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# Living with an Aerobic Treatment Unit and Spray Field

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**I**f you own an aerobic treatment unit and spray field, you are required by law to make sure that your system is treating wastewater adequately.

To do this, you can either contract with a company to conduct the required system inspections, wastewater tests, and report completion and submittal to local governmental agencies, or you can do the work yourself.

For both options, you'll need to know the components of your wastewater system and understand how they work. Basic information about aerobic systems is given in these Texas AgriLife Extension Service *Onsite Wastewater Treatment Systems* series:

- ▶ *Aerobic Treatment Unit*
- ▶ *Tablet Chlorination*
- ▶ *Liquid Chlorination*
- ▶ *Ultraviolet Light Disinfection*
- ▶ *Pump Tank*
- ▶ *Spray Distribution System*

These publications are available on the Web at <https://agriflifebookstore.org/>.

You also need to know the basics of aerobic systems inspection and their maintenance. For information on general onsite wastewater treatment systems, see Extension publications *Onsite Waste-*

*water Treatment Systems: Operation and Maintenance* and *Understanding and Maintaining Your Septic System*.

And unless you don't mind repairing and replacing it often or having system backups, you'll need to adopt household practices that will protect and prolong the life of your system.

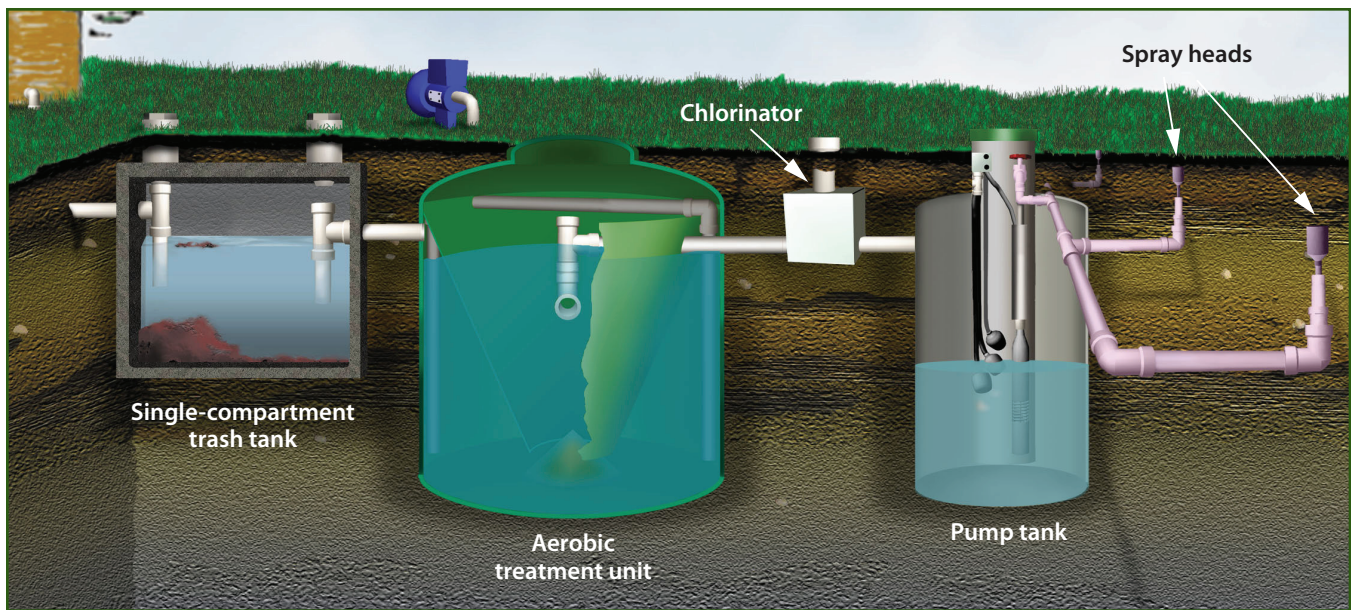
## Performing the work yourself

An advantage of doing the inspecting, testing, and reporting work is saving money. You also can be certain that the work has been done properly and the reports are filed on time. However, if you conduct the work yourself, you will need to:

