Leak Prevention

The Sense of Secondary Containment

by Wayne Geyer

Nagging revelations of MTBE in groundwater have undermined the tenets of gasoline behavior in the environment and set off a flurry of activity among UST regulators and state and federal legislators. How could we get into this position when so much time and effort went into upgrading underground storage tank (UST) systems? And while a great deal of attention has been directed toward the effectiveness and proper design of leak detection to meet federal requirements, there is still concern that the leak detection equipment that is in place may not be operated or maintained properly. As a result, many UST systems may operate as if they had no leak detection.

One solution to this problem is to install equipment that will passively contain a release before it can permeate into the environment. Clearly, secondary containment tank and piping systems have performed this function effectively and continue to represent the state of the art for containing petroleum releases. Secondary containment makes good sense from both an environmental and a business standpoint.

Both fiberglass reinforced plastic (FRP) and steel double-walled tanks are now well established in the market place, but single-walled systems are still out there in abundance. STI records indicate that over 60 percent of new tanks bearing the STI label are of single-walled construction. I’d like to take this opportunity to stroll down secondary containment lane. As a representative of the steel tank industry, I’ll discuss the sense of secondary containment using steel tank examples (of course).

Dual-Wall Tanks

Secondary containment tanks first appeared in the United States in the early 1980s, when certain local and state jurisdictions were beginning to investigate and promulgate rules for hazardous wastes and chemical storage. Secondary containment was one of the solutions.

In California, the first secondary containment steel tanks were termed Type II double-walled tanks. The two walls of steel were physically separated with angles or channels to create an annular interstice of several inches. The goal of this design was to create an enclosure that would hold 110 percent containment of the primary tank capacity.

But these systems were costly and bulky, and the industry needed a more cost-effective design. The industry soon realized that there was no need to contain 110 percent of the tank’s capacity—100 percent was sufficient. Later, with the introduction of fill-limiting devices designed to stop incoming deliveries to 90 or 95 percent of the tank capacity, secondary containment tanks with 95 percent containment were also accepted.

In 1984, the Steel Tank Institute (STI) introduced the first national construction standard for secondary containment tanks. It provided a design for a Type I, intimate wrap steel secondary containment tank, with several alternative construction methods for enabling the interstice to be monitored for releases (i.e., liquid or pressure sensors). The standard even allowed for a simple gauge stick to be lowered into a monitoring pipe.

The STI standard was based on German technology. In Germany, secondary containment had already been in use for a number of years. As a matter of fact, the Germans really didn’t regulate corrosion protection at that time. As long as secondary containment was in place to prevent a release, the time to replace a system that failed due to corrosion was merely an economic decision and not an environmental concern. STI adapted the German construction methods to American tank production methods in order to create the Dual-Wall Tank Standard.

A year later, changes were initiated to incorporate secondary containment into Underwriters Laboratories (UL) listing UL 58, the primary steel UST construction standard. Several UL listings for dual-wall tanks had already been issued prior to 1985 for both the steel and FRP tank industries.

The Jacketed Tank

Around 1987, nonmetallic secondary containment on steel tanks emerged as a popular concept. A thick polyethylene material was wrapped over the tank, and a polyethylene spacer created the interstice between the two materials. The idea of using plastic over a steel tank was actually conceived many years earlier for the purpose of corrosion protection, not containment. Around 1970, many steel tanks were wrapped with thin, overlapping plastic sheets sealed together by duct tape in the field. One such system was called Poly-Wrap. By keeping soil and water away from the steel surface, corrosion could be successfully impeded.

The Poly-Wrap system did inhibit corrosion in many cases, but lost popularity because it required installation under less than perfect field conditions, making it particularly dependent on installer care and expertise. It eventually faded from the market, to be replaced by more sophisticated corrosion control systems. The newer polyethylene material used to provide secondary containment was much thicker than Poly-Wrap. The sheets of plastic were fused together.
with a plastic welding machine at the factory to make it testable and capable of containing releases. By 1989, it became a viable product in the marketplace.

In that same year, Underwriters Laboratories published their UL 1746 standard. The third part of the standard provided a test protocol for nonmetallic containment of steel tanks and coined the term “jacketed tank.”

