

After reading Derek Stearns's article on sawdust toilets, I was struck by two points: how easy it was to accomplish the feat of a waterless system; and, how inconvenient and unpleasant it would probably feel to most Americans to carry the "humanure" out to the compost pile every few days. And of course, there's the Not In My Backyard effect, which in this case might expand to Not In Your Backyard because You Are Next to My Backyard.

Nevertheless, for many of us interested in making our own living more sustainable, the combined goal of water conservation and not wasting our valuable wastes is compelling. At our home in Galisteo, we have adopted the goals but taken a different route to achieving them.

The System: We have an inner courtyard that was designed to be a refuge for birds, bugs and the semi-unintentional small animals. The courtyard is fully planted with native plants on drip irrigation, but even those require a fair bit of water in the summer. To meet this requirement, we take all our normal, low-volume toilet waste, plus all the other water used in the house ("black water") and recycle it completely. All by gravity – the waste water first goes into a separating tank where the non-soluble solid waste sinks to the bottom like in a normal septic system; from this tank, the liquid overflows into a 300 gallon bubbling tank. The only thing that goes on in the bubbling tank is literally bubbling air through the liquid; the oxygen kills the stinky anaerobic bacteria and promotes the aerobic bacteria; the aerobes break down the waste to components. The bubbling tank overflows into a 1500 gallon holding tank and the water in the holding tank is directly usable for the drip irrigation. From the holding tank we pump the nitrogen-loaded, recycled water through a regular drip irrigation system to the plants in the courtyard and elsewhere around the house. Our system can handle 300 gallons per day if necessary.

Thus, all of our water is used twice. No smells. The plants are in heaven with all of the available nitrogen. We have some of the fastest growing, lovely, bushes, trees and flowers you have ever seen. The birds love our plants. The bugs love our plants. The birds love our bugs. We love our garden.

Energy use: One, 75-watt air pump runs 24/7/365. The drip irrigation pump runs direct from a single, 140-watt solar PV panel. In the winter, when we don't need the irrigation, we put the PV output energy into the rest of the house (we are also off-grid).

Maintenance: We clean the irrigation filters twice per year as they tend to get a little more clogged than normal; A normal septic maintenance company proactively pumps the first separation tank and the bubbling tank once every few years; The rubber diaphragm in the air bubbler pump has a tendency to fail every few years, usually just after the warranty runs out – the pump is rebuilt in about ½ hour with a \$90 rebuilding kit; We open and stir the bubbler tank about once per year (no smells) because sludge builds up on top. The sludge is very easy to break up; We "reseed" the system once per month with two quarts of buttermilk down the kitchen drain, which I was told counteracts things going into the water waste like detergents, bleach, mouthwash, and the occasional antibiotic. I have no idea if this is true or necessary, but we've had no problems in 8 years of operation.

One shortcoming to all this is that if the household is very efficient in its first-time-through water usage, there can times of the year when the household will not generate enough recycled water for the needed irrigation. Our solution to this is to collect our roof rainwater and use that to supplement the recycled waste water. We can also supplement the recycled water with well water if necessary. Last year, we got almost all the way through August without having to use any well water for irrigation. This year, with a somewhat dryer winter and turning on the irrigation for the early spring, we will certainly need some

well water supplements before then – unless of course we have a good monsoon season because of this year's El Niño – we can always hope.

Our system is called ClearStream, but the more common brand around this area of the country that uses similar technology is called SludgeHammer.

The benefits are wonderful: Irrigated, naturally fertilized courtyard that is a true oasis in the desert, with very little net water use; and bragging rights to a black-water reclamation system.