- ▶ **Get informed.** To maintain an aerobic onsite wastewater treatment system properly, you must have extensive knowledge. This knowledge can help prevent injury to yourself, other people, the system components, and the environment. Obtain the manufacturer's literature describing system components and the particular maintenance practices from the company's Web site. For a list of courses for maintenance providers on maintaining aerobic systems, see the Texas Commission on Environmental Quality (TCEQ) Web site at <http://www.tceq.state.tx.us>. For a listing of courses offered through the Texas AgriLife Extension Service, see the *Wastewater Treatment and Reuse* Web site at <http://ossf.tamu.edu>.

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**Figure 1.** Example treatment train for residential aerobic wastewater treatment with a spray field.

- ▶ Know and abide by all state and any local requirements for wastewater quality, testing, and reporting.
- ▶ Inspect the system at specified intervals, usually once every 4 months, to check its operation and perform routine maintenance.
- ▶ Wear protective clothing—such as rubber gloves, and safety glasses, goggles, or face shields—during the inspection and testing activities.
- ▶ Observe stringent personal hygiene practices.
- ▶ Be adequately vaccinated against diphtheria, hepatitis B, and tetanus. Also consider protecting yourself from hepatitis A, paratyphoid, polio, and typhoid fever.
- ▶ Collect and handle the wastewater samples properly.
- ▶ Conduct tests on the wastewater.
- ▶ Submit a report on each inspection to the local authorized agent.
- ▶ Take measures to avoid illness and accidents. Common hazards associated with onsite wastewater treatment systems include disease-causing microorganisms, electrical shock, insects and animals, poisonous or explosive gases, exposure to sewage through cuts and abrasions, and confined space entry. This work increases your risk of sickness, physical injury, or death.
- ▶ Keep records on the system performance and your service activities.
- ▶ Recognize the tasks that should be left to professionals to make sure that the job is performed correctly and that you do not subject your family to undue health risks.
- ▶ Know local service providers who can handle the tasks you are not trained to perform.
- ▶ Acquire sampling and testing equipment such as a chlorine DPD field test kit, profile probe (Sludge Judge®), dissolved oxygen test kit, pressure gauge, and a graduated container for solids sampling tests.
- ▶ Keep on hand any manufacturer-required specialty tools and parts.
- ▶ Have common hand tools such as a cordless drill and bit set, shovel, and wrenches.
- ▶ Keep other supplies, such as the permit/as-built plans/specifications, governmental forms, a calculator, the system owner’s manual, a flashlight, insect repellent, and a first aid kit.
- ▶ Keep on hand the proper disinfectant, such as wastewater chlorine tablets or liquid bleach, to add to the disinfection component.

If you try to carry out maintenance activities that are beyond the scope of your training, the results could include but are not limited to voided warranties, destroyed components, additional problems with the system, higher repair costs, personal injury, and even death.

If you do not maintain the system properly, you could endanger human and environmental health, impair your wastewater system, and incur legal action.

**Human health:** Because sewage can contain disease-causing microbes, wastewater is a public health concern.

**Environmental protection:** The EPA has set national guidelines for management of onsite and wastewater treatment systems. The guidelines are posted on the Web at <http://cfpub.epa.gov/owm/septic/home.cfm>.

**System reliability:** All system components from the plumbing fixtures in the home to the spray heads in the yard must be functional within expectations.

**Legal action:** By law, water that leaves your property, either through runoff or by seepage into the ground, must meet certain quality standards as demonstrated by laboratory tests. If your wastewater treatment system is not maintained properly, the water will not be treated enough, and you may be subject to fines.

## Contracting with a maintenance provider

The advantages of contracting with a maintenance provider include saving you time, eliminating the hassle of maintaining the system yourself, and sparing you the cost of replacing a system prematurely because it was not properly maintained. It can also ensure that reports to the government are filed properly and on time.

The disadvantages include the costs and the oversight of activities provided by the maintenance provider.

If you contract with a maintenance provider, you will need to:

- ▶ Research local maintenance providers that provide this service.
- ▶ Understand the terms used in on-site wastewater system maintenance contracts.

