



Home & Environment

Impacts of Additives on Septic System Performance

Brad D. Lee and Mark Coyne, Plant and Soil Sciences

Septic system additive vendors often market their products as necessities that improve septic system performance or repair failing systems. Rather than address specific products, this publication examines general categories of these additives. This publication also describes the treatment functions of septic systems and the available scientific data regarding the effectiveness of septic system additives.

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Treatment Functions of Septic Systems

Septic tanks have several important functions, including:

- **Removing oils, fats, and settleable solids.** Septic tanks are designed to provide calm conditions over time to allow settleable solids to sink to the bottom of the tank (sludge) and floatable solids (scum—e.g., oils and fats) to rise to the surface (see Figure 1). The result is a middle layer of relatively clarified effluent that exits the tank and enters the soil treatment area.
- **Storing settleable and floatable material.** Tanks are generously sized according to projected wastewater flow and composition in order to accumulate sludge and scum at the bottom and top of the tank, respectively. To maintain optimum performance, accumulated sludge and scum layers must be removed at frequent intervals, depending on accumulation rates. Most residences

require pumping every three to five years.

- **Digesting/decomposing organic matter.** In an anaerobic environment (without oxygen), bacteria reduce most organic matter to soluble compounds and gasses, including hydrogen (H_2), carbon dioxide (CO_2), ammonia (NH_3), hydrogen sulfide (H_2S), and methane (CH_4). This process significantly reduces the volume of sludge that accumulates in the tank and reduces the reactivity (BOD) of the clarified effluent as it enters the soil treatment area.

Soil treatment areas also have important functions, including:

- **Absorbing and dispersing wastewater.** In a typical home, each person produces 50 to 90 gallons of wastewater every day, depending on water use habits and water use efficiency of fixtures and appliances. In a properly operating system, the soil absorption field accepts septic tank effluent at the same rate it is generated in the home.

Properly functioning septic systems should not produce odors in or outside the home

- **Removing contaminants from wastewater.** Soil provides the final stage in treatment. It must effectively treat wastewater effluent through chemical, physical, and biological processes.
- Chemical treatment in the soil involves the interactions of contaminants with soil mineral surfaces. For example, phosphate, which is common in household wastewater, is readily adsorbed to the surfaces of soil minerals and does not migrate to groundwater easily.
- Physical treatment of wastewater in the soil relies on the soil fabric—the organization of minerals and pore space. Contaminants and solids in wastewater effluent are trapped in the pore space between soil particles much like a filter traps contaminants.
- Biological treatment occurs as microorganisms in the soil feed on and degrade organic contaminants in the effluent, effectively removing them from wastewater.

Types of Additives and Effects on Treatment Processes

Three general categories of septic system additives are typically marketed to consumers.

- **Biological additives.** Composed of bacteria and extracellular enzymes mixed with surfactants or nutrient solutions, products in this category of additives do not significantly enhance normal biological decomposition processes in the septic tank. However, some have been found to degrade or dissipate septic tank scum and sludge.
- Human waste is already nutrient rich and contains abundant bacteria that are remarkably resilient, diverse, and adapted to anaerobic environments. **There is no need to supplement the bacteria supply in a septic tank.**
- **Odor control additives.** Products in this category contain formaldehyde, paraformaldehyde, quaternary ammonia, and zinc sulfate. They are advertised to control septic odors by killing bacteria, but this objective is counter to the purpose and function of septic tanks (which rely on bacteria to decompose the solids and contaminants in wastewater).

