As alternative onsite systems proliferate, as emphasis on management grows, more systems are using timers.

Timers allow onsite systems to operate over a wider range of sites and conditions. The timer control panel allows the operation of a pump based on common time instead of on-demand use. This allows dispersion of flow over the entire day, smoothing out peak flows that occur during the early morning and evening and reducing stress on the system.

Timed dosing helps the system operate more effectively and maximize treatment efficiency. Some technologies, like recirculating filters, require a timer because they are designed to be loaded independent of daily use patterns.

**Many options**

There are many makes and models of timers, but essentially there are two kinds: clocks and programmable logic controllers (PLCs). Clocks simply track time, and if you use them you will need two – one for the on function and one for the off function.

A PLC is actually a small computer and as such allows more flexibility. It gives more potential settings and makes it easier to capture data you can use to assess and manage the system. PLCs appear to be very stable and work in a wide range of situations.

When using a timer to accommodate the storage of surge flows generated by a typical home, the size of the pump tank should be about twice the daily flow. This allows for peak use to be evenly dosed through the day.

If you use a timer in a commercial setting, then the tank should be large enough to store any extended peaks that are of concern. This allows the soil treatment or dispersal area to be designed for less than peak flows, minimizing size and cost.

**Choosing the settings**

To be most effective, the timer should be set to deliver doses to the system that total 50 to 60 percent of the daily design flow. This level usually closely approximates actual water usage. The installation must include an alarm triggered by flows above the preset level. If the setting is not adequate, the timer can be reset.

On the other hand, when the system is on a site that limits the size of the dispersal area, the timer will be set at the design flow. In this case, the alarm identifies when the flows exceed the design value. Any such instance is significant, and repeated events will require the owner to take management steps to reduce the flow.

When setting a timer, the installer sets two specific times. The first is the time that the pump will operate to deliver the desired dose volume. The second is the pump off cycle. Timing is based on the number of times the pump will operate during the day.

The dose volume is based on three conditions:

- The total amount of effluent to be delivered to the system.
- The drain-back amount in the piping from the system to the tank.
- The desired dose volume.

The maximum dose volume should be no greater than a quarter of the daily flow. For example, if the design flow is 600 gpd, the maximum dose would be 150 gallons.

The minimum dose would be enough effluent to charge the distribution system four times. For example, if the distribution system consists of 1.5-inch pipes (0.11 gallons per foot of pipe) and there is 100 feet of pipe, the volume to charge would be 11 gallons. Four times the charge volume would total 44 gallons.

Four times the charge volume is nec-
necessary to operate the system because the first 11 gallons would simply fill the piping, and the last 11 gallons would gravity flow back out of the pipe after the pump shut down. The 22 gallons in between is the dose that is physically sprayed out of the pressure laterals.

For illustration
To understand this, consider an example. If the design flow for a system is 600 gpd, then the timer should be set to deliver a total of 300 to 400 gallons during the day. If we choose the 50 percent figure (300 gpd), and if the timer will turn on six times, the dose volume would be 50 gallons. This is greater than the minimum (44 gallons), but not a lot more – so six would be the maximum number of times for the pump to turn on.

If the timer is set to dose 50 gallons, the drainfield does not actually get a dose of 50 gallons because the water in the distribution pipe will drain back. If a check valve is used to prevent drain-back, then 50 gallons would be the proper setting, but for cold-weather applications it is necessary to allow the pipe to drain back.

The volume of the drain-back from the supply pipe is calculated by multiplying the length of pipe by the volume per foot. If 2-inch PVC pipe is used for this line and the distance is 100 feet, then the volume of drain-back in that pipe is 100 feet times 0.17 gallons per foot, or 17 gallons. The total dose volume then would be 50 gallons for the system, plus 17 gallons for the drain-back, or 67 gallons per dose.

Pump performance
The next step is to determine the amount of water the pump actually delivers. Some installers and designers like to do this at their desk. Each system and each pump is different, so the only way to know is to field test. First, a field test requires knowledge of the tank volume. Let’s assume the tank has a volume of 30 gallons per inch.

Next, we calculate the flow rate in gallons per minute delivered by the pump. To do this, we measure the level of the effluent in the tank, measuring down from the top of the riser to the surface of the water. Let’s assume the level is 60 inches. Now, we turn the pump on and measure the time. Suppose we run the pump for two minutes, and the effluent level drops to 63 inches from the top of the riser.

This means the liquid in the tank went down three inches in two minutes. If the tank holds 30 gallons per inch, and the level dropped three inches, the volume pumped is 90 gallons. Since the pump delivered 90 gallons in two minutes, the pump capacity in this system is 45 gpm.

If the timer system is to deliver 67 gallons per dose to the soil system, we next have to calculate how long the pump needs to run. To do this, we divide the dose volume by the pump capacity. In our example, 67 gallons divided by 45 gpm yields about 1.5 minutes.

Resting time
The next piece is setting the time off, or resting time, for the system. There are 1,440 minutes in a day. Since we said we would like the pump to turn on six times, 1,440 minutes divided by six doses works out to 240 minutes. To be more exact, we can subtract the 1.5 minutes during which the pump is on (delivering a dose) and set the off timer for 240 minutes minus 1.5 minutes, or 238.5 minutes. The timer is now set.

The floats inside the tank still need to be properly installed. There will be two or three floats in the tank. With a simple clock timer, there are two floats: the off float and the alarm float. The off float should be set right above the pump to keep it submerged. The second float is the alarm float. This float should never operate the pump – it should only be used for the alarm.

For more sophisticated PLC timers, we can use a peakable float. This float is typically set up at 50 percent of the tank volume, and the alarm float is set three to four inches above it.

This peakable float can change the flow to the system based on the flow peaks. For our example, it could change the resting time from 240 minutes to 120 minutes. This would mean the system now receives 600 gpd, or the design flow.

With this control option, the system can adjust to peak flows without tripping an alarm. If this happens with regularity, system efficiency and performance will suffer. Therefore, this method requires more frequent monitoring so the timer can be changed if necessary.