



On-site wastewater treatment systems

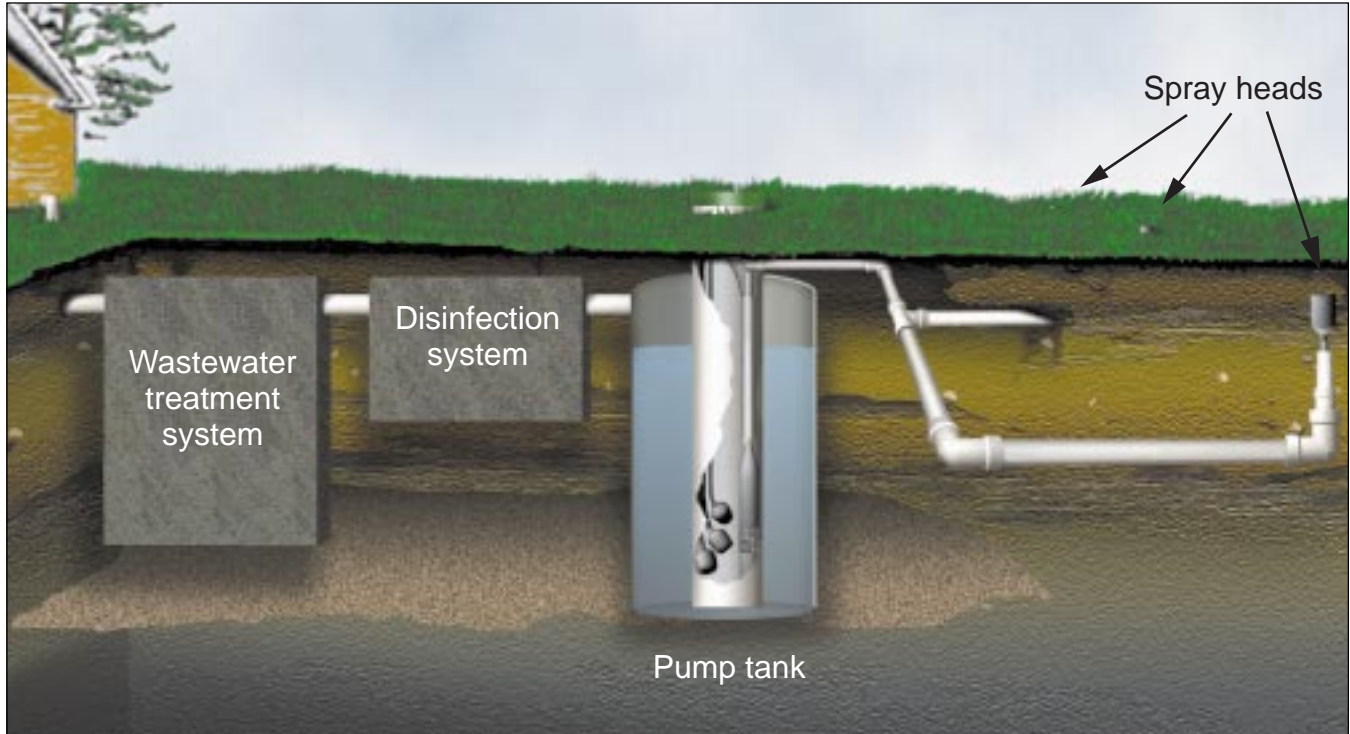


Figure 1: A spray distribution system with treatment and disinfection devices.

Spray distribution system

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Spray distribution systems for wastewater are much like lawn sprinkler systems. They spray treated wastewater over the surface of a yard. Spray distribution systems can be used in all areas of the state and in all soil conditions, and they are the least expensive to install of all wastewater distribution systems. However, they require the most wastewater treatment, which increases the cost of a complete treatment

and land application system. Spray systems also help conserve Texas' freshwater supply by reusing wastewater for the landscape.

Spray distribution systems have four main components:

- ✓ A wastewater treatment

system, an advanced process that purifies wastewater by removing solids and organic matter;

- ✓ A disinfection system, which removes pathogens (disease-causing organisms) from the wastewater. Chlorination is the most common disinfection method;

- ✓ A pump tank, which collects and holds the water until it is sprayed over the landscape; and

- ✓ Spray heads, which are placed in the landscape to distribute the water uniformly on the ground surface.

Because of the potential for human contact with wastewater, a spray system must treat the wastewater to a very high quality before spraying it onto the landscape. This system must treat the wastewater to a "secondary-quality effluent," which means that it must remove 85 to 98

percent of the solids and organic matter. It also must disinfect the wastewater to remove pathogens.

Plants use the water after it is sprayed onto the soil surface. However, state regulations require that each system be designed to handle the most amount of wastewater expected from that household or business, and to be able to handle it during the wettest season of the year without it flowing onto neighboring properties. Therefore, in the dry times of the year, there won't be enough wastewater to meet all the water requirements of the vegetation. Landscapes that require much water will need supplemental watering.