- ▶ Know the kinds of contracts available. A basic monitoring contract meets the state's minimum requirement but requires more maintenance activities by the homeowner. Other contracts offer more service and limit the homeowner's involvement in the operation, maintenance, and monitoring of the system.
- ▶ Choose the amount of work you want to do, if any, and make sure the contract states clearly who is responsible—you or the maintenance provider—for performing the different tasks.
- ▶ Evaluate the maintenance contract. Know exactly what services you are paying for and what is included in the base price of the contract. Basic information on evaluating service contracts is available in the Extension publication, *Onsite Wastewater Treatment Systems: Homeowner's Guide to Evaluating Service Contracts*.
- ▶ Pay attention to the work being done to ensure that you're getting what you're paying for.

## Understanding your system

All water, including wastewater, is part of the hydrologic cycle (Fig. 2). After the effluent is dispersed from a wastewater system, it eventually joins ground or surface water, both of which are used as sources of drinking water. Because of this cycle, the water must be treated properly to protect human and environmental health.

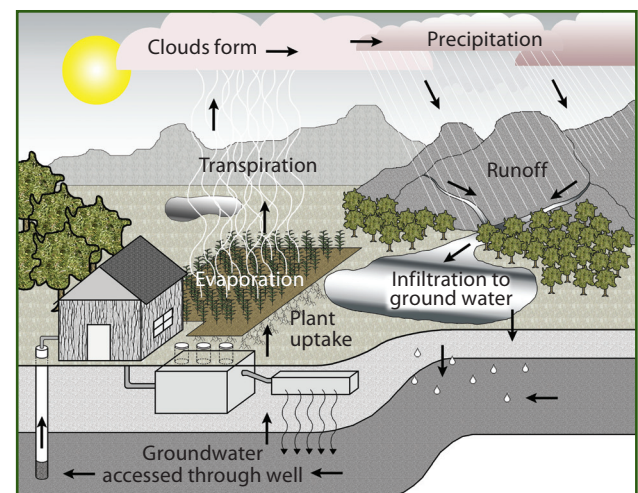


Figure 2. The hydrologic cycle.

Aerobic treatment units can remove substantial amounts of contaminants that are not eliminated by the simple sedimentation that occurs in a septic tank. The aerobic process also breaks down dissolved solids and ammonia and reduces the number of pathogens in the waste.

### **Aerobic system processes**

In onsite wastewater treatment systems, microorganisms convert waste into less harmful substances—water, carbon dioxide, and new cells. Aerobic treatment systems consist of several processes that work together to provide a high-quality effluent:

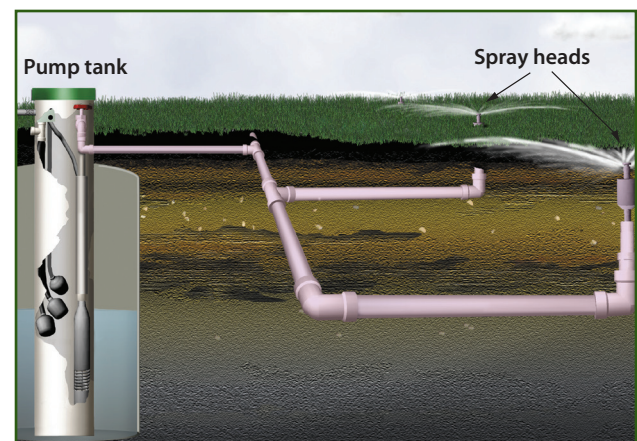
- ▶ **Removal of gross solids (trash):** After the wastewater leaves the house through a pipe, it enters a trash or septic tank, where the solids in the wastewater settle to the bottom or float to the surface.
- ▶ **Aeration:** Air is pumped into the aeration chamber of the unit, and the wastewater remains in the chamber long enough to allow the microbes to convert the waste. Aerobic systems must have a continuous supply of oxygen to keep the microbes healthy.
- ▶ **Clarification:** The clarifier removes the microbial cells, cell waste, and dead cells from the wastewater.
- ▶ **Sludge return:** The solids that settle in the clarifier are returned to a previous component to be treated further.
- ▶ **Disinfection:** Systems using spray distribution of effluent include a disinfection unit as part of the treatment system. In the disinfection process, disease-causing organisms are destroyed or inactivated. However, the wastewater is only disinfected, not sterilized (free of all life). The main disinfectants used in aerobic systems are chlorine and ultraviolet light.
  - **Chlorination** is the most common form of disinfection for aerobic systems. In this process, chlorine is added to the wastewater to reduce the number of pathogens in it. The chlorine oxidizes and destroys the cell enzymes of the pathogens. There are two types of chlorinators—tablet chlorinators and liquid chlorinators. Chlorine

