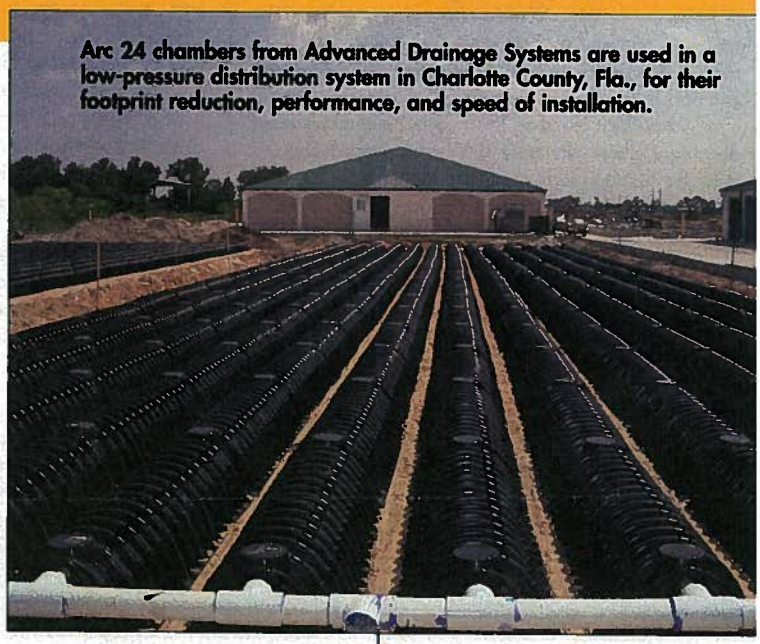
Moving Beyond Rock

Synthetic drainfield media can offer substantial benefits in ease of installation, reduced site disturbance, and system longevity

By Scottie Dayton



Arc 24 chambers from Advanced Drainage Systems are used in a low-pressure distribution system in Charlotte County, Fla., for their footprint reduction, performance, and speed of installation.

Trenches and rock are no longer the default design for onsite treatment system drainfields. In fact, some experts say rock is slipping to minority status as a drainfield medium as designers and installers learn the attributes of the alternatives.

Rock and pipe were used for years in drainfields and are still used widely, being readily available and generally inexpensive. Rock, however, has disadvantages. The main issues are fines sealing the trench-bottom infiltrative surface, and soils compacting from the weight of the rock and the force applied by machinery placing it in the trench.

In addition, high-quality, clean rock is not available everywhere. In areas without native supplies, shipping costs can make rock unattractive.

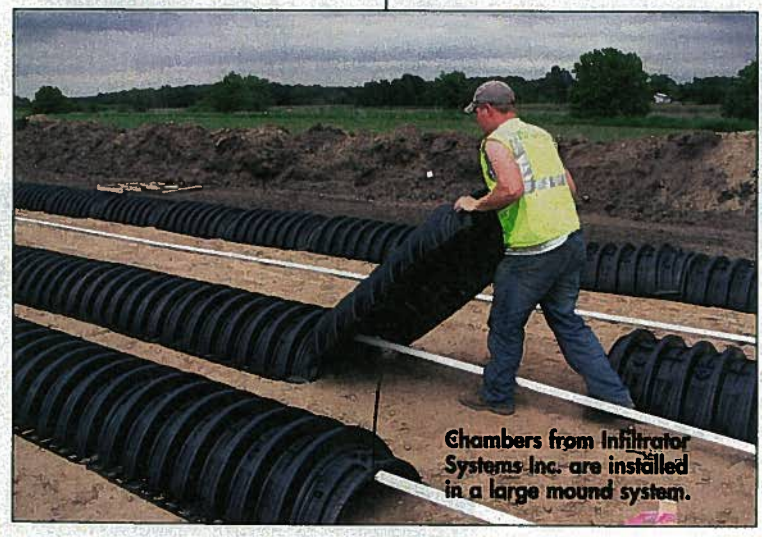
The most common alternatives to rock are plastic leaching chambers and synthetic aggregate. Another option gaining favor for challenging sites is narrow-trench systems using geotextile sand filters. Each alternative has distinct benefits that can apply, depending on soil and site conditions. Here is a look at these by their manufacturers.

"The most recent advance in chamber design is the articulated joint, enabling trenches to follow the contour or avoid obstructions."

Dennis F. Hallahan, P.E.
Infiltrator Systems Inc.

Leaching chambers

Chambers, introduced some 30 years ago, were a revolutionary step in the effectiveness and acceptance of standard and advanced onsite systems. Chambers, ranging from 6 to 30 inches high and from 16 to more than 50 inches wide, are engineered for strength, yet easy to install without heavy machinery compacting the soil.



