

Tune up your water system to save energy

By Windy Dankoff

Water well pumping is one of the largest electrical loads for a country home. There are several ways to minimize its energy consumption. Here is a technique that applies to any pressurizing system, utility or PV-powered, especially if it uses an AC pump.

If you look at the performance curve of any centrifugal-type pump (including all AC submersibles and jet pumps), you will see that as the pressure increases past a certain point, the flow drops drastically. This is the pressure at which the pump “slips” and loses efficiency. If this pressure is *below* the cut-out pressure setting of your system, you are wasting a lot of energy.

A pressurized water system uses a pressure switch to control when the pump turns on and when it turns off. In this system, opening the valve of a faucet or flushing a toilet will reduce the water pressure to a point where the pressure switch will turn on the pump. This is the cut-in point. As the pump overtakes the water demand or pressurizes the system after use, it will reach a point where the pressure switch shuts off the pump. This is the cut-out point. Both the cut-in and cut-out points of the switch are adjustable. A cut-out pressure of 50 psi is a typical setting by the manufacturer of a pressure switch.

We had a customer in Colorado whose cut-out pressure on her PV-powered pump was 50 psi. As the pressure got past 40 psi, the flow rate slowed way down. Since there seemed to be more than enough pressure at the faucets, we reduced the cut-out pressure to 36 psi. In doing so, we cut the energy use of the pump nearly in *half*. The owner couldn't

detect a change in the water delivery but, as it was gardening season, she saw an immediate increase in the amount of energy available from her PV-powered system.

Why do most Americans want more than 35 PSI at their home? The answer is *undersized* plumbing. Most houses in the U.S.A. are plumbed to the legal minimum requirements of the plumbing codes (1/2-inch and 3/4-inch pipe). At the end of a long pipe run, the dynamic pressure may be diminished by 30%.

Is your system affected? If there is a pressure gauge near the pressure switch, you can verify if your pump's efficiency is poor at the high end. Here's how. Release some water, just until the pump switches on. Watch the system's pressure gauge and observe

pipe size (diameter) larger than minimum, for all cold water lines.

3. When using garden hose, 3/4-inch hose will cause far less pressure drop than 1/2-inch or 5/8-inch hose.

When these measures are undertaken, a pressure setting of 25-35 PSI will please anybody.

Reducing water pressure

Pressure adjustments are made at the pressure switch. If your system does not have a pressure gauge, you need to buy or borrow one for these adjustments. Add it, using a tee, in the proximity of the pressure switch.

On a standard pressure switch, there are two adjustment nuts, with a spring under each one. Turning the nuts counterclockwise will lower the settings. You will see the result by

watching the pressure gauge as you run a pump cycle, that is, as the pump cycles on and off. Here's the process:

1. Loosen the nut on the longer screw. This will reduce both the cut-in and cut-out pressure.

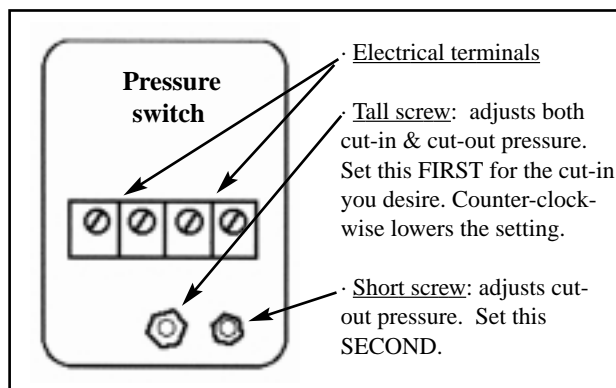
2. Adjust this nut for the cut-in pressure that you desire. Rotate it a specific amount, i.e., a full turn, then observe the pump cycle by opening a

faucet. Repeat this process until you reach the new cut-in pressure, i.e., 24 psi.

3. Adjust the nut on the shorter screw. It adjusts the cut-out point only. Cut-out pressure should be around 1.5 (150%) times the value of the cut-in pressure. For example, for a cut-in pressure of 24 psi, the cut-out pressure should be 35-36 psi.

Check the pressure tank

Once the pressure is set and everyone is satisfied, reset the pre-charge air in the pressure tank. This will



its rate of rise (this indicates flow rate). Does it rise to a certain point and then slow way down, long before it shuts off? If so, your system needs a pressure adjustment.

What can you do to remedy or avoid this situation?

1. Where a house is already plumbed, observe water delivery at the faucets. If water flow is satisfying without opening faucets all of the way, then a reduction in pressure may be acceptable.

2. Where a house has not yet been plumbed, we recommend using one

maximize its storage and minimize on/off cycling.

To reset the pre-charge:

1. Note the value of the cut-in pressure.
2. Shut off power to the pump and release water until the pressure gauge drops to zero.
3. Measure the pressure of the tank's air bladder using a tire pressure gauge at the fitting on top of the tank. Set the

air pressure to a value that is 2 to 3 PSI less than the cut-in pressure.

4. Restart the pump.
5. Write down the running time per cycle. Write it on the wall. This way, the performance can be checked later to detect pump wear or other problems.

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