tablets release chlorine gas. Do not store chlorine tablets in the house, garage or storage areas with metal tools.

- **Ultraviolet (UV) light** is another disinfectant for wastewater. In this process, a lamp emits UV light into a chamber or zone as wastewater passes through the chamber. The UV light destroys the microorganisms in the effluent by altering their genetic material and retarding their ability to reproduce.

### **Spray fields**

In the final stages of treatment and dispersal, the water is dispersed into the soil. Systems that spray the effluent onto lawns are called spray fields (Fig. 3). For these systems, the effluent must be disinfected to reduce the risk of human exposure to pathogens.



**Figure 3.** Spray field components.

Although a spray field is like a lawn sprinkler, it should be viewed very differently. The water being distributed is treated wastewater—not drinking water. Residents and pets should avoid contact with it. Texas regulations specifically prohibit effluent from being applied to vegetable gardens because some pathogens are resistant to disinfection.

### **Selecting an aerobic system size**

Each aerobic treatment unit is sized to treat a specific amount of wastewater. Aerobic treatment units are available in a range of sizes, including those able to treat 500, 600, 750, 1,000, and 1,500 gallons per day.

**Table 1.** Sizing of wastewater aerobic treatment units for single-family residence of various sizes.

Number of bedrooms	Square footage of house	Texas minimum unit capacity (gal/day)	Traditional unit capacity (gal/day)
1 or 2	Less than 1,501	400	450
3	Less than 2,501	400	600
4	Less than 3,501	480	750
5	Less than 4,501	600	900
6	Less than 5,501	720	1,050
7	Less than 7,001	840	1,200
8	Less than 8,501	960	1,350
9	Less than 10,001	1,080	1,500

To select an aerobic unit, first determine the amount of daily wastewater flow from your home or small business.

The rate of daily wastewater flow is based on the home's square footage or number of bedrooms, whichever is larger (Table 1). Then choose a Class I aerobic treatment unit that can handle that amount of flow. The TCEQ maintains a list of Class I aerobic treatment units approved for sale in Texas. These units are listed by company, model number, rated treatment capacity, and requirement for a trash tank in the treatment system.

Water-conserving fixtures can make the wastewater too strong for a system to treat adequately. Therefore, many treatment systems are overloaded organically (too much waste), which requires that the sludge be removed from the systems more often than normal.

Most residential aerobic systems can treat 500 gallons a day or 60 gallons per hour. This assumes that the wastewater contains an amount of organic matter common for homes; it is typically inadequate for businesses.

## Protecting and prolonging the life of your system

An onsite wastewater treatment system is designed to treat domestic sewage from a home or similar facility. The wastewater stream should

contain only the products of normal activities of a home. If other substances enter the wastewater stream, they may disrupt the system's performance.

The system's ability to treat wastewater is affected by several factors, including the system's capacity, the amount and strength of the wastewater, the timing of the wastewater entering the system, and the types of materials it receives.

Sometimes an aerobic treatment system can meet the minimum state requirement for gallons of wastewater treated per day, but its capacity per hour may be too small for a family's normal activities.

For instance, if a 500-gallon-per-day system can handle only 60 gallons per hour (1 gallon per minute), and a normal clothes washer uses 30 to 40 gallons at a time, the residents may have to curtail other water-using activities when doing laundry.

