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Why Do We Pump Test Wells?

CASE STUDY: Well Draw Down Testing Gains in Pump Longevity & Electrical Costs

We've just drilled an irrigation well and the user needs it to supply 6000 gallons of water per day. The designed irrigation system runs from 12 AM to 6 AM, every day, providing just 17 Gallons Per Minute (GPM). The well is 200 feet deep, with a Static Water Level (SWL) of 150 feet (this is the depth that the water comes up to when the well is not pumping). The owner already owns an 85 gallon pressure tank with 20 gallons of usable draw down, and a 30/50 PSI pressure switch (the pressure drops to 30 PSI, turns the pump on, and when the pressure comes back to 50 PSI, the switch turns the pump off, and the 'cycle' repeats).

Not performing a test, the installer looked at the drill log & made an assumption that the well would draw down completely at 17 GPM, thereby requiring that the 19 GPM pump be driven by a 2 HP motor – this is a normal & legitimate assumption. This pump operates on a specific 'Pump Curve', which in this case results in the pump having a cycle time of 3 minutes of on time, and 40 seconds of off time, which repeats over and over again during every period of continuous running. During the 6 hour irrigation period, this 2 HP pump would run for a total of 294 minutes, and be off for 64 minutes, and go through a total of 98 on-off cycles.

Now, assume that testing the well for 4 hours determined that the well could make 17 GPM with 10 feet of Draw Down, or in other words, you could pump 17 GPM, and the water level in the well would go from 150 feet to 160 feet during a 4 hour period. This would allow us to lower the size of the motor on the pump from 2 HP to 1 ½ HP. If a 19 GPM Single Phase 1½ HP Pump was installed, and the irrigation system was running at the same average of 40 PSI with 20 gallons of draw down in the pressure tank, the pump would turn on and run for 12 minutes, shut off for 1.25 minutes, then repeat. The 1 ½ HP pump would run for 326 minutes, be off for 34 minutes, and go through only 27 start cycles.

	Constant Pressure Pump	**1-1/2 HP Pump**	**2 HP Pump**
Daily Start Cycles	n/a	27	98
Power Use (KWH)	0.66	1.1	1.5
Cost per Day ($0.10 per KW)	$0.40	$0.66	$0.90
Cost per Year*	$146.00	$240.90	$328.50

*Assumes 365 days per year of operation

The 1 ½ HP pump would see 71 less start cycles per evening, resulting in the motor theoretically lasting 3.6 times longer in this application. Also, a 1 ½ HP motor can have up to 19% more length in the same size running wire, compared to a 2 HP motor. Obviously, if you're just using water in the house, there is less water being used, and less cost savings in power. However, the well pump will still start up to 360% fewer times, probably increasing the life of the pump by more than 3 times.

Alternatively, using a constant pressure pump controller, the system would be running in the middle of the curve during an irrigation cycle, using roughly 3.96 KW (3960 watts) during the whole cycle. At $0.10 per KW, this system would cost $0.40 per 6 hour irrigation cycle, which is $94.90 per year cheaper than even the 1.5 HP pump.