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L.U.S.T. LINE

A Report On Federal & State Programs To Control Leaking Underground Storage Tanks

When Winkle Woke Up

My, How UST Systems Have Changed in 25 Years!

by Marcel Moreau

Van felt himself awakening—slowly—as if he had been at the bottom of a deep pool and was swimming upward toward a beckoning light above. But eventually he broke the surface and emerged… from his dream into the daylight. He was disoriented at first, but slowly recognized the familiar contours of his cozy shelter and the expanse of the valley below. As far as he knew it was April 1987, and he had visited his retreat in the woods to look over some proposed USEPA tank regulations in peace and quiet, away from the office of his hectic pump and tank service business. It seemed late now. "EPA should market those rules as a sleep aid," he thought, rubbing his stiff muscles and still trying to shake off the drowsiness. "I'd better be getting back to the office."

When he reached his workplace, he scratched his head in profound bewilderment. There was a new brick façade, new trucks in the yard, a new mailbox, and a new logo and name. His "Winkle's Pump & Tank" sign was gone, replaced by "Winkle's Petroleum Services." He entered the door with the look of someone who wasn't sure if he was still dreaming. An unfamiliar young woman looked up from her desk and asked with a somewhat suspicious tone, "Can I help you?"

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"Where's Betty?" he muttered.

"Betty who?" asked the young woman.

"Betty Frost," he answered. "She works here." The young woman pressed the intercom button on her phone and whispered into her headset, "Phil, you'd better come out here right away. There's a weird old guy out here."

Phil promptly appeared from a doorway at the back of the room and walked assertively toward Van. "Can I help you?"

"I'm Van Winkle, and I own this place. What's going on here?"

Stunned, Phil looked carefully at the old man's wrinkled face. There was a familiar glint in the old man's eyes. "Dad? Is that you? Where on earth have you been?" he gasped.

Equally stunned, Van looked carefully at the man in front of him. He could just barely recognize the square chin and smiling eyes of the boy he used to know. "Phil?"

L.U.S.T.Line

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Getting Up to Speed

A week later, Van and Phil were enjoying getting to know each other again. Van had spent a few days in the hospital getting checked out. No one believed his story of being asleep for a quarter century (although he did have a crazy long beard), but otherwise the doctors proclaimed him sane and healthy. Over all those years Phil had grown his dad's UST installation and service business considerably. He was gently giving Van the lowdown on all that had changed in the tank world.

"So whatever happened to those rules I was reading when I fell asleep?" asked Van as they drove to a jobsite together.

"They went into effect in 1988 and have played a big role in revamping the whole UST business," explained Phil.

Where Have All the Gas Stations Gone?

"Gosh, looks like a lot of the places I used to service are gone now," Van noted as they passed through an intersection that used to have a gas station on each corner. Now there were two fast food joints, a used car lot, and a beauty salon—not a gas pump in sight—though the beauty salon looked like it might have been a gas station in another life.

"Oh yeah," agreed Phil, "the rules made tank owners think twice. Commercial operations took a look at whether they really needed to have their own tanks to fuel their vehicles. Retailers had to look hard at their bottom line to see if they were making enough money off fuel dispensing to justify the risks and the costs. Nationally, the underground storage tank population is down by 72 percent since 1988—from about 2.1 million to fewer than 600,000. But we're using about 20 percent more gasoline today, so that means each facility is selling a lot more gas out of larger tanks. It's way more efficient and better for most everyone concerned."

"What about all those old tanks that aren't being used anymore?" asked Van. "Seems like those might get to a point where they're gonna rot out and collapse."

"Well," said Phil, "it's not like you remember when people used to just walk away from tanks that had leaked or that they didn't want anymore. Ever since the rules, most tanks that aren't going to be used any longer are removed. And not only that, if there's contamination—and there is most of the time—the contamination has to be cleaned up."

"Cleaned up?" quipped Van. "I remember when you dug a tank out of the ground you filled in the excavation as fast as possible so you wouldn't have a fire hazard from the gas and fumes in the hole."

