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# Leaking Underground Storage Tanks and the New

Leaking underground-storage-tank (UST) systems have become a major environmental health and safety concern across the country. They cause groundwater contamination, leading to headaches for those who have owned or operated them.

Now, there are about two million USTs nationwide. Many of them are constructed of bare steel. An estimated one-third of them have had confirmed releases. To prevent further problems, by December 22, 1998, tanks nationwide will be required to be upgraded to meet the new performance standards promulgated by the EPA in 40 CFR Part 280 as part of the overall federal UST regulatory program that began in the mid-80s.

With the upcoming deadline for performance standards and the financial responsibility for cleanup, companies will want to take proactive measures now to prevent any further environmental degradation in the future. They will need to implement new compliance strategies and new technologies — a costly endeavor for most companies. However, with average cleanup costs of $100,000, most will find it worthwhile to act now.

## The Historic Problem with USTs

In the past, it was commonplace for industries to store their hazardous waste or petroleum underground to limit the risk of fire or explosion. Single-wall steel tanks were the most common mode of storage due to their low cost. Over a period of years, however, many of these tanks encountered problems, some due to structural failure or spillage, but most due to corrosion. The corrosion is caused by the movement of electrical currents that pass through the steel tanks, weakening the metal and eventually resulting in leakage. Some soil types also contribute to the corrosion because of their acidity and moisture, as well as the reactivity of other metals in the ground.

In response to the growing problem, the government implemented federal regulations in 1988 to monitor USTs to prevent releases from structural failure, corrosion or spills. Under these regulations, any owner or operator of an existing UST must meet the new design and construction requirements, or requirements for upgrading.

A UST is defined in the regulations as: "Any one or combination of tanks (including underground pipes connected thereto) used to contain an accumulation of regulated substances, and the volume of which (including the volume of the underground pipes connected thereto) is 10 per centum or more beneath the surface of the ground." Excluded from the definition of regulated tanks are farm and residential tanks of limited capacity used for motor fuel and home-heating fuel, and other tanks not used for the storage of regulated substances.

## Design, Construction and Installation

Let's say that you want to install a new UST. What do you do? According to the new performance standards, unless the tank is installed at a site where it has been determined by the implementing agency to have noncorrosive soil, or an alternate tank system has been approved, all new tanks must be constructed, at a minimum, with one of the following materials: (1) cathodically protected steel, (2) fiberglass-reinforced plastic (FRP) or (3) a steel/FRP composite. Piping must be constructed of either FRP or cathodically protected steel. The tanks also must have a spill-prevention device, such as a catchment basin that will prevent a release of product to the environment when the transfer hose is detached from the fill pipe, as well as overfill-prevention equipment and leak-detection systems.

For most existing companies, the question most frequently asked will be, "What does a company do when it has a tank that is now unprotected and has been there for about 30 years?"

By 1998, all existing tanks must be replaced, closed or upgraded to meet the new performance standards by installing (1) an interior lining, (2) cathodic protection or (3) an interior lining combined with cathodic protection. In addition, spill- and overfill- prevention equipment and a method of leak detection must be installed on all tanks, whether steel or fiberglass.

## Upgrade or Replace?

Once you understand the options, do you upgrade the tank or replace it?

Companies may choose to upgrade because the initial cost is typically one-third the cost of tank replacement. Steel tanks can be lined internally, for example, to handle some products. However, not all products will be compatible.

The downside of a liner is the high maintenance that is required under the regulations. An interior lining is not regarded as a permanent upgrade, and periodic inspections must be done to determine that the lining continues to meet the original design specifications. It is not a substitute for structural integrity and, at best, is a temporary stopgap measure. If the lining corrodes, it must be replaced.

Another upgrading option is the cathodic-protection system. Cathodic protection is designed to prevent external corrosion of the steel tank.

The protection systems are available in two forms. The first is called sacrificial anodes — pieces of metal that have a higher electrical potential than steel. The corrosion is transferred to the anode, which becomes corroded and is

# Performance Standard

eventually sacrificed. Thus, the name.