Treatment

Wastewater must be treated to lower its biochemical oxygen demand to less than 20 parts per million (ppm) and its total suspended solids concentration to less than 30 ppm. To make sure the pathogens are all killed, the chlorine level in the pump tank must be at least 1 ppm, or a fecal coliform test must find no living organisms.

Although the wastewater is relatively clean when it meets these standards, it still contains such nutrients as nitrogen and phosphorus. Some advanced treatment systems may remove these nutrients also.

Two treatment processes are readily accepted as providing this quality of effluent: Class I aerobic treatment units, and intermittent sand filters. Both are aerobic (using oxygen) treatment processes. The Texas Natural Resource Conservation Commission keeps a list of Class I aerobic treatment units approved for use in Texas.

Intermittent sand filters must be designed to match the site conditions, and they are approved based on the design for your site. Other types of treatment processes used with surface distribution systems are considered nonstandard and must be designed by a registered professional engineer.

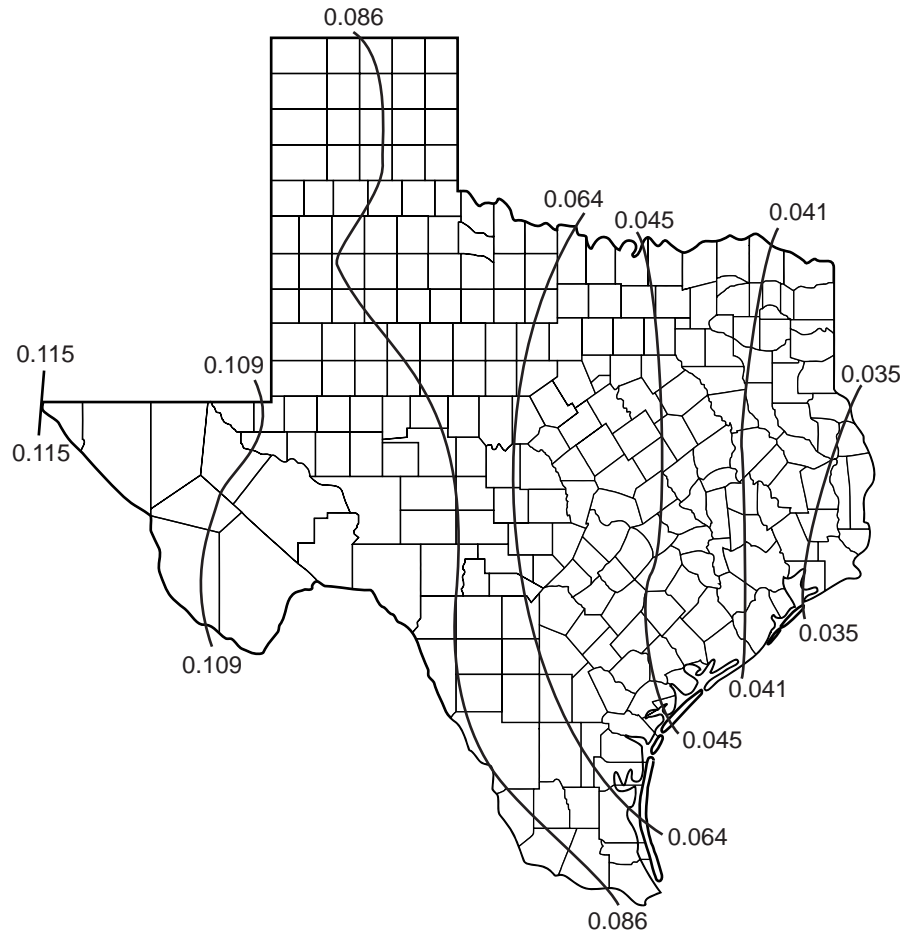


Figure 2: Maximum number of gallons of treated wastewater that can be distributed per square foot per day by spray distribution systems in the various regions of Texas.

Wastewater is usually disinfected with chlorine, which kills pathogens. The most common type of chlorinator is a tablet chlorinator, which stores chlorine tablets in a tube that exposes the bottom tablet to the wastewater. As the bottom tablet dissolves into the wastewater, the upper tablets push down on it until it dissolves completely and the next tablet begins dissolving. Although these tablets look like the ones used for swimming pools, the system can use only those approved for wastewater disinfection.

Other types of disinfection methods, ultraviolet light and ozonation, are seldom used on single-family systems. These methods are more complex and cost more than chlorine disinfection systems.

However, ultraviolet light is the same as sunlight. Sunlight also helps to ensure disinfection of the wastewater sprayed on the landscape systems.

