



Article 124

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Recirculating Sand Filters: An Alternative to Conventional Septic Systems

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Many water quality problems have been associated with residential septic systems, mostly as the result of poor siting or maintenance. However, even systems operating according to design may discharge excessive pollutant loads that can impact nearby waterbodies (see article 123). In coastal areas, this is often particularly true with nitrogen. As a result, efforts to develop systems which show the potential for improved nitrogen removal potential have been intensified. One residential system which shows promise is the small recirculating sand filter, used primarily in Anne Arundel County for the repair of failing conventional systems (Figure 1).

When used alone, sand filters nitrify septic tank effluent, increasing ground and surface water mobilization. This problem can be resolved if the nitrates are sent through an anaerobic environment rich in organic matter. Under such circumstances, denitrifying bacteria reduce nitrates to nitrogen gas, effectively reducing threats to water quality. Recirculating sand filters, which allow nitrified sand filter effluent to mix with organic-rich septic tank effluent, provide this needed denitrification service.

Traditional waterfront development has often occurred on small lots with high water tables that are now considered unsuitable for conventional septic systems and therefore conducive to their failure. Recirculating sand filter systems can be extremely useful in mitigating this problem; in addition to having denitrifying ability, the systems can be easily placed in areas with slowly permeable soils, inadequate unsaturated soil buffer zones, and/or insufficient room for a conventionally-sized soil absorption area. Some homeowners choose to

plant trees and shrubs around the exposed structure or use the wood top as a deck.

Typically, wastewater first enters a 1,500-gallon two-compartment septic tank and then flows to a 500-gallon pump chamber. With a two-compartment septic tank, the second compartment can be used as a denitrification chamber for the mixing of septic and sand filter effluents. It is also possible to use the first compartment of a two-compartment septic tank or a single compartment septic tank for denitrification. Limited observations of these systems have had results similar to the two-compartment design. Mixing and denitrification could also be accomplished in the pump chamber if it is of sufficient size.

It is recommended that a pump chamber of at least 500 gallons be used to permit the use of a timer. Holding capacity in the pump chamber makes it possible to store wastewater surges and dose the sand filter in brief intervals throughout the entire day. A low-level float ensures that the pump does not run dry and a high-water level alarm is used to signal the homeowner that either an abnormally high volume of water is being pumped or there is a pump problem.

The pump then sends treated effluent to the sand filter (Figure 2a). The filter is built for free access and has only 45 ft² of surface area when used to treat the wastewater from a single family home. A 2,000-gallon center seamed concrete septic tank was selected as the sand filter container because it was readily available and could be placed completely out of the ground when necessary.

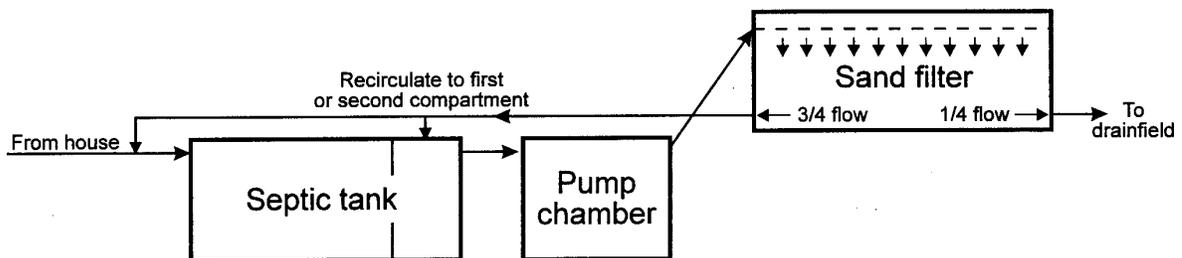


Figure 1: Schematic of a Recirculating Sand Filter