Water systems for homesteads with alternative electrical systems

(This Is the second part in a two part series on water systems for homes with alternative power systems. The first part appeared in Issue No. 9, the May/June Issue-Editor)

By Skip Thomsen

In the May-June issue, we discussed the basics and promised some more specifics on pumps, and another example of a typical complete installation. Well, here goes.

Alternative electrical systems come in all degrees of sophistication. Luckily, so do water pumps. The most basic alternative electrical system, using just a set of batteries and a charging device, might get by with a 12-volt pump designed for RV use.

RV-type 12-volt pumps have built-in pressure switches, making installation of the pump as simple as connecting it in the line between the water source and the point of use. In an RV, that means between the water tank and the RV's points of use: kitchen faucet, and in a big RV, the bathroom. The tank is close to the elevation of the point of use, and the water runs are short. That's what these pumps are designed for.

But even the best of these RV pumps are intended for the intermittent kind of service that RV use implies. Daily use will wear them out prematurely. The farther you deviate from an RV like installation—as in longer runs and/or additional height-difference between tank and point of use -the more work you are expecting the pump to do, and the sooner it will fail.

Not that these pumps are entirely unsuitable for use in a home or cabin; we used a high quality (expensive) RV pump in our home for years. Except for having to install an overhaul kit every couple of years, it served us well. The pump supplied only our kitchen sink, and the water supply was a 1200-gallon fiberglass tank mounted in its own little building about ten feet from the kitchen.

The bottom of the tank was about a foot lower than the kitchen sink, so unless the water level in the tank got down to one foot (which it almost never did), the pump had to do no lifting at all. Between the pump and the kitchen faucet was a Paloma inline propane water heater. (More on these wonderful devices later.)

RV pumps have one drawback which is annoying. An RV-type pump that is simply installed between the water source and the faucet will turn on the instant its pressure-switch detects that a faucet has been opened. As long as the faucet is opened sufficiently for the pump to produce its full capacity, the pumping will continue. The instant the faucet is closed, the pressure build-up will immediately shut off the pump. So what's the problem?

Suppose you want to open the faucet just a little: you're rinsing out a paintbrush or something like that. The pressure-switch now detects the pressure drop from the opened faucet and turns on the pump. In a second or two, the pressure builds up again because the pump is designed to produce more flow than you are using, and the pump shuts off. Another second or two goes by and the pressure once more drops and the pump starts up—for a few seconds. And so on. This is called "cycling," and the resulting pulsating flow and the noise (if you can hear the pump) are not only annoying, but terribly hard on the pump.

Fortunately, it's easy to fix. Simply install a "captive-air" tank somewhere in the line between the pump and the first point of use. A two-gallon tank is sufficient. With the tank installed, the operation of the pump is more or less independent of turning on the faucet. For example, once the pump has pressurized the tank, you will be able to draw small amounts of water several times before the pump needs to turn on again.

