water spouts

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http://www.ext.nodak.edu/extnews/spouts/

Upcoming NDSU Field Days

Casselton Agronomy Seed Farm	July 14	(701) 347-4743
Carrington Research Extension Center	July 15	(701) 652-2951
Minot North Central Research Extension Center	July 16	(701) 857-7677
Sidney, Mont. Eastern Agricultural Research Center, Sidney	July 16	(406) 482-2208
Langdon Research Extension Center	July 17	(701) 256-2582
Mandan USDA/ARS Northern Great Plains Research Lab	July 17	(701) 663-3018
Outlook, Saskatchewan Canada-Saskatchewan Irrigation Diversification Centre	July 17	(306) 867-5400
Oakes Irrigation Research Site	July 29	(701) 742-2189
Tappen Irrigated Potato Field Day – I-94, exit 217 (Pettibone), north side	Aug. 21	(701) 231-7076

North Dakota Water Education Foundation Offers Summer Water Tours

In the next month, the North Dakota Water Education Foundation will offer two water tours. These tours provide a firsthand look at North Dakota's critical water issues. Registration is $15 per person and includes tour transportation, meals, refreshments, informational materials and a one-year subscription to *North Dakota Water* magazine.

Lake Oahe – July 30

This tour, which begins and ends in Mandan, will explore the Missouri River south of Bismarck/Mandan and educate participants about water issues along the river and in Lake Oahe. The tour will include stops at the Tesoro refinery; Fort Abraham Lincoln; recreation and wildlife sites along North Dakota Highway 1806; Mobridge, S.D.; and irrigation/historical sites along North Dakota Highway 1804. Learn how the low water levels in Lake Oahe have stopped irrigation on more than 3,000 acres and created water intake problems for public water supplies and irrigation projects.

Understanding Garrison Diversion and Water Supply Projects – Aug. 13

This tour begins and ends in Bismarck. The passage of the Garrison Diversion Reformulation Act in 1986 and the Dakota Water Resources Act in 2000 changed the emphasis of the Garrison Diversion project to municipal, rural and industrial water supply projects. Tour stops will include the Snake Creek Pumping Plant, Lake Sakakawea, Audubon National Wildlife Refuge, Brekken-Holmes Recreation Area, McClusky Canal, Turtle Lake Irrigation District, local farms and Lonetree Wildlife Management Area.

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Irrigation Field Day and Trade Show – July 17, Outlook, Sask.

A field day and trade show will be held at the Canada-Saskatchewan Irrigation Diversification Centre (CSIDC) on Thursday, July 17. The center is at 901 McKenzie St. S., Outlook, Sask.

Coffee and donuts will be served at 8:30 a.m., the trade show starts at 9 a.m. and field tours begin at 9:15 a.m. Presentations will be held at 11:30 a.m., followed by lunch. Highlights will include:

- Climate change and water management
- Irrigated crop production – dry beans, canola and cereals
- Organic management – vegetables
- Visit to the fruit orchard

Admission is free. For more information, contact the CSIDC at (306) 867-5400.

Gail Dyck, (306) 867-5402
Irrigation Agrologist
CSIDC, Outlook, Sask.

Field Day at the Oakes Irrigation Research Site July 29

The NDSU Oakes Irrigation Research Site will be conducting its annual field day July 29. Refreshments and rolls will be served at 9 a.m., with the tour beginning at 9:30 a.m.

The tour will include:

- A study initiated in 2008 to determine the effects of corn stalk removal for cellulosic ethanol production in two no-till rotations (corn-corn, corn-soybean)
- No-tilled continuous corn and no-tilled corn on soybean ground utilizing fall strip-till. Both studies include fertilizer nitrogen rates ranging from 15 to 200 pounds per acre to provide data to update nitrogen recommendations.
- Corn planted in 30-inch, 30-inch paired and 15-inch rows at populations from 25,000 to 35,000 plants per acre
- No-tilled onions and sugar beets planted on strip-tilled ground
- Weed control studies in onions
- 74 corn hybrids and 60 soybean varieties under irrigation

Tour participants can bring water samples for the NDSU Extension Service to screen for drinking water quality.