STI tested several prototypes for secondary containment of steel USTs. We tried coated fabric material that had to be sewn together. When filled with air it looked like a zeppelin. When emptied of air it turned into a wrinkled baggie. Strike one!

We tested different coatings that were sprayed through various forms of geotechnical reinforcement materials. Great ideas, since they could be used in conjunction with existing coating equipment in the shop. But we just couldn’t permanently seal the system. Strike two!

How about using FRP? Composite tanks had already been accepted in the market by buyers and were allowed in the 40 CFR Part 280 environmental regulations (ACT-100). Historically, an FRP coating had been shown to be an effective method for corrosion control (originating in the 1968 STI specification for STI-LIFE tanks).

Instead of bonding the FRP to the steel to form a coating, however, we decided to separate the two and create an interstice to contain releases. The interstice could be monitored for releases while also assuring corrosion control. Home Run! By 1990, several companies had begun testing their products through UL to acquire a listing for an FRP-jacketed steel tank.

**Getting Better All the Time**

The jacketed tank and the dual-wall steel tank rely on the primary or inner steel tank for structural integrity to hold the product in an underground environment. The outer containment must be strong enough to be handled at the job site and in the soil without losing its integrity. With the jacketed tank, the material must withstand various chemical/soil environments. All of the tanks must be testable and able to communicate a release to a monitoring device. Approximately one of three STI-labeled secondary containment USTs are of jacketed construction and two of three are dual wall steel.

Today, new materials continue to evolve and to be developed for use as secondary containment. Usually, the first step into the marketplace is to pass the UL 1746, Part III test procedure.

While fewer than 10 states mandate secondary containment for regulated USTs, use of the technology continues to grow—nearly 50 percent of all steel USTs made in the USA today are believed to be secondary containment tanks. When the EPA regulations were first promulgated in 1988, this number was closer to 15 percent.

Even greater strides have been made outside the United States. In many countries, tank buyers have leaped from buying unprotected steel tanks to buying corrosion-protected secondary containment tanks. Mexico is nearly complete with its secondary containment tank system upgrade program. The most popular STI-labeled tank installed in Mexico is the dual wall sti-P3 tank.

The European Community issued a series of laws that apply to all member countries, similar to the manner in which the U.S. EPA UST program is applied to all states. One of these laws is through the Construction Products Directive (CPD). One way to ensure compliance with essential CPD requirements is to build products to harmonized standards.

The European Standards body, CEN, recently published a harmonized standard EN 12285-1 for the construction details of underground steel storage tanks. An appendix lists all the “water-polluting liquids” normally stored underground and includes a determination of whether the liquid is considered dangerous enough to mandate a double-walled tank with leak detection. Gasoline is considered dangerous and therefore all European Community participants’ tanks that store gasoline must be of double-walled construction with leak detection.

The province of Ontario in Canada is about to adopt a secondary containment mandate. Yet in the United States, nearly one of every two steel tanks built and sold is of single-walled construction.

**Where the Sense Comes In**

I can think of four key reasons why the use of secondary containment for petroleum storage should be a patent no brainer. It provides the following:

- **Containment** to prevent a release into soil and all the undesirable elements that go with a release—report writing, cleanup, lawsuits, business interruptions;
- **An extra insurance** policy, just in case the tank was improperly installed or maintained;
- **Peace of mind**; and
- **State-of-the-art technology**.

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**Steel Secondary Containment Tanks**

Percentage of STI-labeled USTs since 1990, representing over one billion gallons of storage capacity installed.

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Single Wall 65.4%
Secondary Containment 34.6%
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to protect the environment against such occurrences.

Federal regulations do not mandate tanks to be removed and replaced after a certain life. Although I firmly believe that today’s storage systems can last 30 or more years, I wouldn’t bet my life savings on a perfect batting average because of the human element.

As with the roof job on my home and every major appliance I own, I know that someday it will need replacement. (My expensive 36” television set just bit the dust after only four years!) But I can also see these things every day, unlike a buried UST.

Just 20 years ago tanks with secondary containment did not even exist. Today, the technology is there for the taking, yet the regulations have not caught up. One reason we suffered a tank crisis to begin with was because tanks were routinely buried and forgotten. I’d like to think that soon we’ll get our tank house in order, once and for all, by requiring secondary containment for all petroleum storage tanks and piping. It just makes sense.

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