Peat Filters

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A peat filter pretreats septic tank effluent by filtering it through a two-foot-thick layer of sphagnum peat before sending it to the soil treatment system. Peat is partially decomposed organic material with a high water-holding capacity, large surface area, and chemical properties that make it very effective in treating wastewater. Unsterilized peat is also home to a number of different microorganisms, including bacteria, fungi, and tiny plants. All of these characteristics make peat a reactive and effective filter.

Figure 1. Peat installation at a research site near Duluth, Minnesota

In research conducted in Minnesota, peat filters removed high concentrations of nutrients (nitrogen and phosphorus) and produced a high-quality effluent with less than 30 mg/liter BOD (biological oxygen demand, a measure of organic material), less than 25 mg/liter TSS (total suspended solids), and less than 1,000 cfu/100ml fecal coliform bacteria, an indicator of pathogens and viruses.

The two main types of peat filters are modules and lined filters. Modules are manufactured plastic peat treatment cells (Figure 2). Lined peat filters (Figure 3) are built on site and usually lined with 30 mil polyvinyl chloride (PVC).

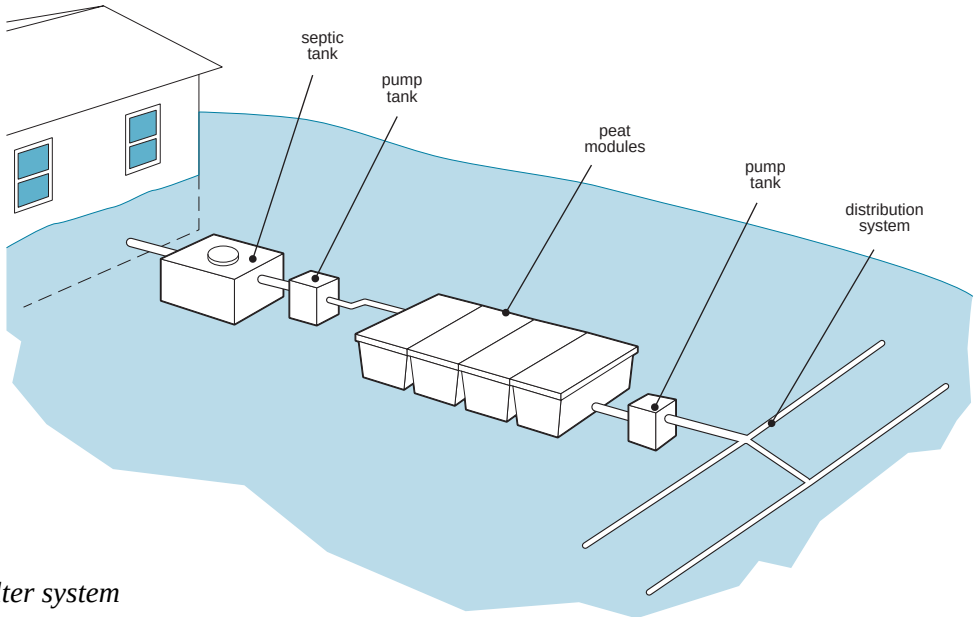

Figure 2. Modular peat filter system

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Peat Filter Application

Since wastewater leaving a peat filter system is a high-quality effluent, the soil in the trench or mound soil treatment system may be better able to accept it, and the system should last longer. Because peat filters produce cleaner wastewater, they are useful for sites with “disturbed” (compacted, cut, or filled) soil and for environmentally sensitive areas such as shoreland areas in shallow bedrock areas, aquifer recharge areas, and wellhead protection areas. Pretreatment may allow a reduction in the three-foot separation required between the bottom of the seepage trench of the soil treatment system and the limiting soil layer.

In locations with difficult access, such as small lots on lakeshores or in heavily wooded areas, modular peat filters may be easier to install than other systems.

How Do Peat Filters Work?

Wastewater flows from the home into a septic tank where the large solids settle out and the liquid flows into a pump tank. An effluent screen or filter is often installed to restrict smaller solids and grease from flowing out of the septic tank. The liquid effluent is then pumped to the peat filter, where it is pretreated and delivered to the soil treatment system for final treatment.

A peat filter has three components: the peat, a pressure distribution system, and a drain.

Wastewater must move through the peat under unsaturated conditions. The peat layer should be from 2 to 2.5 feet deep. Most of the peat used in Minnesota comes from the northern regions of the state. It is harvested from large natural beds and screened for consistency. Table 1 provides information about the consistency of the peat used in research conducted by the University of Minnesota. Bord na Mona brand modular filters use a coarser peat from Ireland. Systems using this coarser medium also provide excellent treatment.

