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Reduce Costs of Irrigation Pumping Plants by Improving Efficiency

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LINCOLN, Neb. & To save energy and money, Nebraska irrigators should check their irrigation pumps for maximum efficiency, a University of Nebraska-Lincoln Extension educator said.

Irrigation pumps that operate at the average efficiency found in university tests are using 30 percent more energy than necessary, said Tom Dorn, extension educator in Lancaster County.

"At today's energy prices, identifying a pumping plant that needs adjustment or repair could save hundreds if not thousands of dollars per year," Dorn said. "Now that irrigation season is over, look at your records and decide which of your pumping plants should be looked at by a professional. If you do it now, you have all winter and early spring to have those repairs made."

This and other cost saving tips to help deal with high input costs in crop production can be found at UNL's Surviving High Input Costs in Crop Production (**http://cropwatch.unl.edu/survivinghighinputcosts.htm**) Web page.

Statewide UNL pumping plant efficiency studies conducted on hundreds of farmer-owned pumping plants for the last 50 years were developed into the Nebraska Pumping Plant Performance Criteria. These criteria state the amount of useful work to expect for each unit of energy consumed by an irrigation pump.

Results varied considerably about 15 percent achieved good efficiency, leaving the other 85 percent using more energy per unit of work than expected by the criteria.

The tests revealed the overall average pumping plant in Nebraska is producing only 77 percent of the work that it should be for the fuel it is using, Dorn said.

If repairs are made to bring a typical diesel powered pumping plant operating at 77 percent of the performance criteria up to 100 percent of the criteria, it would result in an annual savings of nearly 800 gallons of diesel per year, Dorn said.

"That's why it's important for farmers to know how much work is being done to pump the water versus the energy consumed," he said.

When a pumping plant is not as efficient as it should be, the problem is either in the power unit or in the pump, or both, Dorn said.

"Internal combustion power units on irrigation pumps can have the same problems as those in cars and trucks," Dorn said. Poor electric motor efficiency is caused by bad bearings or a far larger motor than needed for the job.

Poor pump performance can be caused by pump designs poorly matched to the job, such as when an operator switches from gated pipe to a center pivot sprinkler. It also can be caused by converting from a high pressure sprinkler package to a lower pressure package without changing the pump. Pumps with worn impeller vanes and/or internal seals as a result of pumping sand and impellers that were not properly adjusted within the pump bowls also can cause poor pump performance.

If making impeller adjustments, be sure they are performed by a qualified professional who knows how to calculate the lineshaft elongation that occurs when the pump is operating under load, he said.

"Great harm can be done to the pump if impellers are improperly adjusted," Dorn said. "Don't attempt to adjust the impellers yourself unless you know how to account for line shaft elongation based on your particular impeller model, lineshaft diameter and length and the total head the pump is producing."

In a study involving 130 farmer-owned pumping plants in Nebraska, test data revealed 58 percent benefited from adjustments, Dorn said. Field adjustments made with a wrench either to the engine or pump or both resulted in 14 percent average savings in energy costs compared to the initial test results.

In addition, inefficient pumping plants were identified and the feasibility of making repairs beyond the field adjustments were calculated.

An analysis, based on the average field pumping plant efficiency found in studies, is presented in the paper titled Repair or Replace Inefficient Irrigation Pumping Plants. This paper is posted on UNL's Surviving High Input Costs (**http://cropwatch.unl.edu/survivinghighinputcosts.htm**) Web site.

After spending up to $17,000 for repairs, the annual extra profit averaged over a twenty year life was $16.51 per acre per year after the cost of repairs were paid out of anticipated energy savings. Total added profit over 20 years was $41,288, assuming the average price of farm-delivered diesel fuel is $4 per gallon over the 20 year period.

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