tanks evolve

Plastic tanks are becoming more common in onsite wastewater systems. Here, a lightweight plastic tank is lowered into a trench.

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By Dennis F. Hallahan

New tank designs serve variety of advanced wastewater treatment needs

There has been a proliferation of tank designs that serve applications for non-municipal, smaller residential and commercial applications. These tanks, generally ranging from 300 to 1,500 gal, are being specified in designs for systems that provide onsite wastewater treatment, storm water treatment, pump tanks, agricultural and chemical storage, and potable and non-potable water storage at the residential level, including rainwater harvesting. Here, the evolved plastic tank is taking hold due to the many benefits provided and the variety of size options available to suit these varying needs.

Material & Manufacture Evolution

While concrete still is the most common material used for wastewater tanks, the use of plastic and fiberglass tanks recently has increased in the marketplace. Due to new manufacturing technology, plastic tanks now offer not only increased strength compared with plastic tanks of the past, but they also are lightweight and easy to transport and install. For these reasons, and because they are available in a variety of sizes, evolved plastic tanks are quickly becoming accepted by contractors, designers and homeowners.

Tank materials are essential to the function and purpose of the tank, and leakage is a major concern with tanks in onsite wastewater systems. Plastic tanks that are manufactured by the rotational molding process typically are one-piece and thus have minimal leak potential. Concrete tanks now are offered with top-seam joints to minimize the chance of leakage, and additives can be included in the concrete mix to prevent corrosion from the harsh wastewater environment.

Concrete tanks are ideal for high-traffic applications, as they can be designed to meet the required loading, and mid-seam concrete tanks still are common. If these tanks are designed and installed properly, then the joint is watertight. Plastic tank designs have been introduced with the new technology of continuous gaskets, which are common in the pipe industry, and the inclusion of a fixed, permanent connector system to lock the seam in place. Concrete, fiberglass and plastic tanks that are assembled with mid-seam joints have passed testing to verify water tightness.

Plastics and fiberglass are inert to wastewater constituents, a benefit for product longevity, and they are notably lighter, making them ideal for difficult-to-access sites. The manufacturing process of injection molding or rotational molding allows the inclusion of corrugations and ribbing to strengthen the tank. Interior structural bulkheads also can be included to increase strength. Recent breakthroughs in the manufacturing process of injection molding have allowed larger plastic tanks (1,500 gal) to be manufactured. The walls of the tank are of a consistent wall thickness and the process allows for a much higher strength plastic material. This yields high-strength yet low-weight tanks, which conveniently are manufactured in "halves," allowing them to nest for increased shipping density.

A typical rainwater harvesting tank configuration.

The Critical Factor

There is an optimal approach and tank choice for each project depending on location, size, budget, usage, etc. What is not negotiable in the world of septic tanks is the need to be watertight. This factor is critical, regardless of the type of material used to manufacture the tank, to prevent any number of problems, including decreased lifespan of the drainfield or the release of untreated wastewater into the environment.

Three key reasons why any septic tank must be watertight are:

- Leaking in: Water (from surface or groundwater) entering the tank will cause hydraulic overload of the drainfield system and/or may flush solids out, causing the drainfield to be plugged;
- Leaking out: Untreated water can pose a health threat to surface or groundwater; and
- Rooting in: Cracks or open seams allow for roots to penetrate and expand openings.

I&I Issues

Sanitary sewers are notorious for inflow and infiltration (I&I). Inflow results from rainwater entering sanitary sewers through holes in manhole covers, catch basins and/or improper plumbing connections. Infiltration results from groundwater that seeps into the sanitary sewer through cracks or joints in manholes or sewer pipe. I&I wreaks havoc on centralized sewer systems, but in most cases, it is simply bypassed at the wastewater treatment plant, resulting in combined sewer overflows polluting waterways.

With decentralized systems, there is no option to bypass I&I deficiencies associated with leaky tanks. Instead, when they occur, the homeowner has to correct and repair the back-ups or there will be sewage on the ground in his or her backyard—all the more reason to ensure that whichever tank is installed in a decentralized project is watertight.

In the case of exfiltration from the septic tank, untreated effluent easily can enter the groundwater table. This can become a major concern in areas with high groundwater, where viruses and pathogens can travel great distances if not treated in an unsaturated zone of soil.

Best Practices

Economics and the higher costs of a depleted resource like water are helping to increase the popularity of diverse tank designs and related applications. Codes related to septic tanks help to ensure that minimum standards are met and include requirements regarding septic tank placement and watertightness. Codes typically are focused on the end goal of defining watertight test criteria and do not specify a manufacturing process or tank material.

In most areas of the U.S. and Canada, codes still only state that a watertight tank shall be provided, but this is beginning to change, as many recent code alterations now require testing to ensure tank watertightness. This is where best manufacturing processes and technological innovations have been developed to meet the new requirements, including the development of the Septic Tank Manufacturing Best Practices Manual by the National Precast Concrete Organization. It explains: "With the increasing regulatory demands for structurally sound and watertight tanks, it is critical for precast concrete manufacturers to continually raise the bar on quality. And, that proper installation of the tank is absolutely critical for maintaining structural integrity and watertightness."

New Applications

Applications such as rainwater harvesting also are coming to the forefront of the tank design arena. Water is highly localized. It is heavy, difficult to transport without extensive energy input and often expensive. This explains the emerging popularity of rainwater harvesting, where homeowners collect their own water in a rainwater harvesting tank system to irrigate their yards or gardens. Whether harvesting rainwater for potable or nonpotable usage, it is essential that the tank be watertight.

In septic system applications, the need for compact systems for small lots and for systems in environmentally sensitive areas is serving as a catalyst for tank innovation, including increased safeguards to ensure watertightness.

The tank may be a simple storage vessel, but it is the heart and lungs of the decentralized wastewater treatment system. Advances in tank manufacturing have added to the potential for larger-capacity tanks and tanks for specialized uses. These advances also have provided tanks that stand up to the watertight standard set by the needs of the industry and those that regulate it. The story is simple: higher quality, higher standards, more options. WWD

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