Chambers from Infiltrator Systems Inc. are installed in a large mound system.

When compared with stone-and-pipe drainfields, chamber systems can accommodate a smaller footprint, yet their corrugated design provides up to 50 percent more infiltrative capacity and up to 67 percent more storage capacity, producers say.

Chambers have a high rate of effluent dispersal and inherent structural integrity. Effluent flows freely to uncompacted backfill through open bottoms and louvered sidewalls that prevent soil migration into the chamber. The chambers are adaptable to serial and lateral drainfields.

"In most applications, chambers eliminate the need for stone or geotextile," says Tori Durliat, corporate manager of marketing and communications for Advanced Drainage Systems (ADS) in Hilliard, Ohio. "One person can install them using a backhoe, level, and rake. Reducing extra manpower, installation time, and extensive site cleanup lowers costs." Chambers also reduce site disturbance, thus enhancing system longevity.

Chambers, often manufactured from recycled materials, are molded with uniform dimensions and tight tolerances that allow for interlocking joints. "The most recent advance in chamber design is the articulated joint, enabling trenches to follow the contour or avoid obstructions," says Dennis F. Hallahan, P.E., technical director for Infiltrator Systems Inc. in Old Saybrook, Conn.

Other advances include diamond-plated, slip-resistant top surfaces that act as a safety feature for installers, snap-in-place end caps that replace screws, and drop-and-go joints that increase installation speed and maximize joint strength. Highly adaptable, chambers are used not only in onsite applications like sand filters, mound systems,

"Narrow-trench systems can be configured for serial distribution, pump systems, level and slope sites any new or replacement application."
Stephen Dix
Eljen Corp.

and constructed wetlands, but also in stormwater applications, in municipal wastewater treatment plants, and even on toxic waste remediation sites.

"Engineers designing community systems prefer chambers due to their large storage capacity," says Hallahan. "Commercial facilities can be subject to large peak flows, which chambers can readily retain." Cluster septic systems use advanced filters, pumps and tank configurations, and chambers to provide a higher level of treatment.

In sand filters, chambers provide increased distribution coverage, allowing the effluent to be applied over the entire surface area of the bottom of the chamber. Chambers installed in the top for effluent dispersion and at the bottom for collection offer much better gas exchange than previous sand filter designs, according to Hallahan.

"Another common application for chambers is in evapotranspiration systems in arid regions," Hallahan says. "Studies show that the solid arch at the top of the chamber does not inhibit evapotranspiration."

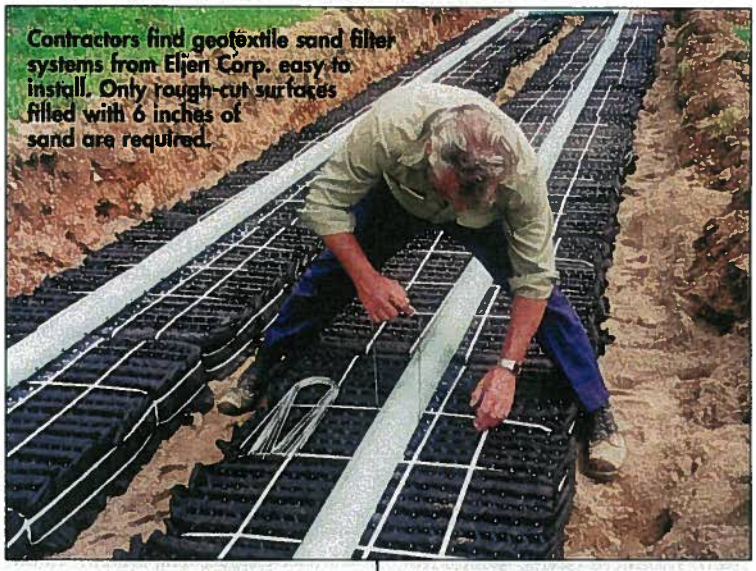
Synthetic aggregate

Another common rock replacement is synthetic aggregate, which retains all the beneficial attributes of rock and pipe while eliminating their detrimental attributes. The product provides increased storage without losing the displacement benefits that rock provides. Bacteria colonize on the media, as they would on rock, enabling biochemical and physical treatment.

Synthetic aggregate is generally 100 percent recycled material bundled within polystyrene netting, with or without a 4-inch perforated pipe, depending on the application. "One person can easily carry and install the product, thus negating the use of heavy equipment driving back and forth over the dispersal field," says Theo B. Terry, III, RS, manager of technology with Ring Industrial Group based in Oakland, Tenn.

"Less compaction from equipment means a better-performing system for the customer. Synthetic media also eliminates the fuel and labor consumed in quarrying gravel, transporting it to the site, and distributing it."