The second type of cathodic protection is the impressed-current system, which supplies an electrical current into the ground through a series of anodes that are not attached to the UST. Since the electrical potential of the anodes is greater than that of the UST, the current is prevented from leaving the UST. Again, the downside to this type of upgrade is the maintenance required.

According to the regulations, unprotected steel tanks that have been installed for 10 years or more must first be internally inspected for structural soundness and corrosion. Those that have been installed for less than 10 years can undergo either a tank-tightness test or monthly monitoring after installation.

All cathodically protected tanks must be tested within six months of installation and a minimum of every three years after that. Although the owner or operator can self-monitor some systems, most must be tested by a qualified cathodic-protection tester.

Wayne Stellmach of the Steel Tank Institute, Lake Zurich, Ill., notes that most companies today are choosing the replacement option over the traditional upgrading options, and that "significant changes in storage-tank trends have evolved over the past decade. The increased interest and competition in the storage-tank marketplace have created a number of new technological advances."

There has been keen competition between the steel-tank and fiberglass-tank manufacturers. Like any product, there are pros and cons to each. The steel-tank industry originally touted the cathodically protected steel tank as the most structurally sound tank. However, with new technologies entering the market, some may say that the market for this type of tank is dying out. Additionally, this type of tank requires more monitoring to maintain its corrosion resistance under state and federal regulations.

Steel/FRP composite tanks are becoming more popular, notes Stellmach, because of their FRP corrosion-resistant coating. These tanks are made of a thick FRP laminate that is bonded to the exterior surface of the steel tank. They are available in both single- or double-wall configurations.

Companies need to check with individual state-regulatory requirements about single- or double-wall containment. At least eight states, including California, Florida, Maine, Massachusetts, New Hampshire, New York, Rhode Island and Vermont, and the District of Columbia, require some type of secondary containment. The American Petroleum Institute, Washington, also recommends secondary-containment systems (or dual-wall tanks) whenever USTs are located within 300 feet of underground water supplies.

The steel-tank industry is promoting a new technology, called the jacketed tank. This tank is an FRP-contained steel tank with space between the steel tank and the FRP containment. "This interstitial space serves as a double-wall tank at a fraction of the cost," notes Stellmach. However, according to some in the tank industry, although the exterior surface is protected from corrosion, some jacketed tanks may

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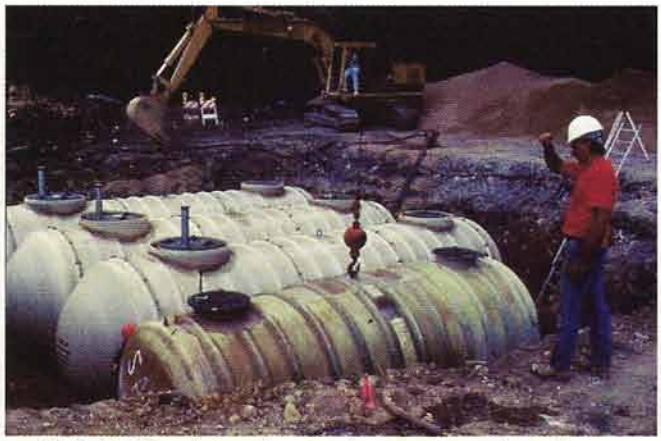


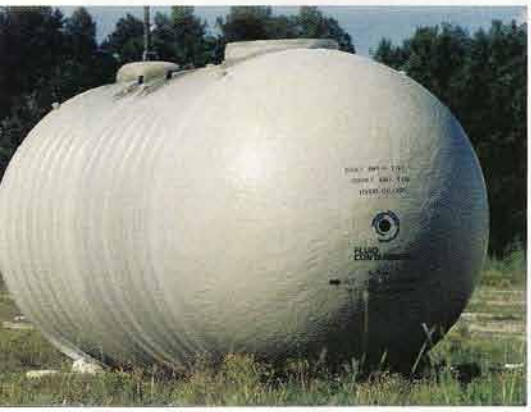
Excavated in 1990 after 26 years of continuous use in underground fuel storage (left), this FRP tank based on isopolyester resin was brought up to current code by the addition of a second manway, recertified and reinstalled (right) by Owens-Corning with three new tanks at another site in 1991. Photos courtesy of Amoco Chemicals.

still be vulnerable to interior corrosion.

