The Importance of Regular Maintenance of Irrigation Equipment

- Regular maintenance of irrigation equipment is important to help increase irrigation reliability throughout the growing season.
- Preventative maintenance can reduce the frequency of expensive repairs to the irrigation system.
- Determining water application uniformity may help determine irrigation efficiency, prevent potential yield loss, and diagnose potential maintenance problems.

Introduction

Irrigation system maintenance problems can reduce water dispersal uniformity, which can potentially reduce yields. During periods of adequate precipitation, irrigation system issues may not be apparent. However, during drought conditions, when irrigation is most important, poor system maintenance may become obvious at the end of the season, when yield maps display patterns of yield loss corresponding to the irrigation system (Figure 1).

Potential water application problems may result from:

- A detached sprinkler creating a geyser on the pivot pipeline.
- A sprinkler no longer rotating or rotating erratically.
- Declines in pumping water level, resulting in the system flow rate and pressure no longer matching the original design.
- Leaking boots, gaskets, and other seals.
- Distance between sprinklers that is too wide, creating spans of un-watered plants.¹
- Plugged nozzles or pressure regulators.²

These problems can result in extra water applied in some areas, and insufficient water being applied in others (Figure 1). Even a minor system problem can cause significant yield reduction. Inconsistent water application can lead to a corn yield decrease of 20-40 bu/acre and significant economic losses.¹²

Pump and Motor Maintenance

Maintenance of the pump and motor can increase pumping efficiency and extend the lifespan of the pumping components. As with any internal combustion engine, oil, spark plugs, coolant, filters, and lubricants should be changed according to manufacturer specifications. Bolts securing the motor should also be tightened. Electric motors do not require as much servicing, but both types of motors should be kept under a shelter and free of debris to increase operating efficiency and keep properly cooled.

Additional maintenance procedures should include: (a) checking centrifugal pumps for free movement, (b) tight sealing of gaskets, (c) checking for leaks, (d) proper support of pump and piping, and (e) necessary lubrication. Turbine pumps should also be properly lubricated and supported.³ Pump adjustment may eventually be necessary if decreased flow rate or operating pressure is observed. This may be due to pump impellers wearing over time. Pumping efficiency can be determined by a trained professional conducting a pumping test. Any adjustment needed should only be performed by a professional. Pumps that regularly pump sand will require more frequent adjustment, usually every 3-5 years.

Coupling systems, used to connect the motor to the pump or line shaft, require regular lubrication and adjustment. This may include gear heads, belts, pulleys, and PTO shafts. The motor speed or coupling drive ratio may be adjusted to modify the speed of the pump. However, be careful as optimal performance occurs within a narrow range of flow rates and pressures.⁴

Well performance may be measured by specific capacity. Specific capacity is calculated by dividing flow rate by drawdown. Well performance should be checked annually, preferably in August, when pumps have been in use, and water levels should be at their lowest.⁵

Figure 1. Center pivot irrigation variability indicating problems with water dispersal. Photo courtesy of Gary Zoubek, University of Nebraska-Lincoln.
Water Treatment and Distribution

Irrigation water may be modified through several means including filtering, adding chemicals, and reducing pressure. Filters may have one of three types of blockage: physical, biological, or chemical. All three types of blockage reduce the ability for water to flow, creating a heavier load for the pump. Physical blockage like sand, silt, or other substances may collect in screens and potentially damage them. Filter screens should be checked regularly for sediment and cleaned with water. Damaged screens should be replaced. Biological blockage often occurs when water is high in iron or sulfate, which can attract bacteria that produce slimy organic material on well screens, the pump intake, and pump column. Chemical blockage occurs when minerals are deposited on irrigation equipment. Over time, minerals like calcium and magnesium carbonates and calcium or magnesium sulfates, can build up in the system and restrict water flow. Deposits are more likely to be found closer to the well than the sprinklers.4,5

Pressure regulators may wear over time, and should be checked for damage. Hoses may be torn and regulator bodies or diaphragms may crack. Use pressure gauges directly up or down-stream of filters to help track system pressure and diagnose potential problems. Chemical injectors used to apply chemicals through the irrigation system require regular inspection for correct operation. Seals and fittings may need to be cleaned and possibly replaced. To prolong the lifespan of the components, be sure to dilute materials at least by a ratio of 10:1 prior to application.

To maintain the water distribution system, flush all lines prior to connecting driplines or sprinklers. Valves, fittings, and backflow preventers may also be checked at the same time.4 After lines have been flushed, attach sprinklers and run system (Figure 2).

Application Uniformity

The uniformity of water application should be checked periodically, especially if the system is used to apply fertilizer and pesticides. The basic method for assessing application uniformity is as follows:

- Place cans or rain gauges along the length of a pivot to capture water from the irrigation system. Containers should be spaced according to the sprinkler spacing on the pivot (10-30 foot spacing).
- Bring the irrigation system up to proper operating pressure.
- Measure the distance from the center of the pivot and the amount of water collected for each can.
- From this data, calculate a coefficient of uniformity as a percentage; recommendations are as follows:
  - 90 to 100: Excellent; no changes required.
  - 85 to 90: Good; no changes required unless a problem area is obvious.
  - 80 to 85: Fair; no improvements needed, but system should be monitored closely.
  - Below 80: Poor; improvements needed, particularly if chemicals are to be injected.

As calculation and interpretation of this data are mathematically involved, spreadsheets and software programs have been designed to assist in determining application uniformity. The University of Georgia offers a free software program called ISAAC (Irrigation System Analysis and Computation) which may be accessed at the following site:

http://striplingpark.org/downloads/

Other agencies, local county agents, or private crop consultants may also have software available.6

For additional agronomic information, please contact your local seed representative.

Sources:

Web sources verified 03/03/15.

Individual results may vary and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible. ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Asgrow and the A Design® and Deltapine® and Design® are registered trademarks of Monsanto Technology LLC. Deltapine® and Leaf Design® are registered trademarks of Monsanto Company. All other trademarks are the property of their respective owners. ©2015 Monsanto Company. 150301093702 030615MEC