Or if you need just a teaspoon of water, and if the pressure level is just

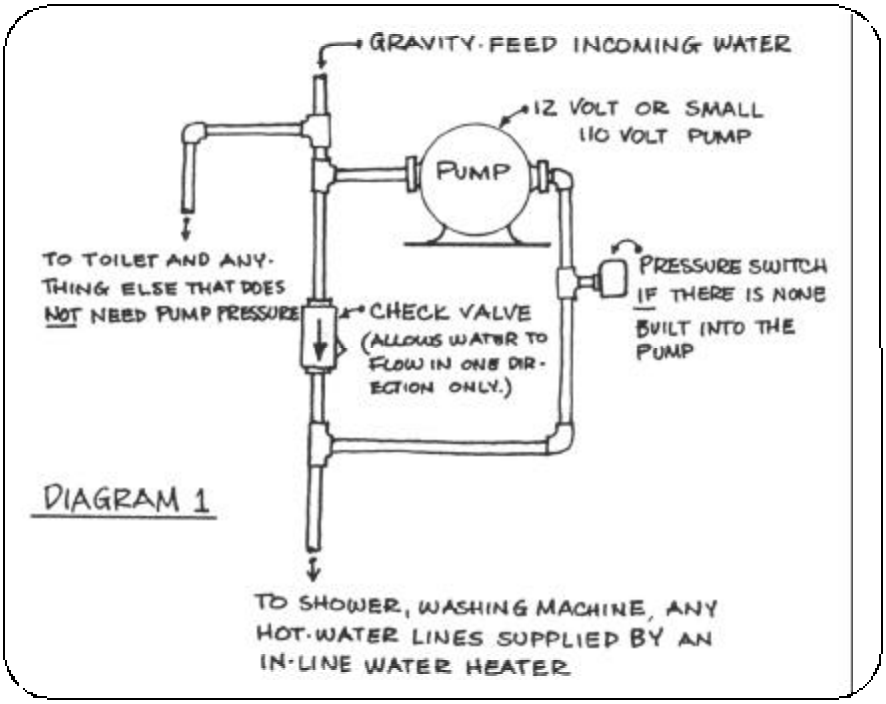
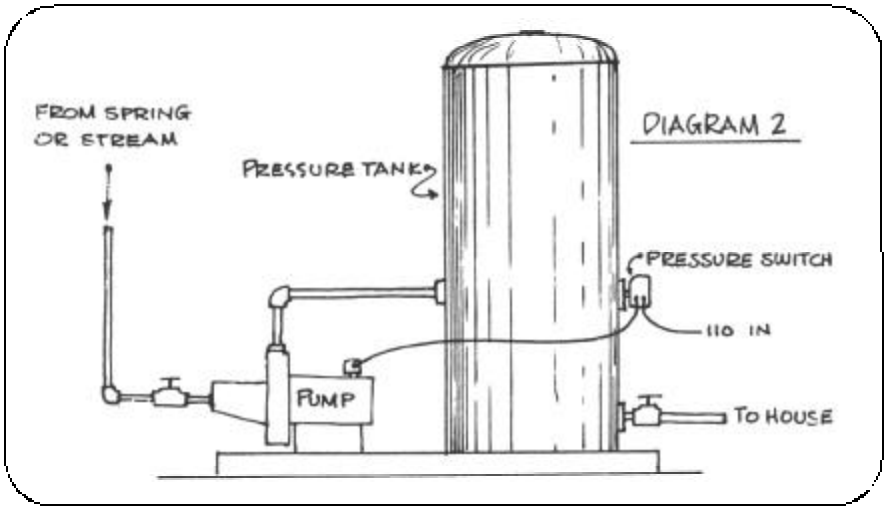


DIAGRAM 1

low enough, the pump will turn on but will keep running for the minute or so that it takes to re-supply the tank. You can have a smooth, quiet flow of water at any flow-level, and the pump will operate at a leisurely pace, insuring its long life. These tanks are available from any water pump dealer or from Sears or Grainger's.

A final note on 12-volt pumps: before you buy one, check around to see what is available. Select a pump which will deliver a minimum of three gallons per minute (GPM) and one which can be overhauled. And don't let the word "overhaul" intimidate you. Installing a diaphragm-and-seal kit is a ten minute screwdriver job.

Now, let's see what we can do with small 110-volt pumps. If your electrical system includes a high-tech inverter that consumes almost no power at idle, you can choose a 110-volt pump which the inverter can handle, and just leave it on- line 'round the clock.



With a gravity-feed water system that develops enough pressure for most domestic applications, but not quite enough for a good shower, Diagram 1 shows how to install the pump so that it can be turned on only when required, while allowing the gravity-feed system to work normally at all other times.

One pump which works exceptionally well with a 1200-watt inverter is the Dayton 1P809, available from W. W. Grainger's (see Resource info at end of article). The 1P809 is a submersible pump; it must be installed either in your creek or spring catchment or in the bottom of your tank. We used a 1P809 for years in our bathroom water system. It also supplied water to the laundry and outside faucets; it draws very little power, and produces about thirty PSI pressure, enough for normal domestic needs. This pump requires an external pressure switch, and like the 12-volt pump, it needs at least a small surge (captive-air) tank to minimize cycling.

What about, shallow-well pumps? The smallest can be run from an inverter; and there are bigger, more powerful shallow-well and deep-well submersible pumps. Any of these is available from any well/water pump dealer or Sears. The pumps which require the use of a generator to operate are necessarily limited to use-as-needed (as opposed to being left on-line) status in a water system running on alternative power. One such application is the typical domestic water system discussed in last month's article.

We used to have a neighbor whose home was about four hundred feet above a crystal-clear creek from which he wished to get his water. After much research, he decided to try a high-pressure agricultural sprayer pump. Installed at the creek, it used one quart of fuel to fill a 4000 gallon water tank at the residence. Not a bad trade-off.

