Even More Ways To Decrease Pumping Costs

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As if the current energy costs for irrigators in the southeast Missouri (SEMO) region aren't bad enough, the one positive note – the low-cost electricity – may now become a thing of the past. A June article in the *Chicago Tribune* stated that the pending environmental regulations that will start in 2014, will lead to a 40 to 60 percent increase in what consumers will pay for electricity. The rate jump comes both from the high cost of energy companies that have to retrofit scrubbers onto existing coal-fired generating plants (used in half the country's energy generation) which will be passed directly on to customers and, secondly, from the fact that energy companies will close down many coal-fired generating plants rather than invest in the expensive equipment to make them compliant. With less power generation capacity online, the rules of supply-and-demand take over.

Since energy costs are becoming more critical, several agencies have organized an Irrigation Energy Field Day to take place Thursday, July 28th at the MU Delta Center in Portageville to assist local irrigators with ideas on how to decrease energy costs. Information on how to register and get more information for this free Field Day can be found below.

In the last issue it was discussed that savings in irrigation energy costs can come from a variety of ways. The first three of the broad categories for decreasing out of pocket expenses for irrigation were previously discussed:

1. Reduce the cost you pay for fuel/energy.
2. Decrease Pumping Head.
3. Improve the efficiency of the pumping plant.

The last three categories will be discussed now:

4. Decrease losses in irrigation systems so pumps don't run as long.
5. Agronomic ways to either reduce crop water requirement or decrease water losses.
6. Miscellaneous methods.

Water Loss in Irrigation Systems. Cutting down water loss to evaporation, deep percolation, and run-off improves an irrigation system's application efficiency (AE), resulting in pumps not having to run as long. Methods to increase AE depend on the irrigation method used.

Pivot Irrigation. Water loss to evaporation and wind drift can be reduced by dropping nozzles lower to the ground with pivot drops. Also, serrated splash plates that break up a nozzle stream into "spider legs" are more efficient than flat-surface splash plates that splatter the nozzle stream into tiny droplets. Nozzles that shoot out rotor streams are even more efficient. The smaller the droplet or rotor stream, the higher is the loss. Retrofitting a pivot with a low pressure nozzle package (an energy savings in and of itself just from lower input pressures) has the added energy benefit of increasing AE by creating bigger droplet sizes and reducing pressure which tends to atomizes droplets.

Furrow Irrigation. The biggest improvements in AE for furrow systems come from items that allow the furrows to get out faster to the end. This increases AE and reduces energy as most farmers key on turning off pumps based on the majority of water furrows being "out" getting them out faster, means turning off the pump sooner. Surge flow, shorter runs, and "cut back irrigation" (CBI) help. If you use a diesel or propane engine, CBI is remarkably simple and effective. One merely revs up high to start out with, thus putting more water into every furrow and thus making them advance faster. When the water furrows are about 3/4ths the way out, idle the engine back to avoid runoff. This operation could easily be set up with a Murphy switch to make it simpler yet. Because of the high flow rates we have in the Delta, we are one of the few places in the irrigation world that can readily use CBI. We probably ought to be taking more advantage of it.

As implied above, larger furrow streams lead to faster advancement down the field. One can double furrow stream size by cutting in half the number of furrows watered in a set by using an extra half roll of Polypipe plus a tee, Y, or surge valve that lets the flow be moved back and forth. The half-roll waters the furrows closest to the tee, whereas, the full roll doesn't have any orifices punched in until half way. Most SEMO furrow irrigators water every 2nd furrow; going to every 3rd, every 4th, etc. will increase furrow stream size. However, the jury is out on whether yields are impacted.

Flood Irrigation. The use of multi-inlet Polypipe is felt to reduce pumping costs by 15 to 20 percent. Also, if there are sandy portions in rice fields, they should be bermed up and planted to soybeans. These sandy spots act like a bathtub drain. Running an EM machine over the field will produce a map of soil textural differences that can be used to identify areas that will seep.

Agronomic Methods. Irrigation pumping requirements can be decreased by the choice of plant/hybrid grown and when it is planted. Early planting can decrease crop water needs because the weather is milder and more rainfall can be harvested. Minimum-till and narrow-row planting will lead to some water savings. The University of Nebraska has suggested that irrigators apply 100 percent of the corn water needs during tasselling and silking, and 75 percent at all other times. This leads to an energy saving with only a 3 percent drop in yield. Two technologies can help decrease energy use. The first is a wonderful method that keeps over-irrigating from happening. Wireless moisture sensors are being used by more and more people in SEMO. Such a monitoring system using moisture blocks and a canopy temperature sensor is seen being installed (Figure 1). The very exciting thing about this technology is that area farmers and irrigation companies have become local dealers. Formerly, the customers of these wireless sensor manufacturers were PhD researchers doing small-plot work, and these companies didn't quite understand the real needs and requirements of the farmer. Now we have farmer talking to farmer and dealers that are well acquainted with the needs of their customer.

Fig. 1. A wireless system that monitors soil moisture and plant canopy temperature is being installed.

Fig. 2. Furrow dikes capturing water during a rain event in Georgia.

Another device that can save irrigation energy costs is on the other spectrum of technology, and was a tooled developed during the Dust Bowl – furrow dikers. Furrow dikers are simple paddle-wheel devices that are attached to a tool bar. A paddle blade drags the soil between two furrow beds and when the pile of pulled soil gets heavy enough, it flips the paddle wheel making a mini basin. Figure 2 shows furrow dike basins catching water in a rain storm in Georgia. Russell Nuti of the USDA/ARS National Peanut Research Laboratory in Georgia has found energy savings and yield increases for a number of crops, including peanuts, cotton, and corn.

Fig. 2. Furrow dikes capturing water during a rain event in Georgia.

Miscellaneous Methods. Well efficiency, the amount of water produced per foot of drawn down, effects irrigation pumping requirements. Using the proper size of gravel pack and screen size will mean that the well does not draw down as deep as one that is incorrectly designed. In some parts of the SEMO area ponds could be used to capture to catch rainfall. Pulling water from a pond requires less head than pulling it from a well.

More information on energy savings for irrigated agriculture will be found at the Irrigation Energy Field Day to be held in Portageville, MO on Thursday, August 28th. Δ

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