Drip Distribution

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Drip distribution pumps pretreated wastewater to a soil treatment site where the wastewater provides nutrients and moisture for plants. The pretreated effluent "drips" out of tubing at regular intervals, allowing a small amount of wastewater to irrigate a large vegetative area. Topsoil with vegetation is an excellent environment because it maximizes the treatment of sewage and minimizes the risk of untreated water flowing quickly through the soil.

Drip Distribution Application

Drip distribution is often used in places where standard trenches are hard to install, such as steep slopes and forested areas. It is also used in places that only operate during the warmer months of the year, such as resorts and golf courses. Drip distribution systems are often used after a pretreatment system, such as an aerobic treatment unit or sand filter, is used.

How Does Drip Distribution Work?

The basic principles for drip distribution are the same as for other soil-based treatment systems: filtering and bacterial decomposition of waste. The difference is that a drip distribution system distributes the effluent evenly over a large area.

A drip distribution system has four main parts: a pretreatment device, a pump tank, a filtering/flushing device, and the distribution system.

The *pretreatment device* depends on the drip tubing and the manufacturer's recommendations. Some drip systems require advanced pretreatment, but others work with only a septic tank. All systems can plug without a good filtering device.

Figure 1. A drip site

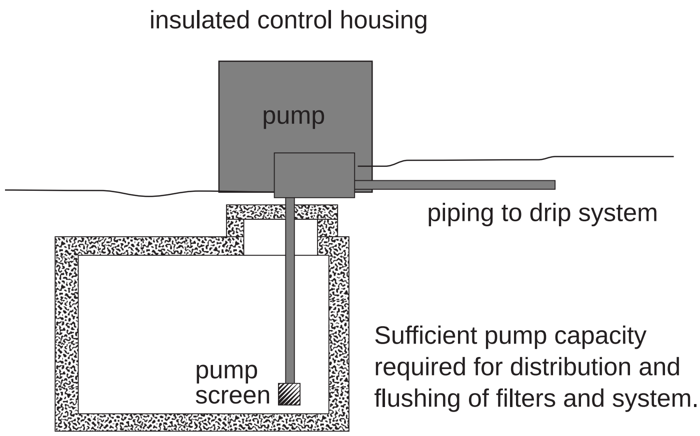

Figure 2. Pumping diagram

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The pump tank stores the water until the drip field is ready for a dose of effluent. A high head pump is needed for even application of the wastewater. Pump selection and installation follows typical onsite treatment system design practices.

The filters remove all particles larger than 100 microns from the effluent. Some filters have automatic cleaning systems. Flushing capacity and the total dynamic head are important design features that assure effluent passes through the emitters in the tubing. Even with excellent filtration, growth in the tubing can cause plugging. Flushing the system removes the growth and prevents plugging.

The most common types of filters are sand, disc, and spin. All three filters will function adequately with proper pretreatment so the designer and owner must weigh the advantages and disadvantages of each type.

- **Sand filters** are similar to swimming pool filters and are inexpensive and easy to maintain. On the down side, if sand particles make their way into the pump tank they can wear out the pump or escape the filter and plug the emitters.
- **Disc filters** were recently developed in Israel and use serrated discs as the filtering medium (Figure 3). They are more expensive than sand filters, but have fewer problems. The manufactured medium allows flexibility in waste strength and the filter maintenance can be completely automated with pressure gauges and control panels.
- **Spin filters** have a stainless steel screen that filters the effluent. The wastewater is forced through a directional nozzle plate onto the inside of the screen, creating a centrifugal action that rotates debris down the screen wall to a large debris-holding basin. Most are self-cleaning.