To alleviate that problem, a flow equalization tank may be placed between the trash tank and the aeration chamber. The tank will hold the wastewater and send it to the aerobic treatment unit at a rate it could handle.

Know your system's capacity. This information should be on the permit or the control panel label for the aerobic treatment unit. If more wastewater enters the system than it was designed to handle, it will not operate as intended.

In addition to the amount of wastewater that the system can treat, the strength of the wastewater the

treatment train can handle is limited. If the wastewater is too strong, it can overload the system, making it unable to meet wastewater quality regulations. Similarly, if the wastewater contains constituents that are toxic to the microorganisms, treatment will be affected.

### **Recognizing treatment interferences**

An aerobic treatment unit needs a regular supply of wastewater. To treat wastewater effectively, the unit needs to maintain a stable population of microbes. Any extreme influxes of wastewater flow or strength will impair the unit's performance.

Your system can be affected by the amount, strength, and timing of the wastewater entering it. These household devices, practices, and products can alter an aerobic system's performance:

- ▶ **Water-saving devices** reduce the amount of wastewater, but they also make it stronger, which can prevent the system from meeting the required effluent standards.
- ▶ **Whirlpool or jacuzzi tubs** (inside) typically use large amounts of water. Their use will affect the wastewater treatment system by exceeding the hourly flow limit of the treatment unit.
- ▶ **Multi-head showers or multiple showers used at the same time** can introduce large volumes of water into the wastewater treatment system. A flow equalization tank and additional treatment capacity are needed to handle the increased amount of wastewater.
- ▶ **Water-treatment devices with automatic back flushing** add extra water into the system that can be avoided.
- ▶ Some **water-conditioning units** add chemicals into the effluent that can reduce the effectiveness of the biological and physical processes in an aerobic treatment unit. This wastewater stream may need to be plumbed around the treatment tanks to the pump tank.
- ▶ **Condensate from air conditioning units** is not sewage. Route it around the system.
- ▶ **Commercial ice machines** can also add large amounts of clear water.
- ▶ **Laundry** activities greatly affect your wastewater system:
  - **Powdered detergent** can plug cast-iron piping, and some soap contains forms of benzo-

ate as filler. Keep these out of the system to improve its long-term performance.

- **Bleach additives** can affect the biology of the septic tank and the rest of the system. Do not overuse bleach.
- The **amount of laundry** done each day is also important. Spread out the loads over time to help the system perform at its best.
- ▶ **In-home businesses** can directly affect the system. Use for daycare increases the overall flow and can increase the use of antibacterial soaps. The system can also be affected by other small businesses that use chemicals, such as antique refinishing services, beauty shops, lawn care services, photo labs, dog grooming services, and taxidermy shops. Barbershops typically discharge large amounts of hair.
- ▶ **Prescription antibiotics and drugs** are extremely hard on the microbes in the system. Flushing them into the wastewater system increases the maintenance.
- ▶ **Heavy use of bath and body oils** can raise the fats, oils, and grease (FOG) values in the system. Removal or reduction of these can improve the performance of the system.
- ▶ A **garbage disposal** adds to the overall loading of the system in four ways:
  - More waste enters the treatment system.
  - Because the organic matter has not been digested, it takes longer to break down.
  - More water is used to rinse out the sink.
  - Smaller particles take longer to settle.Therefore, people who use garbage disposals at home need a larger system to treat the wastewater and more maintenance activities are required.
- ▶ **Toxic drain cleaners** kill the bacteria, resulting in a limited microbial activity in the tank and poor separating characteristics.
- ▶ **Antibacterial soap** also affects the biology of the tank.
- ▶ **Liquid soap** tends to be easily overused and may create problems in the system.
- ▶ **Automatic cleaners (for toilets and showers)** continually send chemicals into the system, which can cause long-term problems.

