Let's Get Decentralized Wastewater Treatment Out of the Stone Age

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Doing things the way they have always been done in many cases is just not a viable option. This includes the outdated practice of using processed gravel as a media in a subsurface wastewater infiltration system (SWIS). Many still endorse gravel because they are unaware of the benefits new technologies provide. Gravel was listed in the Manual of Septic Tank Practice published in the 1950s by the U.S. Department of Health, Education, and Welfare as part of the first national standard. Today, in some regions gravel is still considered the preferred choice for septic system drainfields and continues to be used by the "old guard." Similar to how color televisions replaced black and white, newer septic products are replacing traditional gravel drainfields. Alternatives to gravel are more effective, easier to use, and better protect the environment.

Conventional Gravel Drainfields

In a conventional system, effluent flows by gravity or is pumped to the drainfield, typically constructed with 4-inch diameter perforated PVC pipe and installed level or with a very slight slope with 6 inches of gravel beneath the pipe. Gravel is then placed along the sides and 2-inches above the pipe. Filter fabric is commonly used to prevent the migration of soil into the gravel. Per the US EPA, Onsite Wastewater Treatment Systems Manual (2002) the gravel:

- Stores effluent until it can be released
- Supports the sides of the trench, the soil above, and the drain piping
- Distributes effluent along the trench

Gravel itself does not provide treatment and can be expensive due to the mining, processing, and transportation costs. Additionally, gravel is not ideal due to the environmental hazards associated with mining operations and the site disruption created when using it.

Environmental Impacts of Gravel

Processed gravel has a large carbon footprint. Mining, blasting, crushing, hauling, washing, and dust control are some of the processes associated with gravel that have negative environmental impacts. It is also labor intensive and causes extensive site disturbance during the installation process. An examination of engineering principles demonstrates that gravel is poorly adapted to the role it is believed to play in treatment and disposal of effluent. Gravel often has unacceptable levels of entrained fines, which are not removed by washing processes. The impact of these fines can be detrimental to system performance. Furthermore, certain types of gravel can react with sewage components and may dissolve over time, creating lower permeability areas in the system. This would be particularly true for crushed limestone.

Gravel Alternatives

There are a wide variety of drainfield systems that do not use gravel in the drainfield trenches or beds. In the US, approximately 50% of systems installed today do not use gravel in the drainfield. The advantages to these systems are:

- Lightweight and easy to handle
- Easier to inspect as units are manufactured to precise dimensions
- Eliminates compaction and structural damage to soils
- Installed in a smaller footprint due to improved absorption efficiency
- Minimizes the disruption to property from heavy machinery
- Eliminates clogging from gravel dust and fines
- Can be pressurized for enhanced system effectiveness
- Reduces labor costs
- Eliminates heavy equipment to haul the gravel to the installation site
- Offers easy operation and maintenance including the potential addition of observation ports for ease of system monitoring

Non-gravel drainfields encompass a number of technologies including engineered aggregate, concrete and plastic chambers, bundled pipe systems and fabric-covered pipe. In addition, product enhancements for specialized applications in sensitive environmental areas are available and can provide installers with options for nearly every possible type of installation.

The Future

The future will bring refinement to existing products and the introduction of new technologies. New products replacing older more traditional ones will continue to improve our water quality. The wastewater industry needs to embrace these products and finally move out of the Stone Age.