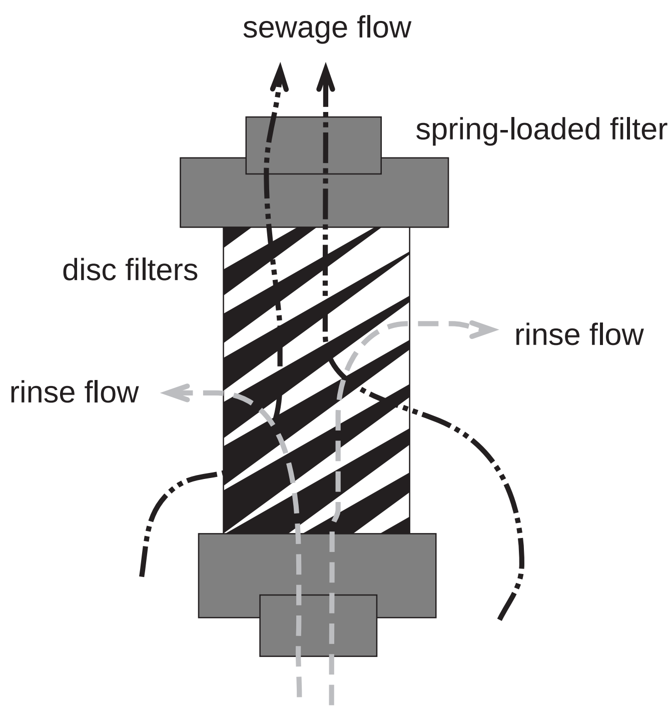

Figure 3. Disk filter

The distribution system includes the components that carry wastewater from the pump to the soil treatment area. It is the most complex part and has seen the most design changes in the last twenty years. At one end, the tubing is connected to the pump. Along its length, tiny orifices or emitters allow the wastewater to drip out into the soil. The tubing is generally $^1/_2$ inch in diameter with an emitter in the tubing wall (Figure 4). The pressure inside operates at 15–20 pounds per square inch. The collection manifold for the drip system connects back to the tank for flushing solids in the drip tubing.

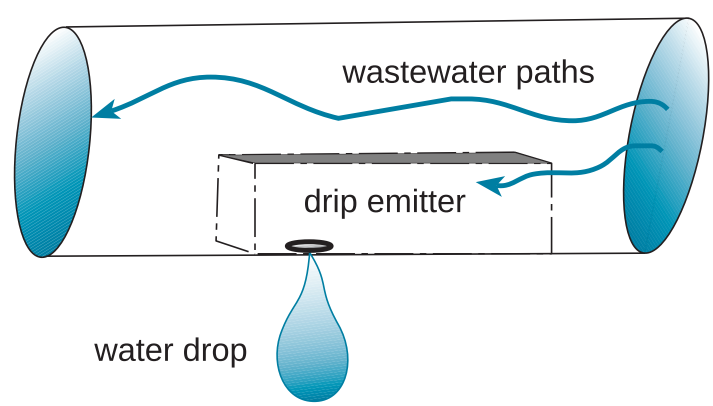

Figure 4. Drip tubing

Most problems occur in the tubing, including plugging of the tubes or the emitters by dissolved or suspended solids or roots. This results in uneven distribution of wastewater. Each brand of tubing is unique and tubing suppliers approach problems differently. System designers or operators should research tubing choices thoroughly before making a selection. Pressure compensating tubing is the easiest choice because it automatically increases the flow if an emitter starts to plug (Figure 5). It is also designed for systems installed on non-level sites, so even distribution is provided with no additional design requirements.

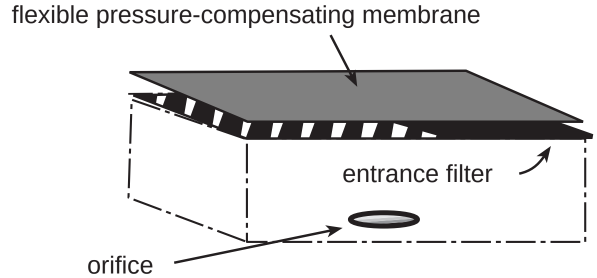

Figure 5. Pressure compensating drip emmitter

Designing Drip Systems

The sizing of drip distribution systems is based on the wastewater flow and the soil texture and structure. Manufacturers give a range of system sizes based on long-term soil acceptance rates. These values are similar to the design rates for soil treatment systems, but the area used is larger (since the goal is to maximize the surface area in contact with the effluent).