Spray distribution systems rely on the soil for final wastewater treatment. The soil must be able to support vegetation that uses the nutrients in the wastewater. Plants use the nitrogen and phosphorus in the wastewater, preventing those nutrients from leaching to groundwater or flowing into surface water supplies.

Design

Spray distribution systems generally require the most surface area of any distribution system dispersing wastewater to the soil.

They need the space because they are designed so that all the wastewater evaporates or is used by vegetation. They are designed to prevent water from percolating deeply into the soil.

The amount of wastewater a spray system is permitted to distribute varies in the different regions of Texas (Figure 2). The rate allowed is measured in gallons of wastewater applied per square foot of soil surface area per day (g/ft²d). The rate is lowest in the eastern part of Texas (0.035 g/ft²d) and increases as you move to the far west (0.115 g/ft²d).

In choosing a system for your home, first estimate the maximum amount of wastewater the system will be expected to handle per day. Then determine the spray application rate approved for your location (Figure 2).

To calculate the amount of space you will need to distribute the wastewater (spray area), divide the maximum daily flow by the spray application rate.

The next step is to choose a site for the spray system. The best site has a land area that is fairly continuous and allows good distribution of the water. If your site is small and has several buildings, your spray system will be more complex and may require different components. The spray pattern may overlap on a small part of the system. However, when you calculate the spray system's surface area to meet the amount of space required by the state, you cannot double-count the area receiving water from multiple sprays.

Take these steps to minimize the risk of the wastewater being carried by air onto neighboring property:

- ✓ Make sure the spray heads used in the system have a "low-angle" nozzle to keep the wastewater close to the ground.

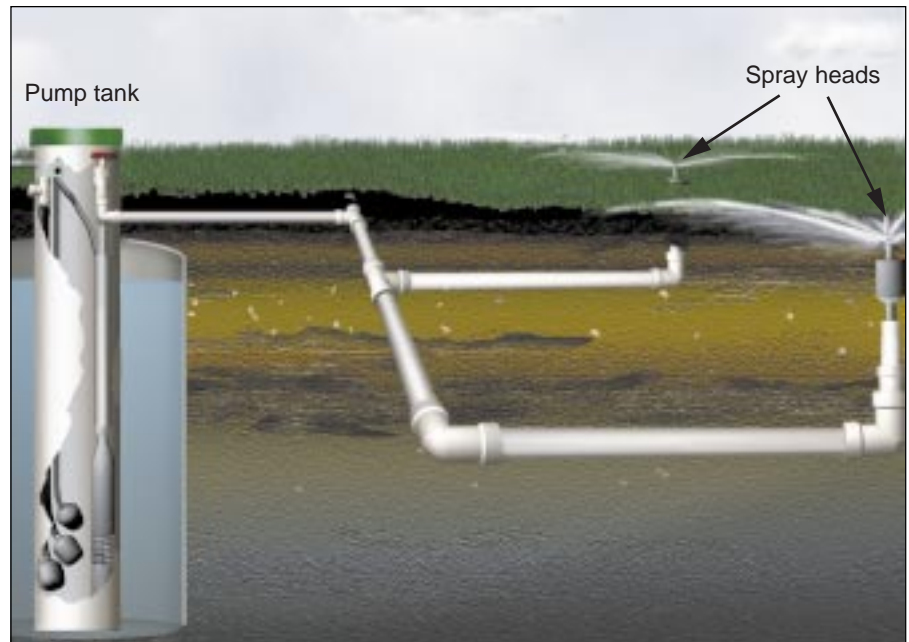


Figure 3: A spray distribution system.

- ✓ Operate the spray heads at a pressure of less than 40 pounds per square inch (psi) to prevent the water droplets from becoming too small and drifting by air off your property.

How to keep it working

To perform well, spray systems require proper operation and maintenance. They must clean the wastewater to a secondary-quality effluent. Check the operation and maintenance requirements for your particular type of treatment system, and work with the maintenance provider to ensure that the system is functioning properly. These guidelines will help you keep it working:

- ✓ Keep the disinfection system functioning. For systems with chlorinators, place chlorine tablets into the chlorinator regularly — probably once a month.

- ✓ Have the pump tank pumped out periodically. This task is usually performed when the treatment system is serviced, probably every 2 to 3 years.

- ✓ Maintain the spray heads. Occasionally, they can be damaged during lawn mowing or landscape maintenance. If you must replace a spray head, make sure the new one works the same as the original. A different kind of spray head may have a different spray pattern, resulting in an inappropriate system.

- ✓ Do not move the spray heads around after installation. Changing the spray head locations may result in the water not being distributed over the required area.

- ✓ Because the spray application rate is based on the season of the year with the lowest evaporation and transpiration (movement of water through plants to the atmosphere) rates, you may need to water the plants during dryer months.

- ✓ Do not plant a garden in the spray area. State regulations prohibit the water from being used on a vegetable garden.

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