

Keeping On-lot Wastewater Systems Healthy

Education and guidance for homeowners with on-lot wastewater disposal systems about how to keep their systems healthy.

For most people living in rural areas, collection, treatment, and disposal of sewage must be accomplished on site. On-lot sewage systems typically consist of a treatment tank and a soil absorption area. The treatment tank removes and partially biodegrades solids while the soil under the absorption area absorbs and renovates the treatment tank effluent. Figure 1 shows a typical on-lot sewage system.

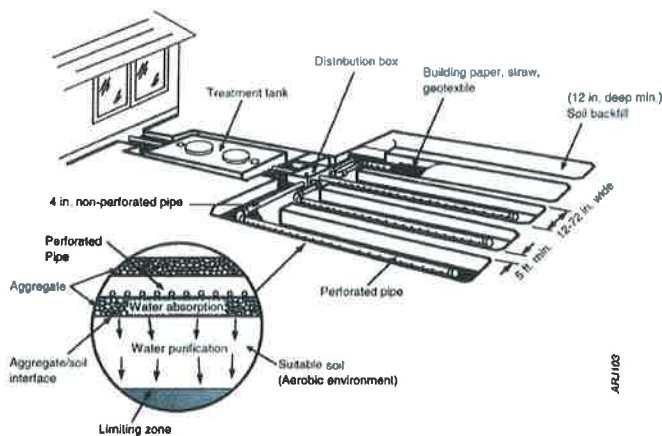


Figure 1. Typical on-lot sewage system

Why On-lot Systems Perform Unsatisfactorily

Properly designed and installed on-lot sewage systems provide adequate treatment and disposal of liquid household wastes. In spite of the efforts of regulators, designers, and installers to properly design and install these systems, on-lot systems may not perform satisfactorily.

Note: See your Sewage Enforcement Officer (SEO) before redesigning or altering your on-lot sewage system

An unsatisfactorily performing on-lot system can result in sewage backed up into the household, untreated sewage emerging at the land surface and/or groundwater degradation.

Although groundwater degradation is seldom visible, it is important since nearby wells (including the homeowner's) and streams can become contaminated.

Assuming your on-lot system was properly sited, designed and installed, unsatisfactory performance of on-lot sewage systems occurs for one of four reasons: faulty installation, hydraulic overloading, biological overloading, or lack of maintenance. This fact sheet discusses each type of system breakdown and suggests potential remedies for keeping your on-lot system healthy.

Poor Installation Practices

If your on-lot system is properly selected, located, sized and designed, there are still several poor installation practices that can eventually lead to unsatisfactory performance of your on-lot system.

The most common of these is to let construction equipment drive on the absorption surface. In addition, heavy equipment should never be driven over the completed absorption area. This equipment can compact the absorption surface, compact the absorption area, or break pipes within the aggregate layer.

These compaction problems are most often associated with the construction of large seepage beds, where it is difficult for equipment to excavate to the center of the bed without driving on the bed itself. The presence of heavy construction equipment moving on this absorption surface can destroy the natural soil structure, thus reducing the soil's ability to absorb the effluent. This is particularly true when the soil is wet enough to form a ribbon between thumb and forefinger. If seepage beds and the associated piping are not installed level, water will not be distributed uniformly over the absorption area.

Finally, surface runoff water must be diverted away from the absorption area. Remember, the system was designed to absorb the household wastewater not an additional volume of surface water.



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Hydraulic and Biological Overloading

Absorption areas often become unable to absorb the wastewater into the soil because (1) the soil's permeability is too low (Hydraulic Overloading), or (2) the aggregate-soil interface at the bottom of the absorption area becomes clogged due to the development of a slime layer created as a result of persistent wet (anaerobic) conditions in the absorption area (Biological Overloading).

Hydraulic Overloading

Hydraulic overloading arises when water usage in the home exceeds the parameters used in the design of the absorption area. Before most on-lot systems are constructed, a percolation test (Perc Test) must be conducted to determine how fast the local soils can infiltrate or absorb water.