The product, made in 10-foot-long bundles 4 to 18 inches in diameter, is extremely flexible with optimum storage volume. The bundles are installed singly or in horizontal, vertical, or triangular groupings. "Some drainfield products are manufactured with a geotextile covering between the aggregate and netting," Terry says.


Contractors find geotextile sand filter systems from Eljen Corp. easy to install. Only rough-cut surfaces filled with 6 inches of sand are required.

Synthetic aggregate systems are installed 6 to 12 inches below the surface for maximum treatment by natural soil processes. Shallow placement maximizes vertical separation distance from the drainfield base to the groundwater. The drainfields have small footprints, yet can be loaded at high rates with effluent seeping directly into the soil. This product can also be used in low pressure pipe, mound, and bed systems. A 4-inch Versa Coupler connects PVC pipe to the product.


A worker builds a mound system using bundles of EZflow synthetic media from Ring Industrial Group.

Narrow-trench systems

When contractors find a tight site with groundwater too close to the surface for conventional systems, a low-profile, narrow-trench drainfield is one alternative solution.

The technology, with its minimal footprint and two-thirds reduction in trench length, often rescues homeowners replacing lakeside cottages with larger year-round luxury homes that leave little space for the onsite system, says Stephen Dix, president of Septic Solutions LLC and consulting engineer for Eljen Corp.

Designers of new shoreline homes choose narrow-trench systems because they require little maintenance and have no moving parts. The media grants these systems a 4:1 loading rate. Dix notes that Massachusetts and Georgia grant groundwater separation credits for these systems, often making it unnecessary to mound the landscape.

"Since wastewater leaves the system as high-quality effluent, the soil in the trench or mound may be better able to accept it, and the system should last longer," Dix says. Cleaner wastewater qualifies the systems for use at sites that have been compacted, cut, or filled, and for environmentally sensitive areas near lakes, in shallow bedrock and

aquifer recharge areas, and in wellhead protection areas. The systems also retrofit into drainfields that have failed because of excessive organic loading.

"Contractors find the systems easy to install," Dix says. "Only rough-cut surfaces filled with 6 inches of sand are required." The expanded soil interface gives a much larger soil contact area. The sand connects and holds open large pore spaces — critical for use in heavy clay soils. The sand is easy to level before placement of the lightweight media.

"Less compaction from equipment means a better-performing system for the customer. Synthetic media also eliminates the fuel and labor consumed in quarrying gravel, transporting it to the site, and distributing it."

Theo B. Terry, III, RS
Ring Industrial Group

Based on the site's percolation rate, one 3- by 4-foot or 2- by 4-foot module is installed per bedroom. "That's a large surface area and reservoir space per module," Dix says. "They can be configured for serial distribution, pump systems, level and slope sites — any new or replacement application."

The modules, installed shallower than conventional systems, minimize site impact and add flexibility when dealing with site constraints. Each module uses 100 square feet of filter fabric, representing 12 square feet of soil interface. Partially treated effluent then passes through the secondary treatment zone — 6 inches of washed sand under and around each unit. Dix states that the sand layer's long-term acceptance rate (LTAR) is two times that of conventional systems.

The modules, when laid in series and sized for the site's LTAR, prevent a clogging biomat from developing in the soils below. Pretreated effluent and enhanced surface area enable drainfields to be up to 50 percent smaller than traditional pipe and stone beds, reducing land requirements, reducing lumbering costs on wooded sites, and preserving the environment, according to Dix.

A distribution box disperses effluent to the modules. "Clean backfill and washed sand are critical parts of the installation," Dix says. Installation labor is reduced. When trucks cannot access the site, installers can carry a module in each hand as opposed to transporting gravel in wheelbarrows.

Site flexibility is probably the system's biggest advantage. Because the filter is watertight and uses media for treatment, the drainfield soil is not as important as the ability of the media in the filter to transfer oxygen. The system should be constructed to keep surface water from entering the filter, Dix notes. Effluent is very clean, but still must discharge to the soil for final treatment.

Narrow trenches are not for everyone, Dix cautions. Contractors must use quality ASTM C-33 sand and should be trained, dedicated installers. Systems can be installed within a sand envelope, or the media can fit over pressure distribution laterals. The long, thin interface supports dispersion of lower-nutrient effluent after an ATU. The media can be trenched into denser soils to take advantage of more permeable shallow soil horizons.