Other pumps which are useful on a homestead are transfer and fire pumps. Some transfer pumps are designed to move lots of water- hundreds of gallons per minute—and put out very. little pressure. These are useful for tasks like filling a cistern from a nearby pond or creek, or low pressure, high volume irrigating.

Others are more modest but no less useful. For example, we used a small, portable 110-volt transfer pump to fill our two twelve-hundred gallon storage tanks from our water truck. We used this same pump along with a portable 1800- watt generator to pump out of a seasonal creek some 700 feet away and a fifteen -drop from the house. (The make, model and part number are listed later in this article.)

Fire pumps are wonderful to have on a homestead, particularly if the homestead happens to be in dry country. But they are very spendy. One of the least expensive units we could find is Grainger's No. 3P636 at $2000. Anything less provides false security, letting you think you have a fire pump when, in fact, you do not.

For instance we once accumulated a six-foot tall pile of brush in a small clearing near our house. In the early spring, when the pile was still very wet, we poured a can of scrap paint down the middle and torched it. It took about ten minutes for the blaze to dry the pile out. Then it fairly exploded. The flames shot twenty-five feet in the air and the heat was intense.

We had the tank truck nearby and the pump ready to go, thinking that we were prepared to keep the heat under control. Well, we did manage to keep the surrounding trees wet enough to sustain only minor damage- But every time we aimed the stream of water-in the general direction of the blaze, it evaporated before it got close to the flames. That water supply was totally useless for serious fire- fighting.

Even the best pump won't be much use with an insufficient water supply. Take the supply available into consideration when shopping for a fire pump. And make sure you keep your supply topped up at all times. (Remember Murphy's Law?)

Let's run through another typical water system and see how it can be operated with power supplied from an alternative source. This system draws its water from a spring at a point ten

feet higher than the average faucet-level in the house. Obviously, this system could get by with no pumps at all, but, with ten feet of drop, you would have only about 5 PSI of water pressure. The alternatives are several:

1. Use just-the gravity-feed pressure and design the system around that limitation. The water heater (necessarily a tank-type) would have to be installed at a level higher than point of use, and any shower would have to be one of those big, old-fashioned ones designed for low pressure. An in-line water-heater would not work with this system.

2. Use gravity-feed pressure wherever it is adequate, and use a small pump, either 12-volt or the 110volt unit described above for those applications requiring more pressure. The pump can then be switched on only when needed, as for a shower. (See Diagram 1.)

3. Use gravity-feed to supply water to a standard pressure system. This would require that the pump, which is controlled by a pressure switch, be left on-line 'round the clock. This system works well with an inverter that is "on" all the time. (See Diagram 2.)

Phantom loads

There is much talk in alternative-energy circles of "phantom loads." Phantom loads are those loads on your electrical system which accomplish little but are always there, such as clocks in appliances, "automatic-on" circuits in remote-start electronics, timers, and inverters which are left on 24 hours a day. If there are several even seemingly insignificant phantom loads, they can add up to a debilitating drain on a system not designed to accommodate them.

The high-end inverters which we recommend for this kind of service (like the Trace, Heliotrope and Heart units) draw about a half a watt at idle. A 25-watt light bulb left on for thirty minutes uses about the same amount of power as one of these inverters uses in 24 hours of standby service.

You will have to decide whether this represents a luxury beyond reason in your particular electrical system. In our case, we felt that the convenience of full-time 110 was well worth the expense of supplying our system with that tiny amount of extra power. And our system was designed to handle it.

Isolating pump noise

Whenever a water pump is installed in the house itself, rather than at a remote location like a tank- or pump-house, there is the possibility of pump noise in the building. Even the smallest pumps can transmit an unbelievable amount of noise if they are not properly isolated from the structure.

A simple way to isolate a pump is to mount it on a board, preferably through any rubber mounts it may have come with, and then place the board on a thick pad of dense upholstery foam. Then use a short length of flexible hose between the pump and any rigid plumbing going to the house. RV supply houses have hose which is specifically designed to be used with potable water systems. (See Diagram 3.)

