

SYSTEM DESIGN

By Stephen P. Dix, P.E.

Onsite Wastewater Treatment:

A Technological and Management Revolution: Part 2

Part 1 of this article details modern enhancements in septic tank design and introduces some innovations in leachfield design.

Scientific Validation

As performance data and research became increasingly available, the true efficiency of chamber systems as compared to traditional septic disposal methods became evident. Most areas have sizing reductions for chamber leachfield systems due to their increased efficiency as compared to stone. Chambers today are manufactured in various sizes ranging from 6" to 48" sidewalls and 15" to 48" widths. These models are accepted by the regulatory community at a sizing that reflects their performance at twice the infiltrative capacity of stone and pipe leachfields. Advances in chamber design have been market driven and directed by the regulatory community. Chamber models have been designed to be highly adaptable in response to leachfield trench sizing regulations, topographical issues and special applications. In addition, most chamber

manufacturers incorporate the use of recycled plastics in their chamber designs.

Advanced System Designs and Applications

In addition to the traditional use in septic system leaching trenches and beds, chambers have been used in a variety of applications. Chambers have been installed for use in sand filters, mound systems and in evapotranspiration beds. They also are used in conjunction with pretreatment devices, constructed wetland projects, agricultural wastewater runoff, stormwater detention/retention facilities and even on remediation sites.

Management Issues and Strategies

Increased understanding of how septic tanks work and the purpose and function of the equipment in the tank will result in better effluent treatment. However, ongoing maintenance is critical to retarding the failure of any onsite wastewater system. This essential element is key to the longevity of the system and poses a formi-

dable task to our industry. Establishing maintenance programs that receive public support and are cost effective is the major challenge in our industry today.

The Environmental Protection Agency's 1997 Report to Congress evaluates the potential of onsite systems to meet small community needs compared to the traditional sewered approach. Many consider this report a watershed for the onsite industry. Gone are the days when septic systems are considered temporary solutions until sewers arrive. While defining its cost effectiveness, the EPA identified management as a barrier to implementing this decentralized approach. This is particularly true as more advanced treatment systems are developed and operated in environmentally sensitive areas.

EPA's new *Guideline for Management of Onsite/Decentralized Wastewater Systems (2001)* gives more specific management recommendations to help officials in small communities develop management programs. EPA also is seeking proposals from



▲ The ultraviolet disinfection unit that receives effluent from a geotextile filter serving a development on Lake of the Ozarks is examined.

▶ George J. Gering, director of Public Water Supply District 2, adjusts the recirculating sand filter valve for a new cluster system serving 39 homes in Rolla, Mo.



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states to move this simple generic guidance into state supported programs that establish management requirements. States such as Illinois are very interested because more than 42 percent of its new homes are using advanced treatment plants with no requirement for long-term operation and maintenance. With a majority of the inventory of existing conventional septic systems now reaching their 30th birthday, upgrading, replacing and managing these systems will be a major focus of local government in the years to come.

The Future

The good life in rural America with larger lots and greater privacy is pushing the limits of soil-based systems. New technology is needed to provide more cost-effective solutions in areas previously considered unsuitable for septic systems. Tom Sinclair, founder of Perc Rite, pioneered this technology developing wastewater drip irrigation systems. The system uses thousands of feet of small diameter drip line with micro doses releasing effluent into the soil at a suitable rate. Soils previously considered unsuitable are now accepted and the system is no longer a disposal system but a valuable resource. Originally developed for agricultural use in extremely dry climates such as Israel, this system is designed to balance water uptake by vegetation. This is the ultimate evapotranspiration system since all the water can be effectively used. Surprisingly, the technology has migrated as far north as Minnesota to address development in areas with very shallow or tight clay soils.

A very prominent demonstration of this technology is the onsite wastewater management system at President Bush's Texas ranch. In addition to beneficial reuse of the wastewater, the President's system also collects stormwater. Both sources of

water are blended, stored and then fed to the landscape through the drip system. Water and nutrients are recycled for maximum beneficial reuse through this onsite soil-based technology.

This example illustrates how onsite technology has evolved over the last decade to become an advanced reuse system. What we also must realize is that by investing in the soil-based approach, we avoid the costly sewers that now pose a significant ongoing cost and potential threat to water quality in this country if a substantial investment is not made in their upgrade. EPA now estimates that the U.S. has a 23 billion-dollar gap in funding the maintenance of this infrastructure.

Boston is a community that has just completed its new system and it reflects the economic reality of the true cost of central sewers. Homes connected to this system pay more than \$1,000 a year for this service. While a septic system also must be maintained, the ongoing repair and upgrade is an individual responsibility. Adding a trench or replacing a leachfield is not cheap; however, the ongoing restoration practice places the onsite soil-based systems in the category of being sustainable.

As we move forward, the inventory of more than 25 million simple, cost-effective, gravity septic systems in the ground will dominate the day-to-day

activities of local health departments. Improved science will increase the level of comfort and willingness to use advanced decentralized systems that are professionally managed. Risk will be quantified and accepted by regulatory and management utilities as they apply new programs for the life cycle operation of these systems. Do not be surprised if the next home you buy comes with a contract for operation and maintenance. Operating permits likely will become the norm as onsite systems become long-term community solutions in your back yard.

The future of onsite technology is bright. Advanced systems will make onsite wastewater systems the option of choice for environmentally sound management for most non-urban development. At some point we may even wonder why any developer would consider using sewers anywhere but in high-density areas. With the ability to design systems that include the option of reuse for irrigation or stormwater drainage, onsite management will be poised to provide total water management that protects the environment for the future.

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For more information on this subject, circle 868 on the reader service card.

The Point Randall Resort at Lake of the Ozarks depends on a 10,000-gallon-per-day recirculating filter that uses a geotextile medium with UV disinfection. ▶