From these Perc Test results and the number of bedrooms in the home, the minimum dimensions of the absorption area are determined. This ensures that as long as the flow from your house does not exceed its daily design flow (400 gallons for a three bedroom home) the soil should absorb the effluent distributed to the absorption area from the treatment tank.

There are several ways this water balance can be disturbed. The most common is that some people use more water than expected. Typical conditions that can cause excessive water use are facilities like swimming pools, hot tubs, and parties where large numbers of people gather. It is the extra water use associated with those using the facilities, especially in the toilets that overload the on-lot system. Hydraulic overloads caused by excessive water use are actually quite common. Any water conservation activities/practices that can be implemented in the home will reduce the chances of excessive water use.

Biological Overloading

Biological overloading is the development of an impermeable anaerobic slime layer on the aggregate-soil interface within the absorption area. In many homes about 80% of all daily water usage occurs during the early morning "get-up-and-get-to-work/school period" and during the evening "eat-dinner-get-ready-for-bed period".

Because these two heavy water-use periods are separated by 8 to 12 hours, each of these large volumes of water enter the on-lot absorption area where they have 8 to 12 hours to infiltrate into the soil. These periods of relatively large water usage separated by periods of low water usage usually produce a desirable flow cycling to the absorption area that generally uniformly distributes the wastewater over the absorption area but still gives adequate time for the soil to absorb the water.

There are, however, many homes where water is discharged to the on-lot sewage system at a slower, more uniform rate that often extends over much of the day. In these homes the toilet is flushed, and then a few minutes later the shower is used. A half-hour later teeth are brushed. An hour later a load of

laundry is started. The afternoon will bring more toilet flushes, cleaning, and cooking. After dinner, there is the dishwasher to run, get the kids ready for bed with baths and more toilet flushes and finally, if everyone actually goes to bed at once the absorption area may get a much needed rest.

If we think about what these small, but persistent water uses within the home mean to the absorption area, you should be able to visualize many small flows of wastewater entering and leaving the treatment tank. The water leaving the treatment tank flows to the absorption area where it constantly dribbles out of the first few holes in the distribution pipes causing a constantly wet zone near the beginning of every trench or the bed. This is especially true in homes with older gravity distribution systems. This constantly wet condition will eventually lead to the development of an anaerobic microbial condition in the trench or bed, the by-products of which are a nearly impermeable slime layer on the aggregate-soil interface at the bottom of the trench or bed.

Research at Penn State and other places has shown that when this slime layer develops the only practical way to remove it is to turn off the water and shut down the on-lot sewage system. Yes, it's time to give your system a long rest. When your on-lot sewage system begins to give you trouble, it's time for two things; first is to have the treatment tank pumped, and second is to find a way, such as a family vacation, that will reduce water usage in the home to zero. A few days may not be long enough, but a week or two, or better yet three or four weeks have been shown to yield great recovery of these biologically overloaded absorption areas.

Actually, you should be having your septic tank pumped every two to three years regardless of whether your on-lot sewage system is giving you problems or not. Penn State Extension Fact Sheet "Septic Tank Pumping" F-161 will give further guidance on this topic, but a pertinent suggestion is to have your septic tank pumped every two years. This will limit the build-up of solids in the septic tank, see Figure 2. When solids get too deep in the septic tank, they can be carried to the absorption area with the septic tank effluent. These additional solids and higher-than-usual carbon content enhance the anaerobic slime layer development in the absorption area.

