past growing season. Here are three methods you can use to determine the volume of water pumped for irrigation, depending on your equipment.

1. Do you have a working flow meter?

A working flow meter with a volume totalizer makes filling out the postcard easy to do. The volume totalizer is a counter similar to the odometer in a car.

Some meters record the volume in hundreds or thousands of gallons. Determine which one usually is easy because the manufacturer will show zeros to the right of the counter. If the meter records hundreds of gallons, it will have two extra zeros; it will show three zeros if it records thousands of gallons.

Some meters record the volume in cubic feet of water (1 cubic foot equals 7.5 gallons) and some record in acre-inches or acre-feet.

If you wrote down the numbers on the volume totalizer at the start of the season, then all you need to do is read the meter again and subtract the current number from the previous number to obtain the volume pumped.

You can report water use in gallons or acre-feet. Just remember, an acre-foot of water covers an acre 1 foot deep in water and is equal to 325,800 gallons. An acre-inch is equal to 27,150 gallons.

2. Do you have an hour meter on the center pivot or pump?

For a center pivot system, you can calculate an estimate of the amount of water pumped using the hour meter in the pivot control panel. However, you need to have written down the hour-meter reading at the beginning of the growing season. Subtract the current reading from the previous reading to get the number of hours the pivot operated this year.

You then need to know the approximate flow rate to your center pivot. This can be obtained from the center pivot sprinkler chart. Now that you know the flow rate, use the following formula to calculate the acre-feet of water that were pumped:

Volume pumped =
(Hours of operation) x (gallons per minute) ÷ 5,430

For example, say your center pivot ran for 895 hours and the sprinkler flow rate is 800 gallons per minute. Then the volume pumped is approximately:

(895 x 800) ÷ 5,430 = 131.9 acre-feet

You also can use this method if you have a diesel or gasoline engine with an hour meter or an hour meter in the pump's electrical control panel and know the average flow rate being pumped.

3. No water or hour meter?

If this is the case, estimating the volume pumped will be difficult. However, for electrically driven water pumps, you can obtain an estimate of the number of hours of operation using the electric meter. Modern electric meters not only record the total energy use in kilowatt-hours (kwh) but also other parameters such as peak kwh and average kwh use.

You can estimate total hours the pump was operated by dividing the total kwh used during the growing season by the average kwh. The seasonal total and average electric draw for each meter can be obtained from your electrical supplier.

For instance, say your pumping plant used a total of 43,937 kwh and the average pumping load was 43 kw. Dividing 43,937 kwh by 43 kw shows that the pump operated for 1,021.8 hours. Again, you need an estimate of the flow rate to calculate the total volume used.

The calculated hours will be correct even if the meter is recording the electricity used by the pump and a center pivot or if it is recording electrical use of just the pump. The extra electrical load of the center pivot is recorded in the average draw and the total, so it doesn't affect the calculated hours of operation.

Estimating the volume of pumped water becomes very difficult when irrigation systems have one pump that supplies multiple pivots or multiple wells that supply a single or multiple center pivots. If you have difficulty estimating pumped water volume, consider installing a flow meter, or if you have a center pivot, write down the reading on the hour meter.

Other ways of estimating the volume of pumped water from electrical use are available, but they involve a few more calculations. Contact me if you have questions.

Tom Scherer, 701-231-7239
Extension Agricultural Engineer
Thomas.Scherer@ndsu.edu

North Dakota Irrigation Statistics: 2016 Growing Season

Sources: Farm Service Agency (FSA), National Agricultural Statistics Service (NASS) and the North Dakota state engineer's office (State Water Commission [SWC])

Total harvested cropland acres (NASS)	27,200,000
Number of acres irrigated (FSA)	307,000
Percentage of cropland irrigated	1.13 percent

Major Irrigated Crops (acres):

Corn	120,300
Soybeans	63,850
Potatoes	24,790
Wheat	23,020
Alfalfa	14,900
Barley (malt and feed)	14,270
Dry edible beans	13,400
Sugar beets	11,270
Subtotal	**285,800**

Miscellaneous Irrigated Crops:
mixed forages, oats, field peas, onions, grass, rye, sorghum, flax, safflower, canola, carrots, millet, lentils and triticale .... Total of 21,200 acres

Total agricultural crop receipts (NASS)	$10.95 billion
Total receipts from irrigated crops	$250 million
Irrigation revenues as percent of total	2.3 percent
Gross return per irrigated acre (major crops)	$875
Gross return per dryland acre	$402
Dryland acres needed to equal an irrigated acre	2.17*

* 2016 was an unusual year, with almost ideal rain across the state during the entire growing season. Normally, approximately four dryland acres equal the economic return on one irrigated acre.

Irrigation Systems

Center pivots are used on about 90 percent of irrigated land; surface irrigation methods are used on 10 percent.

Water Use for Irrigation (SWC, 2013)

In 2013, permitted irrigation systems diverted about 194,000 acre-feet of water, for a statewide average of 8.6 inches of pumped water applied to each acre. For volume comparison, the maximum storage capacity of Lake Sakakawea is 23.8 million acre-feet of water.

Water Sources (SWC, 2013)

In 2013, about 119,000 acre-feet, or 61.3 percent, of water permitted for irrigation came from groundwater (wells) and about 75,000 acre-feet, or 38.7 percent, came from surface water.