The Oakes Irrigation Research site is 4.5 miles south of Oakes on North Dakota Highway 1.

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Optimizing Crop Inputs Using Chemigation Management

With the high prices for fertilizer and pesticides, applying crop inputs in the minimum amounts needed for good crop growth or protection becomes an economic necessity.

Chemigation is recognized as a best management practice for irrigated agriculture because it allows "split" application of fertilizer. This can save money because you can apply fertilizer based on the growing conditions of the crop, reduce fertilizer losses due to leaching early in the season and reduce fertilizer amounts later in the season if leaf or petiole testing indicates no more is needed.

However, to obtain the maximum benefits from chemigation, you must understand the equipment, the management requirements and some of the limitations.

The injection of any chemical, such as nitrogen, phosphorus or a pesticide, into irrigation water and application to the land through an irrigation system is called chemigation. Injecting only nitrogen fertilizer commonly is called "fertigation."

The most common chemicals applied with chemigation in North Dakota are liquid forms of nitrogen, fungicides, herbicides and insecticides. Chemigation is **not recommended** for use with volume guns (big guns) due to poor application uniformity and wind drift problems. Chemigation can be used with other forms of sprinkler irrigation, such as wheel rolls and solid-set systems.

Chemigation equipment requirements have been incorporated into the North Dakota Century Code. The law specifically requires the following equipment:

1. Anti-siphon device on the main water line (chemigation check valve)
2. Backflow device in the chemical line between the injection pump and pipeline
3. Pressure sensor on the pressurized water line (standard equipment on center pivots)
4. Inspection port (to see if the check valve is leaking when the pump is off)
5. Injection port downstream from the anti-siphon device
6. Chemical-resistant injection pump
7. Interlock, either mechanical or electric, between the water pump and the injection pump to shut off the injection pump in case the water pump stops

For photos and explanations of this equipment, go to this Web site: *www.ag.ndsu.nodak.edu/abeng/chemindex.htm.*

Chemigation with center pivots

Sprinkler uniformity is critically important because the objective of chemigation is to apply the same volume of chemical to each square foot of the field surface. Sprinkler uniformity can be checked with a "catch can test." A can test involves measuring the amount of water applied at two or more locations under each span of the pivot. This can be done with rain gauges or plastic cups, but they all must be of identical construction. After the pivot goes over the cans, the amount in each can and its location in the field should be recorded.

The average application amount should be computed and the individual can amounts compared. If any deviate from the average by a large amount, then you probably have a problem with sprinklers at that location on the pivot. While running the can test, you should walk the length of the pivot and check for broken sprinklers and pipeline leaks. If you find any, they should be fixed before chemigating.

Chemigating with the end gun on is not recommended for pesticides because of wind drift and usually poor uniformity under the area irrigated by the end gun. Chemigation should not take place when the wind speed is greater than 10 mph, but in North Dakota, finding days with low wind is difficult. A compromise would be to start chemigating in the early evening, when wind speeds generally decrease.

Injecting nitrogen

A question often asked is how much nitrogen (N) should be injected during each chemigation event. The most common liquid fertilizer is UAN 28 and it contains 28 percent nitrogen. Amounts injected are from 10 to 30 pounds of actual N per acre (lbs/ac). One gallon of UAN 28 contains 3 pounds of N, so to apply 10 pounds of N per acre, 3.3 gallons of liquid UAN 28 need to be injected. Applying 30 pounds of N requires 10 gallons per acre. For a standard 128-acre pivot, you need at least 1,280 gallons of UAN 28.