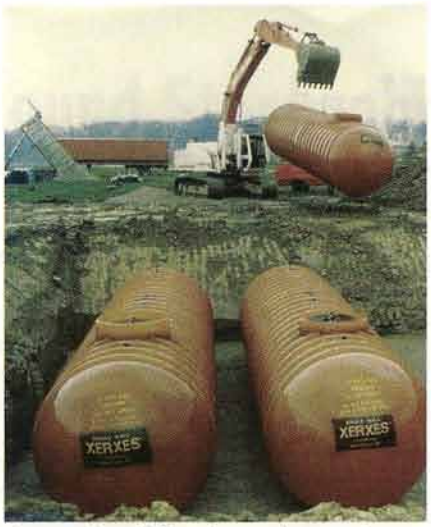
Of course, the fiberglass industry encourages the use of corrosion-resistant fiberglass tanks. When Amoco unearthed a 25-year-old, fiberglass, gasoline storage tank at one of its old service stations, the inspectors found the tank in excellent condition. They saw no signs of leakage, structural duress, or corrosive or chemical attack. Amoco attributes the primary reason for the tank's long-term performance to the isopolyester resin specified for the fiberglass construction. The resin is based on isophthalic acid from Amoco Chemicals, Chicago.

"UL-1" — another isopolyester-FRP, fuel storage tank — was excavated in the summer of 1990 to make way for a new state highway near Chicago. The 6,000-gallon vessel looked so good that engineers decided to use it again. The tank's UL-1 alphanumerical designation means that it was the first of its kind to achieve Underwriters Laboratory (UL) recognition for corrosion resistance.

The resin specification for UL-1 had fallen upon the fabricator, Owens-Corning Fiberglas Corp., Toledo, Ohio. Andy Bastone, project manager at the time for Owens-Corning, is now with Isorca, Inc., Granville, Ohio, a resource for developing polymer-composite applications and technology. On January 1, 1995, Owens-Corning Fiberglas sold the assets of its Tank Division to Fluid Containment, Inc., Conroe, Texas.



Pictured is a 360° secondary-containment, double-wall fiberglass tank from Fluid Containment, Inc.




These single-wall, fiberglass, underground storage tanks from Xerxes Corp. are among the strongest, most robust tanks available due to a unique integral-rib design, and construction of resin and glass-fiber reinforcement.

Tank manufacturers, such as Fluid Containment and Xerxes Corp., Minneapolis, are also promoting several advantages of fiberglass tanks. Rick Whately, vice president of sales and marketing, Fluid Containment, notes that "FRP double-wall tanks offer 360° leak-detection capabilities, as well as protection against internal and external corrosion."

Terry Jensen, manager of sales services at Xerxes Corp., notes that in 1965 only one percent of the tanks being installed were made of fiberglass. Today, fiberglass tanks make up 50 percent of the market, and most of the major oil companies have chosen to use fiberglass. According to Sully Curran of the Fiberglass Tank and Pipe Institute, Houston, more than 350,000 isopolyester tanks and 60 million feet of FRP piping have been buried at service stations around the United States since the early 1960s.

Jensen from Xerxes also notes that fiberglass tanks are significantly lighter than steel tanks, eliminating the need to rent heavy installation equipment. Moreover, companies can move the tanks from an original-installation site and recertify them for installation at a new location with the proper installation procedures.

### Above-Ground Storage

To meet the 1998 performance standards, another option that has become increasingly popular is the above-ground storage tank (AST). Areo-Power Unitized Fueler, Inc., Smithtown, N.Y., is promoting a lightweight, double-wall, above-ground storage tank called the Fireguard™, which provides thermal insulation to meet the applicable requirements for two-hour fire-rated ASTs. The outer steel wall provides secondary containment, which protects the insulation material and resists cracking and spalling.