"You'd be in a lot of trouble if you did that today, dad. Nowadays you've got to take soil samples and groundwater samples and have them analyzed before you can call a hole clean. A whole cleanup industry has sprung up around doing just that at gas station sites. Nationally, tens of billions of dollars have been spent cleaning up leaking tank system sites. While you were sleeping, I started a subsidiary cleanup company for a while in the 1990s because there was so much cleanup work with all the tanks being dug up. I sold that off a while ago to get back to just doing the UST service and installation work."

They're Double-Walled Too?

They arrived at the worksite where a new tank was being lowered into the excavation. "Whoa, that is one mother of a tank!" exclaimed Van.

"Yep, we put in lots of compartmented tanks these days. That one is 20,000 gallons with two compartments."

"Hmm, I see it's fiberglass," noted Van. "I never thought I'd see the day when there'd be fiberglass tanks going in around here. Don't they cost a lot more?"

"The days of burying old tin cans in the ground are gone, Dad. Everything has to be corrosion protected now. Some people still use steel tanks, but even then they're usually coated with fiberglass. Nothing is as cheap nowadays as those old bare steel tanks you used to bury."

"What's that dome on the top of the tank?

"Oh, that's the brine reservoir for the leak detection system. It's a double-walled tank with liquid in between the walls so you can tell if there's a leak."

"So they're double-walled too?!"

"Yeah Dad, for several years now that's all we've been putting in."

"Well, ain't that something," marveled Van. "All the big oil guys used to say inventory control was all you needed for leak detection. When I used to try to sell double-walled tanks in the '80s owners looked at me like I was from another planet. They couldn't understand why anybody would want to bury that much money where no customer was ever going to see it."

"Well, leak detection for single-walled systems wasn't working out so well, so rules changed beginning in 2005 so that most states have gone to nothing but double-walled tanks."

"What's the blue stuff on that reel?"

"That's double-walled flex pipe."

"Flex pipe?"

"Yeah, it's the joints in the piping that always leaked, right? With flex pipe, you drastically cut down on the number of joints, which really helps with the piping leaks, although piping is still where we have the biggest problems."

"Wonder why I didn't think of that," said Van. "And what are those big tubs?"

"Those are the sumps that go around the submersible and underneath the dispensers. They catch all the leaks from those areas. They'll have sensors in them that will sound an alarm if there's a problem."

Van was shaking his head. "I'll bet there's a lot of old oil company men turning over in their graves to think about all this money and technology going into the ground. To think we used to say all it took to put in a tank was a backhoe and a couple of six packs on a Saturday afternoon."

"Not any more, Dad. Things are pretty complicated these days. There's blueprints and permits and checklists and certificates and safety rules and lots more than you ever had to think about."

As Phil checked in with the job foreman to be sure everything was going smoothly, Van watched as the huge crane carefully lowered the tank into the excavation. "I guess the days of rolling a tank into the hole and hoping it lands with the bungs up are gone," he thought.

"Okay, things are looking good here, Dad," said Phil, waving him over to his truck. "Let's go check out a site that we just finished. They opened for business yesterday and I want to make sure everything is running smoothly."

Where Are the Service Bays?

"Man, this sure is fancier than what I remember," said Van as they drove into the parking lot of the new gas station/C-store/deli operation. "Where are the service bays?"

"Well dad, gas stations where you bring your car for repairs are getting to be few and far between. Most retail fuel facilities sell food now, not tires, batteries, and accessories. "

"Those dispensers look pretty fancy. I'll bet those are pricey!"

"Yeah, they're a lot fancier than what you used to put in. Most everything is electronic now. No more gears and dials in the meters or displays."

Van did a double take. "Did that person just put a credit card in that dispenser?"

"That's right dad. It's called a *card reader in dispenser* or CRIND. People don't have to go into the store anymore to pay. They can pay right at the pump."

Ethanol?

"Holy smokes!" declared Van. "And what's that different colored pump over there?"