With a gravity distribution system, wastewater may pond on top of the peat and compress it, reducing the flow of wastewater through the filter. With a pressure distribution system, wastewater is applied evenly over the peat surface, allowing rapid infiltration. Filters using pressure distribution are long-lasting and provide good treatment of wastewater.

The drain is a liner or module that holds the effluent inside the filter. The drain collects the effluent and delivers it to the soil treatment system. In a lined filter, the drain is a four-inch slotted PVC pipe surrounded by twelve inches of drainfield rock. The bottom of the filter slopes slightly (one inch in eight feet) to keep effluent from ponding. With a module peat filter, the drainage system is built into the module.

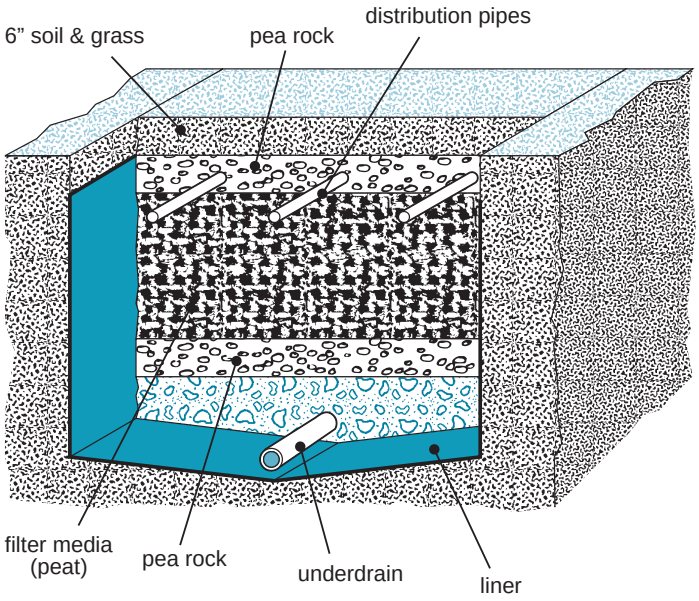

Figure 3. Lined peat filter cross section

Table 1. Physical Characterization of the Peat Used in U of MN Reserach

Sphagnum & Bryopsida	30%
Ligneous (woody)	30%
Herbaceous & Rootlets	5%
Charcoal	3%
Detritus	32%
Unrubbed Fiber Content	69%
Rubbed Fiber Content	42%
Coarse Fiber (8.5–15 mm)	34%
Medium Fiber (2.36–8.5 mm)	37%
Fine Fiber (<2.36 mm)	29%
Organic Content	88%
Ash Content	12%
pH (water)	4.4
pH (CaCl)	3.6
Moisture Content	60%

Designing a Peat Filter

In a modular peat filter system, the recommended design is one module per bedroom. For a constructed peat filter, the recommended size is 1 gallon/sq. ft./day.

To determine the design size of the filter, the volume of wastewater flow from the residence is divided by the loading rate. The length-to-width ratio is not as important as a distribution system that applies wastewater evenly to the filter surface at regular intervals. The use of a timer to spread the application out is recommended.

Final Disposal of Wastewater

Effluent leaving a peat filter is sent to a soil treatment system. Options for soil treatment systems include trenches, mounds, drip distribution systems, and linerless peat filters. A linerless or "bottomless" drain system, in which the effluent from the peat is allowed to drain directly into the soil, is shown in Figure 5.

The effluent is so "clean," a biomat layer does not form the way it does with effluent from septic tanks. A pressure distribution network is needed to apply effluent evenly throughout the system.