When Handling Anhydrous Ammonia, Don't Hurry

Fall fieldwork always seems to generate a feeling of "hurry, hurry." Some years, the fall season isn't so rushed, but the feeling always 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 all has to be done. Often, hurrying 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.

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 to be made. Check to see where the closest water is for an emergency dip if something really goes wrong.

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

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

Placing your body upwind from the connection on which you are working helps move any escaping ammonia away from you. Have an escape route in mind so if a problem does develop, you don't have to use up valuable time deciding which way to run and what will be in your way.

Disconnecting the empty nurse tank in the field is another a job that should not be rushed. First, be sure to close the liquid withdrawal valve on the nurse

Live release of ammonia during an education and safety demonstration workshop in 2016.

(Photo by John Nowatzki)

NDSU NORTH DAKOTA STATE UNIVERSITY

DEPARTMENT OF AGRICULTURAL AND BIOSYSTEMS ENGINEERING
NDSU Dept 7620
PO Box 6050
Fargo ND 58108-6050

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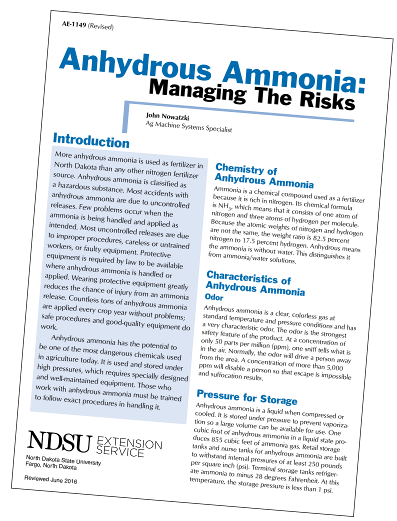
tank completely. If it is not completely closed before disconnecting, the nurse tank hose will remain pressurized, which is a dangerous situation.

When connecting the fresh nurse tank to the applicator, always be certain the hose end bleeder valve is closed and the hose end is plugged into the applicator securely 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, gloves or goggles until you've made all connections and you've found them to be safe. Then place the protective equipment back in the nurse tank kit unless you are wearing your own.

Be sure of what you are doing, following all the disconnection and reconnection steps in their proper order, and stay safe in your anhydrous ammonia application.

More information on safe handling of anhydrous ammonia can be found in the NDSU publication "Anhydrous Ammonia: Managing the Risks" (AE1149). It's available at all county offices of the NDSU Extension Service or online at *http://tinyurl.com/HandlingAnhydrousAmmoniaSafely*.


AE-1149 (Revised)

Anhydrous Ammonia: Managing The Risks

John Nowatzki
Ag Machine Systems Specialist

Introduction

More anhydrous ammonia is used as fertilizer in North Dakota than any other nitrogen fertilizer source. Anhydrous ammonia is classified as a hazardous substance. Most accidents with anhydrous ammonia are due to uncontrolled releases. Few problems occur when the ammonia is being handled and applied as intended. Most uncontrolled releases are due to improper procedures, careless or untrained workers, or faulty equipment. Protective equipment is required by law to be available where anhydrous ammonia is handled or applied. Wearing protective equipment greatly reduces the chance of injury from an ammonia release. Countless tons of anhydrous ammonia are applied every crop year without problems; safe procedures and good-quality equipment do work.

Anhydrous ammonia has the potential to be one of the most dangerous chemicals used in agriculture today. It is used and stored under high pressures, which requires specially designed and well-maintained equipment. Those who work with anhydrous ammonia must be trained to follow exact procedures in handling it.

Chemistry of Anhydrous Ammonia

Ammonia is a chemical compound used as a fertilizer because it is rich in nitrogen. Its chemical formula is NH_3, which means that it consists of one atom of nitrogen and three atoms of hydrogen per molecule. Because the atomic weights of nitrogen and hydrogen are not the same, the weight ratio is 82.5 percent nitrogen to 17.5 percent hydrogen. Anhydrous means the ammonia is without water. This distinguishes it from ammonia/water solutions.

Characteristics of Anhydrous Ammonia

Odor

Anhydrous ammonia is a clear, colorless gas at standard temperature and pressure conditions and has a very characteristic odor. The odor is the strongest safety feature of the product. At a concentration of only 50 parts per million (ppm), one sniff tells what is in the air. Normally, the odor will drive a person away from the area. A concentration of more than 5,000 ppm will disable a person so that escape is impossible and suffocation results.

Pressure for Storage

Anhydrous ammonia is a liquid when compressed or cooled. It is stored under pressure to prevent vaporization so a large volume can be available for use. One cubic foot of anhydrous ammonia in a liquid state produces 855 cubic feet of ammonia gas. Retail storage tanks and nurse tanks for anhydrous ammonia are built to withstand internal pressures of at least 250 pounds per square inch (psi). Terminal storage tanks refrigerate ammonia to minus 28 degrees Fahrenheit. At this temperature, the storage pressure is less than 1 psi.

NDSU EXTENSION SERVICE
North Dakota State University
Fargo, North Dakota

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John Nowatzki, 701-231-8213
NDSU Agricultural Machine Systems Specialist
John.Nowatzki@ndsu.edu