The availability of advanced drainfield technologies may depend on state or local regulatory codes. Be sure to check with the proper officials before adding them to your arsenal of onsite solutions. ■

MORE INFO:

20 **Advanced Drainage Systems**
800/821-6710
www.ads-pipe.com

33 **Eljen Corporation**
800/444-1359
www.eljen.com

79 **Infiltrator Systems Inc.**
800/221-4436
www.infiltratorsystems.com

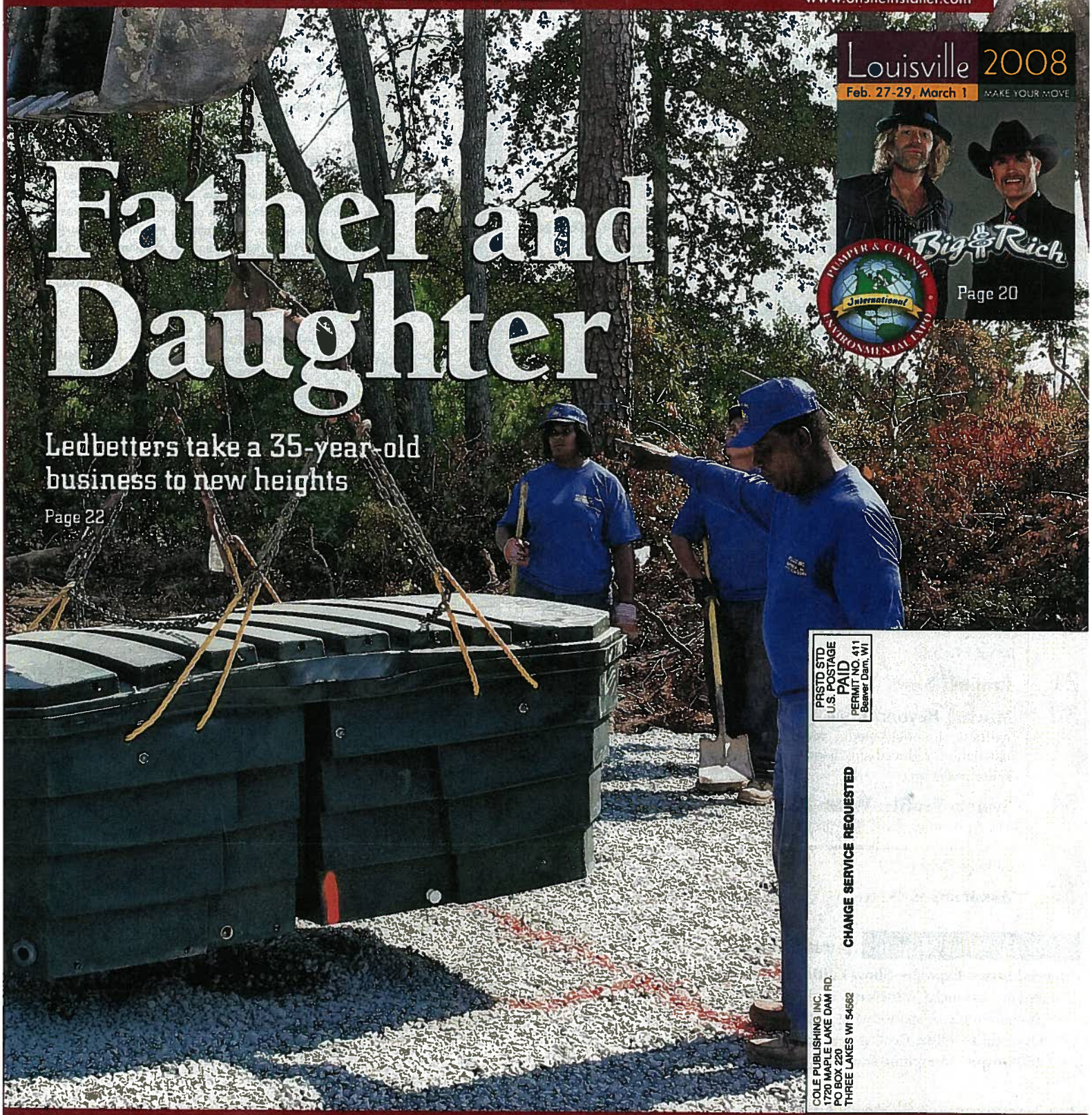
22 **Ring Industrial Group**
800/649-0253
www.ezflowlp.com

December
2007

ONSITE installer™

PROMOTING WASTEWATER TREATMENT QUALITY AND PROFESSIONAL EXCELLENCE

www.onsiteinstaller.com



Father and Daughter

Ledbetters take a 35-year-old business to new heights

Page 22

PRSTD STD
U.S. POSTAGE
PAID
PERMIT NO. 411
Beaver Dam, WI

CHANGE SERVICE REQUESTED

COLE PUBLISHING INC.
1720 MAPLE LAKE DAM RD.
PO BOX 220
THREE LAKES WI 54562