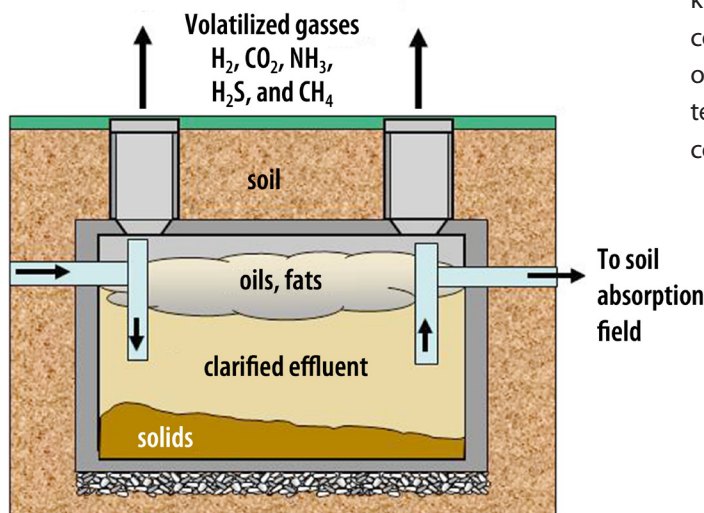


Figure 1. Degradation of solids in waste products results in gas production including hydrogen (H_2), carbon dioxide (CO_2), ammonia (NH_3), hydrogen sulfide (H_2S), and methane (CH_4). The remaining solids separate in the tank into those less dense than water (oils and fats) and those heavier than water (poorly degradable solids). In an airtight septic tank the gasses are released to the atmosphere through the sewer vent system that is integrated into the home (not shown) or to the soil treatment area, where they diffuse through the soil before entering the atmosphere. If the septic tank is not airtight, the gasses can vent through the access ports.

Additives have little positive effect on septic system performance, and in some cases may actually be harmful.

- If odors are a concern, then the odor's source should be investigated. Odors can result from sewage surfacing in the absorption field area, a ruptured sewer line, a plumbing vent problem in the home, or some other, usually correctable, problem. Properly functioning septic systems should not produce odors in or outside the home.
- **Solid reducing additives.** Known as "flocculants," companies market these products as a way to reduce the concentration of suspended solids in septic tank effluent. Theoretically, the clumping and settling of suspended solids results in cleaner effluent discharges into the soil treatment area.
- Research has not conclusively demonstrated the value of septic tank flocculants. It may be that extremely large, uneconomical doses of such products are required to make a significant difference.
- Properly sized septic tanks allow for adequate retention time and help reduce suspended solids. Septic tank effluent screens installed at the septic tank outlet can also be used to prevent suspended solids from entering the adsorption field.

Other Chemicals Found in Septic Tanks

Other chemicals are occasionally and inadvertently added to wastewater.

- **Inorganic compounds.** These chemicals usually contain strong acids or alkalis and are marketed as ways to rapidly open clogged drains. Popular commercial drain cleaners often contain ingredients such as sulfuric acid or lye.
- Occasional and minimal inorganic additive use will probably have little effect on septic systems. However, frequent use can adversely affect biological treatment and even result in structural damage to plumbing, septic tanks, and other treatment system components.
- **Organic solvents.** Products in this category often contain chlorinated hydrocarbons (such as methylene chloride or trichloroethylene) that are commonly used as degreasers. However, some organic solvents are mobile in soil environments and can contaminate groundwater and harm the biological wastewater treatment process.
- Organic solvents can destroy productive microorganisms in the treatment system. Disposing organic solvents in wastewater entering an onsite treatment system is banned in many states. If groundwater is contaminated, the homeowner may even be held liable for the damage.

Modifying User Habits

Additives have little positive effect on septic system performance, and in some cases may actually be harmful. These products can also be expensive. However, homeowners can inexpensively improve septic system performance with some useful habits.

- Minimize use of "every flush" or "automatic" toilet bowl cleaners. These products are often solid blocks dropped into the toilet's water reservoir or clipped to the rim of the bowl. These blocks dissolve slowly over several months, releasing bleach and other chemicals.
- Reduce the amount of hair, grease, and food particles that go down the drain by using a strainer.
- Use ecologically friendly products (e.g., baking soda, vinegar) as an alternative to chemical cleansers.
- Do not drain chlorine-treated water from swimming pools and hot tubs into septic systems. Chlorine is meant to kill bacteria in bathing water. It will also kill the helpful bacteria in a septic system.
- Never use the septic system to dispose of solvents, paints, antifreeze, and chemicals. Use local recycling and hazardous waste collection programs.

For more on practices that improve septic system performance, see the University of Kentucky Home and Environment website: <http://www.ca.uky.edu/enri/henv/>.

Summary

According to the Environmental Protection Agency, there are no conclusive studies to date that show significant benefits from septic system additives. Given the lack of conclusive studies and recent unbiased testing about the effects of septic system additives, our best advice remains to have septic tanks pumped every three to five years. Also, consider how the annual cost of additives could be better spent on improving your wastewater system.

For more information

Visit the Home and Environment webpage at www.ca.uky.edu/enri/henv.

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About the authors

Brad D. Lee, Water Quality Extension Specialist, Department of Plant and Soil Sciences

Mark Coyne, Professor, Soil Microbiology, Department of Plant and Soil Sciences