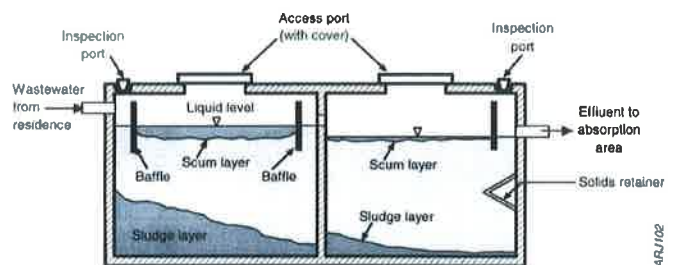


Figure 2. Cross-section of a typical two-chamber septic tank

"How do you get rid of the slime layer?" This is where the septic tank pumping and system resting come to the rescue. The goal here is to create the greatest opportunity for the absorption area to be drained of all the free standing water, for the soil at the aggregate-soil interface to become as dry as possible, and to create an aerobic biological environment in

the absorption area so the slime layer will decompose and return your absorption area to its former well-functioning state. Pumping the septic tank will not only remove all the water, sludge and scum from the septic tank, but also should permit water ponded in the absorption area to drain back into the septic tank where it too can be pumped and removed. The second part of this plan is to give your on-lot system a long rest; a long family vacation works well. A two- or three- week vacation would be great if you can do it. A week or 10 days will help, but not as much as several weeks. If this vacation can be planned for the driest time of the year, it will even yield greater benefits.

The point is that you do not need to wait until your on-lot sewage system shows signs of failure before you implement this plan. Recommendation: have your septic tank pumped the day before you leave for vacation every other summer.

Regular Maintenance

Septic tank-soil absorption systems were never intended for a lifetime of use without maintenance. Neglecting to maintain your on-lot sewage system can lead to unsatisfactory performance.

The most important maintenance issue is having your septic tank pumped every two to three years. See the section above for details about this issue. Chemical or biological additives are not recommended. In addition to solids buildup in the tank, baffles at the inlet and outlet pipe can deteriorate and even drop into the tank. Without the baffles, sewage can short circuit the tank or scum and solids can enter and clog the absorption area.

Failures can also occur in a maintenance-neglected absorption area. Deep-rooted plants and trees should never be planted over or near an absorption area. Roots, seeking oxygen, may find and enter the distribution lines and clog them.

Never put anything into your on-lot system or do anything to it that might decrease its effectiveness. Garbage disposals introduce very high carbon loads to the system and should not be used, or at least severely curtailed in homes with on-lot systems. Never place harsh chemicals, such as bleach, lye, latex paint, and sodium hydroxide into your septic system, see list below.

Finally, never put non-biodegradable materials into your system. Products such as plastics, kitty litter, etc. only fill the tank faster, see list below.

Prevention and Cures for an Unsatisfactory System

With all the things that can go wrong in your system, you may be wondering what you can do to prevent problems from happening. Fortunately, a number of preventive and corrective measures can be undertaken to ensure that your septic system functions properly. Here are several reminders:

Safety Note: Never enter a septic tank. The gases contained therein can kill you.

- Take every opportunity to conserve water in the home.
- Have your septic tank pumped the day before you leave for vacation every other summer.
- Do not use, or at least severely curtail, the use of a garbage grinder in the home.
- Do not flush non-biodegradable wastes into the septic system, see list below.
- Do not add harsh chemical cleaners to your septic system, see list below.
- Do not plant deep-rooted plants or trees over or near the absorption area.

Materials that should not be introduced into your on-lot wastewater system

- Antifreeze
- Bandages
- Bleaches
- Bones
- Cigarettes
- Coffee Grounds
- Cotton
- Dental floss
- Disposable diapers
- Drugs/Medicines
- Egg Shells
- Fat, grease, or cooking oil
- Feminine hygiene products
- Fertilizer
- Food Scraps
- Furniture polishes
- Gasoline
- Gauze
- Glue
- Kitty litter
- Metal polish
- Motor oil
- Nail polish remover
- Paint, stains, thinners, varnishes
- Pesticides
- Pet wastes
- Photographic solutions
- Plumbing cleanings (Drain-O)
- Sanitary napkins

- Stones
- Wood

You can also have the system inspected by an experienced, certified professional. For a list of companies performing PSMA inspections in your area, contact:

[Pennsylvania Septage Management Association \(PSMA\)](#) P.O. Box 144 Bethlehem, PA 18016 Phone: 717-763-PSMA

For additional assistance contact your local Sewage Enforcement Officer or your Extension Educator.

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