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water spouts

No. 260 October 2011

Upcoming Irrigation Workshops

Dec. 8, 2011 – Bismarck Best Western Ramkota Inn

This workshop is held in conjunction with the North Dakota Water Users Association's annual convention. The Missouri Slope Irrigation Development Association, NDSU Extension Service and North Dakota Water Users Association are sponsors. The convention will include an irrigation exposition at which suppliers display their products and services. Workshop topics will include an update on water metering requirements, the basics of tile drainage, irrigation development along the McClusky Canal and northwestern North Dakota industrial and irrigation water supply issues.

Dec. 15, 2011 – Ernie French Building, Williston Research Extension Center

This workshop is for experienced irrigators. Topics covered will include irrigated crop fertility and water management, use of fungicides, saline soils and a Nesson Valley irrigation research update. Contact person is Chet Hill, (701) 774-4315, *Chet.Hill@ndsu.edu*.

Minimize Heat Damage, Spoilage and Fuel Consumption When Drying Corn

Even though drying conditions are excellent now, some producers may be faced with drying high-moisture or immature corn this fall. To minimize spoilage during drying, do not use natural-air or low-temperature drying to dry corn with moisture contents of more than 21 percent.

Natural-air drying doesn't work well in late fall because the air's drying capacity is extremely poor at temperatures below about 35 degrees. When outdoor temperatures average near or below freezing, cool the corn to 20 to 25 degrees for storage this winter and finish drying in early April. Natural-air drying is the most energy- and cost-effective method of drying at that point.

Limit the corn depth to about 20 to 22 feet to obtain the proper airflow rate for drying. An airflow rate of 1 to 1.25 cubic feet per minute per bushel is necessary to dry the corn before deterioration occurs. Turn fans off during extended periods of rain, snow or fog to minimize the amount of moisture the fans pull into the bin.

Adding heat doesn't help dry wetter corn and increases drying speed only slight. The primary effect of adding heat is reducing the corn's moisture content unless you use a stirring device.

If high-temperature drying, use the maximum drying temperature that won't damage the corn. That increases the dryer's capacity (bushels dried per hour) and reduces the energy use. Removing a pound of water will require about 20 percent less energy at a drying air temperature of 200 F than at 150 F. Follow the dryer manufacturer's recommendations, but generally, drying temperatures should be 210 to 230 F.

Excessively high drying temperatures may result in a lower final test weight and increased breakage susceptibility. In addition, as the drying time increases with high-moisture corn, the corn becomes more susceptible to browning.

To prevent the corn from scorching or browning during drying, limit dryer temperatures. Research indicates that exposure to drying air temperatures above 200 F for more than two hours likely will result in some browning. For corn with moisture contents of more than 30 percent, browning is likely.

The drying temperature and the length of time the corn is exposed to the heat affect the potential for discoloration. Reports from producers indicate that softer, higher-starch kernels may have a higher potential for darkening. Darkening during drying also can be a result of sugar in the kernels becoming caramelized. This is a sign that the corn's development wasn't completed.

Corn can be discolored without being graded as dryer-heat damaged. Kernels damaged by dryer heat are almost entirely black. Try reducing the temperature to various levels to see which one works best. Temperature reductions likely will need to vary for corn from field to field.

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A cross-flow dryer that moves corn from the inside to the outside of the drying column, varies the corn flow rate across the drying column or varies the corn's exposure to the drying air should be less prone to cause kernel discoloration. Decreasing the temperature in the lower portion of a multistage dryer also will reduce the potential for heat damage.

Another way to reduce the heat damage potential is to dry corn to 20 percent moisture content instead of 15 percent. Evaporative cooling still occurs at the higher moisture content, and the kernels will not be exposed to the heat as long when corn is dried to the higher moisture content. This also reduces stress cracks and kernel breakage.

Using combination drying is another option. For example, corn at 28 percent moisture content can be dried to 20 percent using a high-temperature dryer, then stored for the winter and dried to storage moisture in the spring using natural-air drying or a high-temperature dryer.

Using in-storage instead of in-dryer cooling boosts the capacity of high-temperature dryers 20 to 40 percent, reduces the risk of stress cracks and removes about 1 percentage point of moisture. In-storage cooling requires a positive-pressure airflow rate of about .20 cubic feet per minute per bushel to cool the corn in about 75 hours. Start cooling immediately after transferring the corn from the dryer to the storage bin to reduce the condensation potential. To further reduce condensation, cool the corn to about 90 degrees in the dryer before placing it in storage.

Dryeration will increase the dryer's capacity 50 to 70 percent, reduce energy use by about 25 percent and remove 2 to 2.5 percentage points of moisture, or about .25 percent for each 10 degrees the corn is cooled. Dryeration is moving hot corn from the dryer to a dryeration bin with a perforated floor, where is it allowed to remain hot for four to six hours, then cooled and transferred to a storage bin. A tremendous amount of condensation occurs during the steeping and cooling process, so the corn must be moved from the dryeration bin to another bin for storage to prevent spoilage.

Removing debris that accumulates during drying is more critical when outside air temperatures are cold because condensation can develop on the dryer, creating a wet surface on which debris can collect. The debris may reduce airflow through the dryer, decreasing the dryer's capacity and creating a fire hazard. For more information about corn drying, visit NDSU's grain drying website at *www.ag.ndsu.edu/extension-aben/post-harvest*.