How much to inject is dependent on the crop, growth stage, amount applied previously, yield goal and soil type. By the time corn is chest high, it has a deep root system, so applying 30 lbs/ac would be reasonable and this may be required only once in the growing season, depending on how much N previously was applied. However, if you have a shallow soil, which restricts full corn root development, you may want to put on two applications of 15 lbs/ac. The root depth of potatoes is only 2 feet, so smaller amounts of, say, 10 to 20 lbs/ac of N applied more frequently are desirable so N is not lost to leaching events caused by summer storms.

Another question asked is how much water should be put on with the N. Since you want to get the N to the roots, chemigating with N during a regular irrigation event is the most desirable. If circumstances are such that you need to apply the N and are not concerned about the amount of water, then the timer should be set to apply at least a quarter of an inch.

Injecting fungicides and insecticides

Fungicides are either protectants or systemic. Protectant fungicides applied by chemigation provide protection to the plant by coating the above-ground biomass of the plant. Systemic fungicides work by being absorbed by the plant and providing protection from the inside of the plant through the tissues. For both types of fungicides and insecticides, the object is to cover the plant but not put on too much water so that the pesticide is washed off. Low application amounts are applied and typically the pivot timer is set at 100 percent, which applies about one-tenth to two-tenths of an inch of water.

Injecting herbicides

Herbicides have two modes. Either they are applied before weed emergence or they are applied after weed emergence. If you are applying pre-emergent herbicides, then you want the water containing the herbicide to penetrate at least 4 inches into the soil. Selecting an application amount from 0.25 to 0.5 inch will accomplish this very well. If you are applying a postemergent herbicide, then the pivot timer would be set to 100 percent and the application amount would be about one-tenth of an inch.

Five easy steps to calibrate a center pivot for chemigation

Center pivot systems are used on more than 83 percent of the irrigated land in North Dakota (in excess of 200,000 acres). With the cost of pesticides and liquid fertilizer increasing every year, properly calibrating a center pivot irrigation system for chemigation is important. Below are five easy steps to follow to ensure that a center pivot chemigation system is calibrated properly.

1. **Calibrate the injector pump.**

   Determine the injection rate of the chemical injection pump for a particular setting of the injection rate control knob. This must be done with the irrigation system running so the injection pump is working against the water pipeline pressure. Do this by letting the injection pump draw from a calibrated container on the suction side of the injector pump. Determine the time in minutes to inject 1 gallon of liquid, then use this equation to determine the injection pump rate in gallons per hour:

   $$\text{Injector pump rate} = \frac{60}{\text{minutes to pump 1 gallon}}$$

2. **Determine the number of hours to make one complete revolution around the field at the speed at which the center pivot will be operated and the total number of acres the pivot covers:**

   Time in hours to cover the field (full-circle pivots – hours to complete a full revolution, part-circle pivots – hours to move from one side to the other).

   Total area the center pivot covers in acres.

3. **Determine the total gallons to be injected. Multiply the injection pump rate (step 1) by the total hours to cover the field (step 2). Use the following equation:**

   Total gallons injected =
   (injector pump rate) x (hours to cover field)

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4. **Determine the amount of chemical required to cover the field**.

   Multiply the field acreage by the chemical rate as specified for the particular chemical and crop. For nitrogen, the amount would be the pounds of N per acre. For pesticides, it would be the rate recommended on the label for the particular crop. Use the following equation:

   Total chemical volume =
   field acres (step 2) x chemical volume/acre

5. **Add the total chemical (step 4) to the injection supply tank.**

   For nitrogen in the form of UN-28, the supply tank should contain the amount calculated in step 3. However, for most pesticides, add water to the supply tank until you have the necessary total volume to be injected (step 3).

When working with many pesticides and dry chemicals, make sure you have a method to agitate the injector supply tank to keep the chemicals in solution. Many chemicals will settle out if not agitated.

For more information on chemigation and calibration of center pivots, contact me and request publication FS-863, “Chemigation: Calibrating Systems for Center Pivot Irrigation,” by Hal Werner, South Dakota State University Extension agricultural engineer.

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