The owner of a Fireguard AST also can visually inspect it for leakage and overflow. The tank can store petroleum, chemicals and other hazardous materials. Although the tank itself is usually more costly than a UST, it can be less expensive overall when one factors in the cost of a UST installation.

Future federal legislation may affect the current standards on all ASTs. In 1993, the government introduced the

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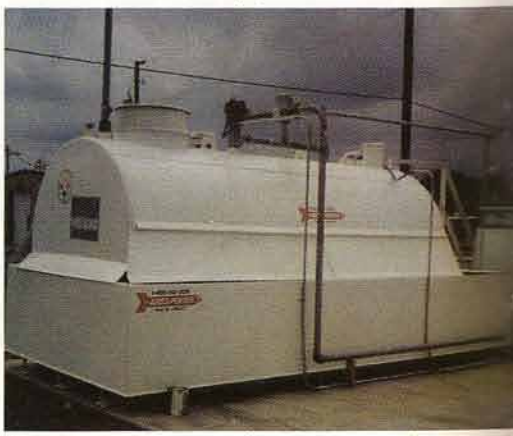

Fireguard tank from Areo-Power.

Safe Above-Ground Storage Tank Act bill to mandate notification requirements for all AST owners. It requires certified inspections, corrosion protection of tank bottoms and underground piping, and installation of spill- and overfill-prevention devices. Although this bill never passed, it is likely that the government will soon introduce federal regulations that are more comprehensive.

Concerning above-ground storage tanks, Morton International, Inc., Chicago, provides liquid polysulfide-based sealants and coatings for secondary containment. They have been well-received by chemical and petroleum manufacturers whose ASTs must comply with regulations preventing groundwater contamination.

## Conclusion

With the host of technologies available, UST owners and operators can now take proactive measures to develop a compliance strategy within the context of the applicable state and federal regulations. With the financial responsibility of cleanup resting on their shoulders and many state funds for leaking USTs running dry, the impetus to act is even greater. Whether owners and operators choose to upgrade, replace or close their tanks will be an individual decision based upon the particular desires and needs of the company. Whatever the choice, it will be a step toward solving groundwater-contamination problems across the country. ●ASI

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### Need More Information?

Isophthalic acid, a key building block for isopolyesters used to fabricate FRP tanks — Ben Bogner, Amoco Chemicals Research Center, MC D-7, 150 W. Warrenville Road, PO Box 3011, Naperville, IL 60563; 708-961-7786; fax: 708-961-7979. Or **Circle No. 50.**

Polymer-composite applications and technology — Andy Bastone, Isorca, Inc., PO Box 414, Granville, OH 43023; 614-587-3262; fax: 614-587-1881. Or **Circle No. 51.**

Fiberglass tanks — Sully Curran, Fiberglass Tank and Pipe Institute, 9801 Westheimer, Suite 606, Houston, TX 77042; 713-465-3310; fax: 713-465-6544. Or **Circle No. 52.**

All-steel and steel-composite tanks — Wayne Stellmach, Steel Tank Institute, 570 Oakwood Rd., Lake Zurich, IL 60047; 708-438-8265; fax: 708-438-4509. Or **Circle No. 53.**

Single- or double-wall FRP underground storage tanks — Terry Jensen, Xerxes Corp., 7901 Xerxes Ave. S., Minneapolis, MN 55431-1253; 612-887-1890. Or **Circle No. 54.**

Single- or double-wall FRP underground storage tanks — Rick Whately, Fluid Containment, Inc., PO Box 3085, Conroe, TX 77305-3085; 409-525-3802; fax-on-demand literature: 800-324-8804. Or **Circle No. 55.**

Fireguard tanks — Areo-Power Unitized Fueler, Inc., 103 Smithtown Blvd., Smithtown, NY 11787; 516-366-4362; fax: 516-366-0905. Or **Circle No. 56.**

Polysulfide-based adhesives for above-ground tanks — Morton International, Inc., 100 N. Riverside Plaza, Chicago, IL 60606; 312-807-3307. Or **Circle No. 57.**