"That's an E85 dispenser," chuckled Phil. "E85 is a blend of 85 percent ethanol and 15 percent gasoline. All the other gasoline dispensers here are pumping E10, that's what you used to call gasohol, with 10 percent ethanol. About 10 percent of fuel these days is corn-based ethanol. And there's some folks say we should use even more ethanol because it's homegrown."

"Ethanol? Whatever happened to Methanol? That's what I remember all the environmental folks pushing when I went to sleep."

"Well, there were some pretty big issues with methanol like compatibility with existing storage systems and the fact that you had to have special cars to use it. Oil companies had been adding this stuff called MtBE to gasoline in the '80s to help replace the octane we were losing by phasing out the lead we used to have in gasoline. It turned out some studies said that MtBE could help reduce emissions as well. It was compatible with storage systems and you could use it in existing vehicles, so you could reduce tailpipe emissions a lot sooner because you didn't have to replace the country's entire vehicle fleet. So MtBE was in the gasoline for most of the '90s until it started showing up in groundwater all over the place. Seems like our storage systems weren't quite as leak-tight as we hoped they were, and MtBE was getting out into the environment. So then Congress said we had to use more renewable fuel, so there's ethanol in most of our gasoline these days. We're seeing more biodiesel now too. "

"Man, sounds like a lot was happening while I was snoozin'!"

That's One Fancy Gauge Stick!

As they entered the new store, Phil waved to his father, "Let's go out back, Dad. I want to show you this new tank gauge. It's the latest. It lets the owner monitor his inventory from anywhere, sends alarm messages, does everything but brew your coffee. With the right software and these tank gauges, a single person can manage inventory, deliveries, and leak detection for hundreds of facilities and not even work up a sweat."

"Wow, I remember a salesman trying to sell me on these. They looked pretty Mickey Mouse to me back then. Why would anyone want to spend $5,000 on a fancy gauge stick, when you could get a wooden one for ten bucks?"

"Well, Dad, after the EPA rules required leak detection, it was pretty clear that tank gauges were the only means of leak detection that actually gave you a business benefit by helping you with your inventory as well as meeting your leak detection requirements, so ATGs, that's what they're called, really kind of took off in the 1990s. Pretty much everybody has them nowadays."

PEI Is Still Doing RPs

Back at the office, Van noticed a vaguely familiar document on Phil's desk. "Is that the PEI Recommended Practice on Tank Installation?"

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"Yes, it is Dad. In fact, PEI has a whole library of RPs now. There's RPs on how to maintain dispensers and tanks, how to build marinas and vehicle lubrication facilities—you name it. The old seat of the pants approach just doesn't cut it anymore. People like to have standards to refer to, especially since most of the big oil guys are leaving retailing. So it's a good thing that organizations like PEI and STI have stepped in to give us some solid guidelines."

Big Oil Is Leaving Retailing?

"Big oil is leaving retailing!? So who's running gas stations nowadays?" asked Van.

"Well it depends. In populated areas there are some pretty substantial regional marketers that run really good operations. And what we call "big box" retailers like Sam's Club and Costco are selling a lot of gasoline too. But in less populated areas it's mostly just mom 'n pop operations, and a lot of them are being run by folks from other countries going after their piece of the American dream. Sometimes I feel like a diplomat trying to understand all these foreign cultures so I can keep in touch with my customers. It's a real challenge."

"Well Phil, I gotta say I admire what you've done with my company. I'm sure I'd never be able to deal with all this new stuff. This world's just gotten too complicated for me."

"Well, Dad, you had a great reputation for quality service around here, and you had some real good technicians working for you too, so when you disappeared it wasn't too hard to keep things going. But I'm real glad I have a business degree to help me figure all this out. And I spend a lot of time just keeping up with changes in equipment, regulations, and customers. I expect it's only going to get more complicated as time goes on. But that's what keeps it interesting."