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Water Metering

Currently, all holders of conditional water permits issued by the state engineer, including those for irrigation use, are required to properly install in-line, continuous-recording totalizing water meters to measure the quantity of water pumped. The water metering condition is as follows:

1) Prior to the beneficial use of water, an in-line, continuous-recording totalizing water flow meter shall be installed on the pump discharge line to measure the quantity of water pumped from the water source. The water flow meter must meet the following requirements:
   a) The water flow meter must be certified by the manufacturer to record neither less than 98 percent nor more than 102 percent of the actual volume of water passing the water flow meter when installed according to the manufacturer's instructions.
   b) The water flow meter must have a display that is readable at all times, whether the system is operating or not.
   c) The water flow meter must have a totalizer that meets the following criteria:
      i) Is continuously updated to read directly only in acre-feet, acre-inches, gallons, cubic feet or barrels (42 U.S. gallons)
      ii) Has sufficient capacity, without cycling past zero more than once each year, to record the quantity of water diverted in any one calendar year
      iii) Has a dial or counter that can be timed with a stopwatch over not more than a 10-minute period to accurately determine the rate of flow under normal operating conditions
      iv) Has a nonvolatile memory if the meter is equipped with an electronic totalizer
   d) The water flow meter must be installed according to the manufacturer's specifications and must be properly maintained according to the manufacturer's recommendations, including proper winterization, such as removal during the winter.
   e) The water flow meter shall be available for inspection by the representatives of the state engineer.

At the end of the calendar year, a water use report form is mailed to each water permit holder. The permit holder is required to report the beginning and end-of-year meter readings, the total quantity of water pumped and the pumping rate of the water capture system. The annual water use report is sent to the Water Appropriation Division of the State Water Commission and a senior water resource manager compiles the water use data.

The water use data acquisition program plays a very important part in water resource management in North

Dakota. Technicians in the Water Appropriation Division collect ground-water level and stream-flow data throughout each field season. As the competition for water increases, computer models are developed to assess the impact of additional water withdrawals in aquifers and streams. Water level, stream flow and water-use data are needed to test the reliability of the computer models prior to being applied as a predictive water management tool. If we do not know how much water was pumped, calibration of computer models is impossible.

During the 1970s and '80s and well into the '90s, the reliability of in-line totalizing water meters, particularly for irrigation applications, was an issue. As a result, the state engineer developed a flexible water metering condition to obtain annual water use. The condition read: "Prior to the beneficial use of water, instrumentation shall be installed from which the quantity of water pumped can be determined. The instruments are subject to the approval by the State Engineer and shall be available for inspection by representatives of the State Engineer."

Many irrigation permit holders install hour meters on their pump power supplies or pivot systems to measure the total hours of irrigation pumping. In addition, the Water Appropriation Division and the NDSU Extension Service commonly measured pumping rates.

Pumping rates were provided to irrigation permit holders, and that data, coupled with hours of operation, allowed the permit holder to calculate annual water use. However, pumping rates are not constant throughout an entire irrigation season. For example, as aquifer water levels decline during the irrigation season, pumping rates also may decline due to increased pump lift. In addition, pumping rates vary if the irrigation system is equipped with an end gun or cornering system.

Accurate measurement of annual irrigation water use requires the installation of an in-line, totalizing water meter. Given improvements in metering technology and the need to gather more accurate annual irrigation water use, the state engineer is requiring that the older water-metering method described above be replaced with the current water-metering tool that is applied to all newly issued conditional water permits.

During the 2011 legislative session, Sections 9 and 15 of Senate Bill No. 2020 required the state engineer to purchase and install remote water metering devices to measure and record "real time" water use for industrial water permits providing greater than 15 acre-feet of water annually for water supplies sold for oil and gas development. The remote water-metering requirement arose out of concern that industrial-use permit holders were pumping in excess of their approved allocations and not accurately reporting annual water use.

The governor vetoed sections 9 and 15 of Senate Bill No. 2020. The Water Appropriation Division is developing a pilot remote metering program to evaluate the utility of remote metering systems. In addition, a mandatory monthly water use reporting system, coupled with periodic on-site inspections, is being considered for 2012 to more accurately determine industrial oil field water use.

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Fall Irrigation Checklist

- ❑ Chlorinate the well.
- ❑ Drain pipes, valves, tanks and centrifugal pumps.
- ❑ Protect pump-out risers and other equipment from ivestock.
- ❑ Close or cover any openings that might invite rodent entry.
- ❑ Check all motor and pump openings to see that they are properly screened to keep rodents out.
- ❑ Lubricate all pump and motor bearings and shafts.
- ❑ Lock the control box in the "OFF" position.
- ❑ Spray electrical contacts with contact cleaner to displace dirt and moisture and prevent corrosion.
- ❑ Replace panel door seals if hard or broken to keep moisture and dust out.
- ❑ Check the level of oil in the reservoir and change the oil if it's discolored.
- ❑ Loosen the packing gland if used.
- ❑ Loosen any belts.
- ❑ Remove the flow meter and pressure gauges and cover the holes.
- ❑ Store gated and straight pipe so they can drain.
- ❑ Inspect the gaskets in portable pipes.
- ❑ On center pivots, check all gearboxes for moisture accumulation, lubricate all fittings, check the water drain valve on each span, remove and clean the system end cap, drain all water-carrying lines and drain the booster pump case.
- ❑ Park center pivot into or with the prevailing wind (northwest or southeast).
- ❑ Winterize stationary engines.

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