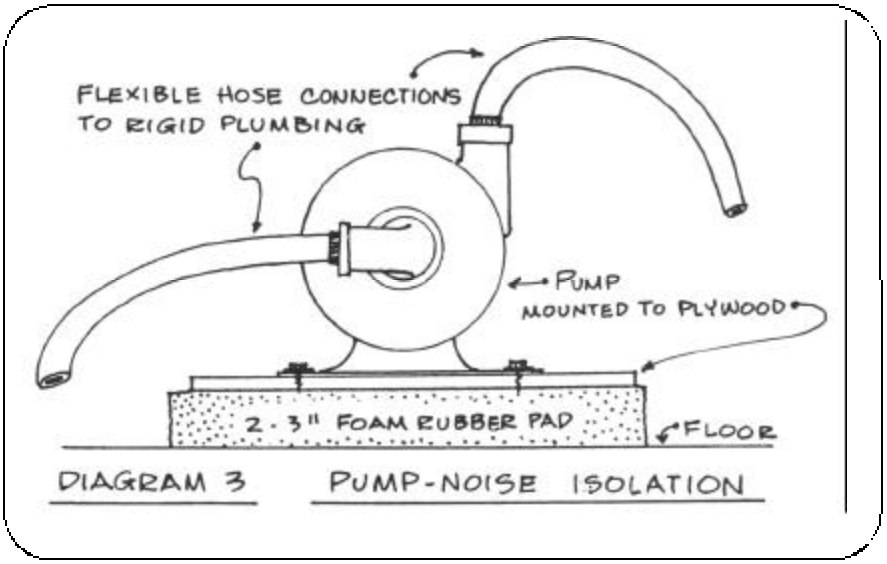


DIAGRAM 3 PUMP-NOISE ISOLATION

Tankless heater

The term "in-line water heater" has come up several times in this discussion, and these wonderful little appliances, also known as "tankless water heaters," deserve further explanation.

A conventional electric or gas-fired water heater is merely a large tank with a built-in heater. The heater must keep the entire tankful of water Hot at all times to allow you the convenience of drawing off a little hot water whenever you wish.

An in-line, or tankless heater stores no water at all. It consists of a small gas burner which heats water as it passes through a series of loops in the heater, and a gas valve which turns on the burner when it senses a drop in water pressure. The instant you turn on your hot water faucet, the resulting pressure-drop turns on the burner, heating only the water that passes through the heater.

These heaters are so efficient that the amount of fuel they use is almost insignificant. Of course,there's a catch. In-line water heaters are relatively expensive. The least expensive models are those intended for RV use. Unlike RV water pumps, however, they are not prone to premature failure from heavy use.

We used two Paloma in-line water heaters on our homestead: one in the kitchen and another in the bathroom and laundry. The reasons for two heaters were two: the distance between the bathroom and the kitchen, and the luxury of taking a shower without someone freezing us out by turning on the kitchen water. These two heaters still. functioned as-new after 10 years of service.

The only limitation of the RV-type heaters is that they are designed to

deliver the kind of flow-rates consistent with RV usage namely low. Showers will be rain-like, and it will take a little longer to fill the sink or tub. If that doesn't bother you, they are well worth investigating.

To be used to its fullest advantage, any in-fine heater should be installed as close to its point of use as possible. That way you get hot water almost instantly.

The larger tankless heaters, which are intended for regular domestic use, cost about twice as much (or more) than the RV models, but ONE would serve in a well-designed home. They are available in several sizes, all of which have much higher flow-rates than the RV units.

Resources

Here are some resources you may find helpful:

Grainger's is a good source for just about any electrical and pump needs you might ever have. In addition, they stock many different kinds and brands of fans, blowers, motors, small engines, and tools. Grainger's has branches all over the country. If you can't find one in your phone book, look in the yellow pages under "electrical equipment" and find someone who sells Dayton brand products (Grainger's house brand). They will have a catalog on hand and will be able to order anything in it for you. Failing that approach, write to:

W.W.Grainger, Inc.
5959 W. Howard St.
Chicago, IL 60648

The portable transfer pump mentioned in the article is Grainger's No. 1P8621. The fire pump is No. 3P636. The wonderful little 110-volt submersible pump is No. 1P809.

The high-pressure sprayer pump is a Sears 71AF46121N High Pressure twin-piston sprayer. 500PSI/3gpm. An alternative is their 71AF4613IN roller pump, 5gpm, 150psi.

RV-type in-line water heaters are available through most RV dealers. The brand we had such good luck with was Paloma.

The potential capabilities of alternative electrical and water systems seem to be related to the creativity of their owners. By the way, if you are interested in a manual covering every detail of the design, construction, operation and maintenance of a reliable, high output electrical system, you should have a copy of *More Power to You!*. I wrote it.

(Skip Thomsen Is the author of *More Power to You* which provides step-by-step Instructions for building a time-tested, high-output, full-time 110-volt, generator-based power system. It is available from *Backwoods Home Magazine.*