- ▶ **Other cleaning products** may also alter the treatment process. When choosing a cleaning product, first read the label:
  - **Danger** means that the chemical will kill the microbes; use it rarely or never.
  - **Warning** means that limited use should not affect the system much.
  - **Caution** typically means that the product will have little effect on the system.
- ▶ **Excessive amounts of toilet paper** cause sludge to build up faster.
- ▶ **Treated toilet paper**, such as the type that contains lotion, does not settle well and forms a thick layer of scum at the top of the tank.
- ▶ **Other paper products**, such as wet wipes, should not enter the system.
- ▶ **Flushable cleaning products**, many wipes and toilet cleaning materials are labeled as “septic safe.” This statement typically refers to their ability to flow through the piping. These items will collect in the treatment system and increase the need for maintenance.
- ▶ **Trash and nondigestible material** increase the amount of maintenance required and may even shorten the life of the components. Examples are rags, toys, diapers, condoms, cat litter, plastic bags, coffee grounds, cigarette filters, and feminine hygiene products. Many of these items have neutral buoyancy and will pass through the treatment components. Cat litter and coffee grounds add to the sludge that must be pumped out during maintenance. Diapers must be removed individually.

Make a list of the cleaning and antibacterial products used in your home. When using these products, keep in mind that they can have a cumulative effect on the treatment system. If something will harm the microbes in the system, do not send it down the drain.

### ***Returning after vacation***

A vacation or extended absence develops a condition of limited food supply in the wastewater treatment system. The microbial population is reduced, which also reduces treatment once the vacationer returns and wastewater addition resumes. Therefore, the wastewater loading should be increased gradually for the first couple of days, which allows the microbial population to grow. Avoid greater than average water

usage such as excessive laundry, which can result in lower quality water passing through the system.

### ***Preventing rainwater from overloading the system***

An onsite wastewater treatment system is designed to handle a specific volume of wastewater. If rainwater enters the system, the proper operation can be disrupted.

Water collecting over the components can leak into them. Also, the tanks are installed in an excavation that is backfilled with material that can collect water. If the system is not watertight, the collected water can enter the system and flush sewage through the treatment system and into the yard.

Evaluate these conditions to determine whether rainfall may be affecting the system:

- ▶ Look at the ground over the tanks to see if a depression has developed where rainwater could accumulate. Rainwater infiltrating the system can overload the treatment components.
- ▶ Evaluate the color and growth of grass around the tank. Excessive growth and darker green color than the other grass in the yard indicates that the tank or piping is broken.
- ▶ If the tank has a riser, verify that it is in good condition and properly sealed to prevent infiltration.
- ▶ Check the inside of the riser/tank seams for stains that would indicate that groundwater or surface water is entering the tank.
- ▶ Evaluate the system performance during rainy periods: Rainwater may be infiltrating the system if there is an unexplained number of dosing cycles or water flow and/or if the spray distribution system is spraying during a rain shower.

### ***Protecting your family and pets***

An onsite wastewater treatment system is treating sewage using containers to hold the wastewater, microbes to remove contaminants, electrical components to move air and water and sense water levels, electricity to power the electrical components, and chlorine/UV radiation to disinfect the wastewater. By their nature, these parts and components pose a risk to public health, environmental health, public

safety, and pet safety. If the system components are in areas often visited by your pets and family, greater attention is needed when selecting treatment system components, implementing component safeguards, keeping chlorine disinfectant in the unit, and keeping the components functioning properly, which may include upgrading existing systems.

Reduce these risks by limiting access to these components. Safety practices include installing fencing for components, risers with heavy concrete lids, lighter lids with safety screws, lighter lids with locking mechanisms, lighter lids with internal restrictions to access, and control panels with screws and/or locks.

Use products only in accordance with the instructions on their labels. As the system owner, you are responsible for following these safety practices.

## **Troubleshooting**

Troubleshooting involves identifying and correcting sources of system breakdown. If a component is found to be inoperable during an inspection, troubleshooting is often required to bring it back into operation. Contact a trained professional maintenance provider to identify and fix the problem.

## **For more information**

A comprehensive guide for homeowners, *Checking My Aerobic System: General Guidance for Monitoring Aerobic Treatment Units, Disinfection Units, and Spray Fields in Texas*, is available at the Texas AgriLife Extension Service Bookstore at <https://agrillifebookstore.org>. Also available at that site is *Onsite Wastewater Treatment Systems: Responding to Power Outages and Floods*.



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