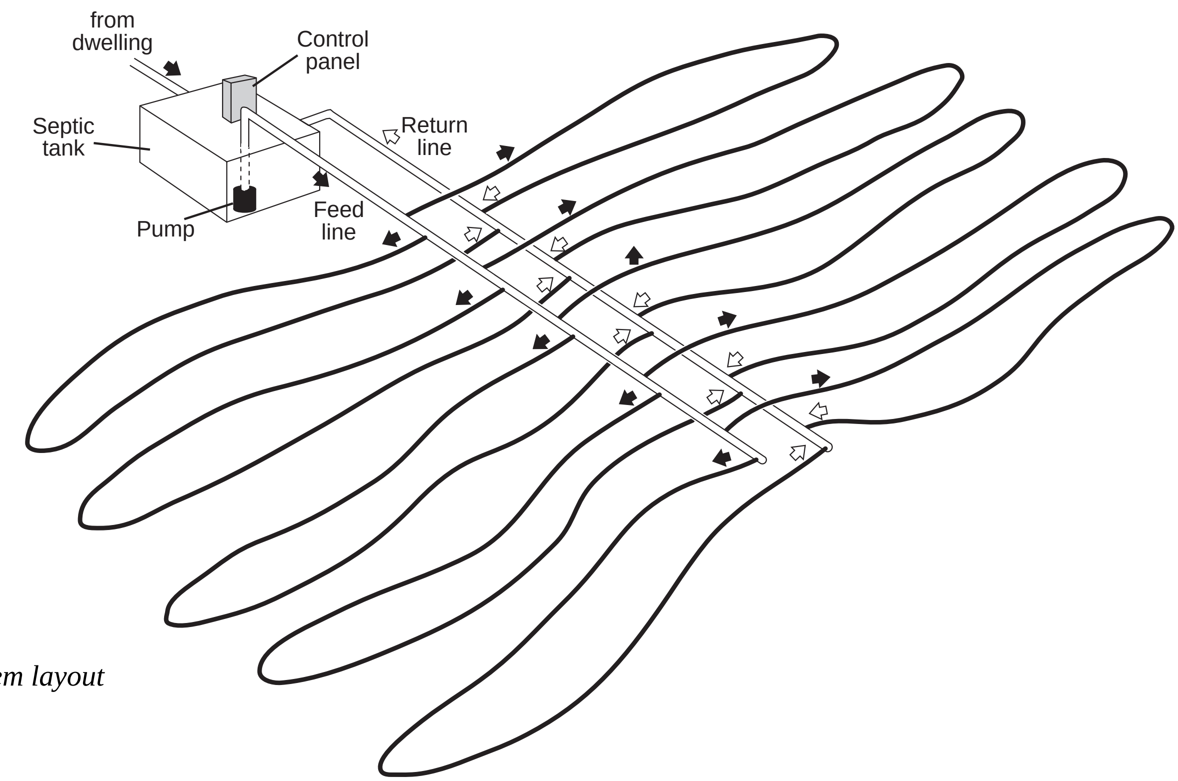

Figure 6. Drip system layout

Placement

Location of the system depends on soil conditions, including depth of soil to bedrock or zone of saturation, texture, and temperature. The tubing type dictates siting requirements. These may include equal length runs, a level distribution field, equal distance from the pump, and equal manifold heights. Pressure compensating tubing has the fewest siting restrictions; in particular, a level field is not required and the system-dosing controller allows for different lengths of tubing runs.

Since most product development occurs in warm climates, freezing can be a problem in cold climates. In the initial operation of a drip system near Duluth, Minnesota, parts of the system (most notably the filters) worked well in the winter, while other parts froze. The filter portion must be both well insulated and heated. Depth of placement is an important consideration. Systems used only during the summer (at camps) often have tubing placed six inches deep. A minimum depth of twelve inches is recommended for all other systems in Minnesota. A research site near Hastings had freezing problems attributed to compaction of snow cover by foot traffic over the area. Repeated walking or driving over the system reduces the insulating ability of the snow.

System Classification

There is debate about the necessary depth of separation from bedrock or saturated soil. Current Minnesota standards require three feet of separation for a standard soil treatment system. Use of drip distribution automatically makes this system a nonstandard system. If three feet of separation to the limiting layer are present below the tubing, the system is classified as "another system" and required to have a monitoring and mitigation plan and a flow meter installed. If three feet of separation does not exist, the system is classified as "performance" and only allowed by local governmental permitting agencies that have adopted performance standards. These systems must have a monitoring and mitigation plan, a flow meter, and an operating permit.

Figure 7. Installation of drip tubing

Maintenance and Operation

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

Maintenance should be done annually (or ideally, quarterly) and the entire system must be examined. First, pressure gauges should be checked for changes in pressure, which would signal clogging or leaks. Second, walking around the application area while the effluent is applied can uncover obvious leaks. Third, the air relief valve must be checked to make sure the unit is not wearing down or operating improperly. If the air relief valve malfunctions, soil particles can be sucked into the emitters and cause a problem that is very difficult to fix. The flow meter should be checked to measure actual wastewater application. This tells homeowners if the amount of effluent is above the design level. Finally, the tubing and filters may have to be flushed.

Daily running costs for drip distribution are based on the operation of a small submersible pump and average less than a dollar per month for an individual home. Maintenance costs range from $200–$500 per year, which includes a periodic pump-out of the septic tank, electricity, and maintenance visits.

Summary

Drip distribution can be an effective option in areas with forests or steep slopes, but must be properly designed, installed, and maintained. Particular care must be taken to prevent freezing.

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

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