Irrigation water leaks

Progressive Forage Grower **Editor Lynn Jaynes**

If you had a sack of money slung over your shoulder and someone told you the bag had a hole in it and coins were falling out, you'd probably fix it. If dollar bills were falling out, you'd not only fix it, you'd retrace your steps and pick up every darn one. Yet somehow, during irrigation season when the sprinkler pipes or nozzles are leaking, we don't value it as we would lost money. Yet we not only lose water but also the electrical costs associated with the leak. So it's hard to decide whether the leak is the worst of your problems, or not fixing the leak.

Dr. Howard Neibling, Biological and Agricultural Engineer at University of Idaho extension, gives some graphic examples of what even seemingly minor leaks can mean. Neibling conducted a study funded by Idaho Power and measured the flow and calculated the costs from several leaks he found in irrigation equipment.

Prepare for a sobering reality check.

For all calculations in the following examples, full-season use is assumed as 1500 hours of operation at 50 psi, with a cost of $0.079 per kilowatt hour. If pumping from a canal, a 30-foot rise was estimated, and a 300-foot rise was estimated if pumped from a well.

This is a common site – a puncture in a pasture mainline. Punctures are nearly impossible to prevent in a surface line where horses or cattle might graze, so we're never too surprised to see them. What is surprising is that this leak puts out 8.4 gpm under 50 psi. Based on running 1500 hours per season and a cost of $0.079 per kilowatt hour for electricity, if you're pumping or pressurizing from canal water (say 30 feet), this will result in a cost of $39 per year. But if you're pumping it from a well (say a lift of 300 feet) the electrical cost climbs to $111 per year and water loss over the season equals 2.32 acre feet.

This photo shows a leaky gasket (or absent gasket?) at a mainline joint. Due to volume of the pipe, it loses 24 gpm at 50 psi. If lifting water from a 30-foot drop (like a canal system) losses would total $111 per year just in electrical fees. If pumped from a well 300-feet deep, electrical fees would equal $318 per year, and water losses will equal 6.62 acre feet.

And who hasn't seen the geyser spray before? This spray, although seemingly minor, loses 4.6 gpm. If lifting water from a 30-foot drop, losses would total $21 per year in electrical fees. If pumped from a well 300-feet deep, electrical fees lost would equal $61 per year, and water losses will equal 1.27 acre feet.

This swimming-pool-in-the-making is filling at a rate of 0.4 gpm, resulting in a loss of $1.86 per year if pumped from a canal and $5.30 per year if pumped from a well. It will lose .11 acre feet of water over the season.

And how about an end plug leaking – any guesses? It loses 10 gpm, $46 per year if pumped from a canal and $132 per year if pumped from a well. And that's 2.76 acre feet of water you could have used in production somewhere else.

This baby geyser seems harmless enough. Yet even at a rate of 0.5 gpm, it results in a loss of $2.32 per year if water is pumped from a canal and $6.60 per year if pumped from a well. And you'll still lose .14 acre feet of water.

This wheel-line blowout leaks at a rate of 3.2 gpm, loses $15 per year in electrical fees if pumped from canal level and $42 per year if pumped from a well. And that's a season loss of .88 acre feet.

This leaky nozzle will lose 2.3 gpm, and cost $11 per year if pumped from surface water or $30 per year if pumped from a well. This nozzle alone loses .63 acre feet per year. How many leaky nozzles are on your farm?

When a sprinkler head blows out altogether, it's like running a pressure sprayer at full throttle. This one lost 20 gpm, and will result in a loss of $93 per year if pumped from surface water sources, and $265 per year if pumped from a well. Over a season, it will lose 5.52 feet per acre.

If you're not feeling the impact of this yet, just remember that although you've considered electrical costs and water loss, we haven't even scratched the surface for yield loss due to inconsistent irrigation and nitrate leaching.

Pressure will be affected by these leaks, and either pressure too high or too low will affect water distribution.

You know this from simple observation on a lawn sprinkler – if pressure is too high, then the area immediately near the nozzle is dry. If pressure is too low, then the area near the nozzle is too wet because drops are larger and heavier.

If an end gun on a pivot is mis-calibrated and discharging more water than normal, an extra 3-5 inches of water can be applied over 3-5 revolutions, affecting yield loss in the area it's not watering to the tune of 34 cwt per acre. At $5 per cwt, the loss equals $170 per acre or $850 for the 5-acre band. That's money dropping out of your bag .

And just to make sure you're not in denial anymore, I'll give you another sobering number. During Neibling's study, 922 heads or drain valves were tested of which 148 (or 16 percent) were leaking greater than 0.1 gpm. Of the 922 nozzles, 13.4 percent were applying excess water because they were the wrong size or worn.

Other take-aways from Neibling's study include:

- Some level of leakage was present on every lateral tested, with 25 percent of the standard wheel lines tested having leak loss greater than 15 percent.
- Reconditioned standard wheel lines purchased and installed performed like new lines with minimal leaks and good uniformity.
- System age was not a good predictor of the number of lateral leaks in set systems. Neither was system age a good predictor of uniformity in center pivots. Age of application package was a better predictor but was still not entirely adequate.
- Based on uniformity testing and a coefficient of uniformity threshold equal to 85 percent, 75 percent of high-pressure systems tested required updating or maintenance and 60 percent of low-pressure systems tested required updating or maintenance.
- Proper installation of a well-designed new center-pivot water-application package can improve the coefficient of uniformity from less than 85 percent to about 93-94 percent.

So again I ask, how leaky is your system?

But remember, the leak isn't your biggest problem – ignoring the leak is. ***FG***