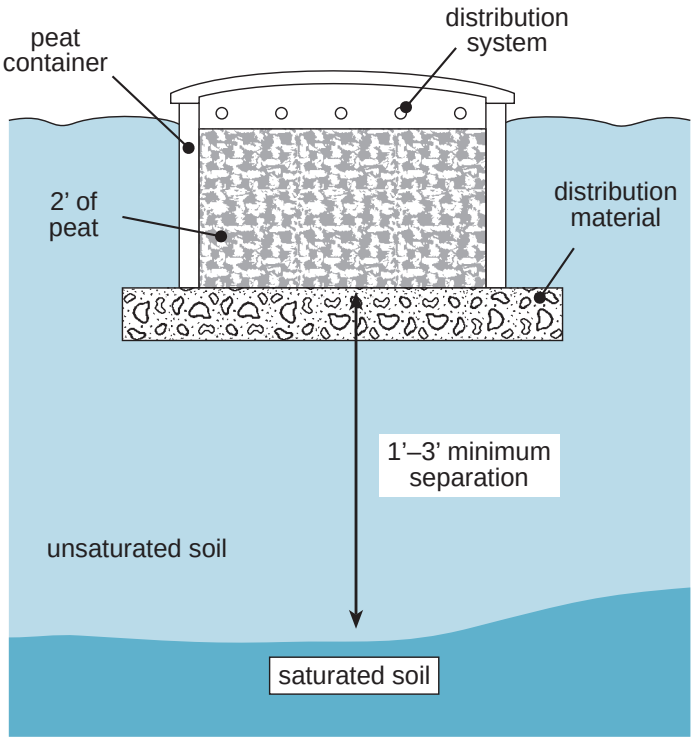

Figure 4. Bottomless peat filter

System Classification

Most soil treatment systems will last longer when treating effluent from a peat filter than when treating effluent from a conventional septic tank. These systems can be smaller than those designed to receive conventionally pretreated effluent. It also may be possible to reduce the vertical separation distance to the seasonal high water table or bedrock. Systems with these modifications are called "performance systems," and require local approval and an operating permit. The operating permit requires a monitoring and mitigation plan and the installation of a flow meter. Researchers in Minnesota, Wisconsin, and Pennsylvania are currently testing size reductions for soil systems using pretreated effluent, so the sizing requirements may be subject to change.

Operation and Maintenance

All routine operation and maintenance practices suggested for onsite treatment systems apply to peat filters. (See *Septic System Owner's Guide,* PC-06583, for details.)

Peat filters require more maintenance than conventional septic-tank-drainfield systems. A maintenance contract is strongly recommended. Depending on the local governmental unit requirements and the recommendations of the manufacturer, the system may require quarterly to yearly maintenance. Maintenance includes inspecting all components and cleaning and repairing when needed. The flow meter and timer should be checked to ensure that the right amount of effluent is being applied to the system. A visual inspection of the effluent is required, and a lab analysis of effluent is often necessary.

Because of the high organic content of peat, the filter media must be periodically replaced. This means physically removing the layer of peat when it has begun to decompose. Life expectancy of the peat media in a filter is estimated to be ten to fifteen years. The system should be designed to make it easy to remove and replace the peat. Module peat filters are easier to maintain than lined peat filters because they are open to the surface.

Daily running costs for a peat filter are based on the operation of a small submersible pump, and average less than one dollar per month for an individual home. Overall operational costs of $200–$500 per year include pumping, repairs, maintenance, and electricity.

Summary

Because of the unique treatment abilities of peat and its availability in the state, the peat filter appears to be a very promising method of treatment for Minnesota's wastewater.

Visit our Web site at www.bae.umn.edu/septic/ for additional information.

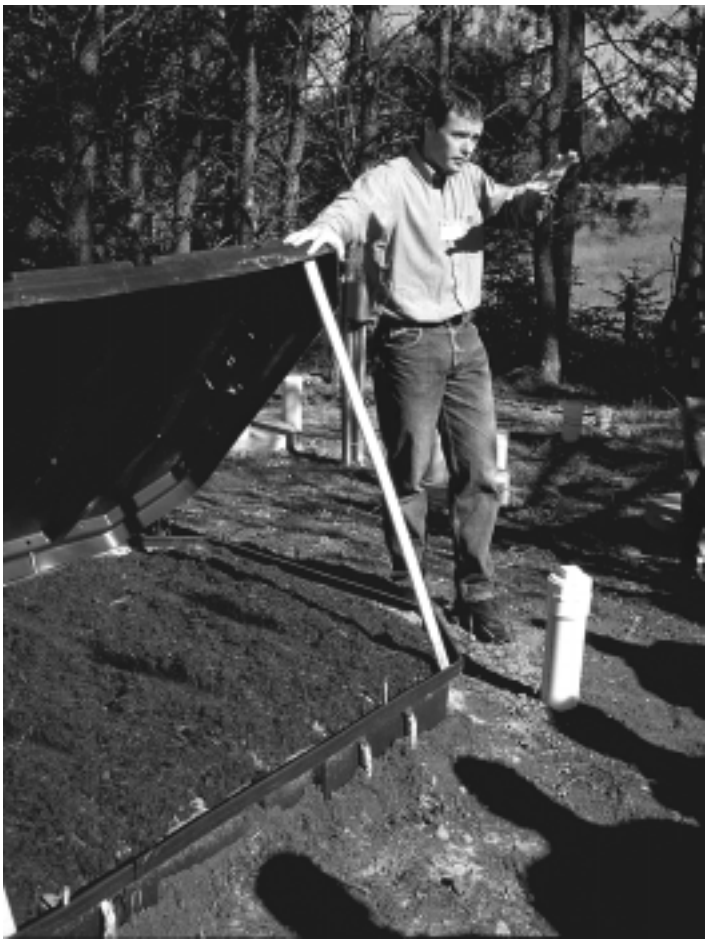

Figure 5. Peat module at research site near Duluth

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