"Well, maybe so, but I think I'm ready for another nap!" ■

Marcel Moreau is a nationally recognized petroleum storage specialist whose column, "Tank-nically Speaking," is a regular feature of LUSTLine. *Marcel can be reached at marcel.moreau@juno.com.*

Hiding in Plain Sight

Inventorying South Carolina's Petroleum Sites

by Mark Berenbrok

Gas stations have been a common fixture of the American landscape in both rural and urban areas since the 1920s. Given the possibility that contaminated soils or a long-forgotten UST could be lurking just beneath the surface, communities attempting to address vacated petroleum sites, referred to as brownfields, often face a challenge in developing a comprehensive inventory. Locating the corner gas station that closed three years ago is easy. But what about that much less obvious gas station that closed in the 1960s and the building has been remodeled and repurposed? Memories fade, people move away, buildings are demolished, and parking lots are repaved. The gas station your grandfather frequented may now be the sandwich shop that went out of business last year.

Many South Carolina communities have applied for and received USEPA grants to inventory and assess both hazardous substance and petroleum sites in areas they have targeted for development or revitalization projects. The South Carolina Department of Health and Environmental Control (DHEC) assists grantees in compiling inventories, developing work plans, conducting site assessments, and understanding assessment results. Petroleum brownfields such as former gas stations present a unique challenge because they're numerous and usually small. Educating stakeholders about the many sources of petroleum and how those sources are regulated are key components of our outreach.

The Tip of the Iceberg

Grantees often begin their inventory with a windshield survey of gas stations and bulk terminals. They may supplement it with a list of sites from the state petroleum program. But this may be a mere glimpse at what is actually buried out there. The user of any list needs to know how it was compiled and what it does and doesn't include to understand its limitations. For example:

- Any list of UST sites is going to be biased toward facilities that have operated since 1974. Since gas stations have been opening and closing since the 1920s you're going to miss a considerable number of sites if you limit yourself to a list from a state agency. We have found that an inventory composed only of regulated UST sites will include less than half of the potential population of petroleum sites.
- Some states regulate heating oil tanks and ASTs (aboveground storage tanks) in addition to USTs. Some lists may only include AST and heating oil sites if a release has been reported.
- Petroleum facilities that no longer exist (called historic sources) include gas stations, garages, bulk terminals, heating oil tanks, dry cleaners, and fleet tanks. These sources should be included when building an inventory.
- Historic sources often cause greater delay in site redevelopment than existing sources. Finding contaminated soil or that forgotten set of USTs during grading activities can bring everything to a grinding halt.

Petroleum 101

Stakeholders need a history lesson about petroleum use in the twentieth century. In Petroleum 101 guidance sessions we cover gas stations, bulk terminals, railroad lines, abandoned sites, mystery USTs, and the types of issues you can expect to encounter at a long-closed site. We also provide an overview of how our regulatory program works because of misinformation about responsibility and assessment requirements for petroleum contamination.

UST programs have been registering sites since the mid-1980s and overseeing site assessment and cleanup for just as long. This information is a treasure trove for communities that are often unaware of site conditions and assessment work that has been performed. Having a DHEC liaison for petroleum issues allows communities to get prompt, consistent answers and builds a healthy working relationship.

Mapping It Out in Dillon

Dillon is a small city of approximately 6,800 located in rural northeastern South Carolina. In 2009 the city received a USEPA brownfield assessment grant to develop an inventory of petroleum sites and conduct Phase I and Phase II assessments.

The city had been working with DHEC on a large derelict manufacturing site prior to 2009 and was familiar with the brownfields program and staff. This experience was key to allowing the city to incorporate petroleum brownfields into its overall brownfields initiative. A DHEC brownfields program staff member was assigned as a liaison and assisted the city throughout the project.

To allow the city to identify potential sites, we created a Google® map of petroleum sources that included DHEC records and Sanborn Fire Insurance maps (Figure 1). (Sanborn Maps were originally created for assessing fire insurance liability in urbanized areas in the United States. Since 1867, they have provided detailed information regarding town and building information in approximately 12,000 U.S. towns and cities.) The Dillon Google® map included registered UST sites, AST sites, and dry cleaners. Approximately 140 existing and historic sites were shown on the map along with a brief description for each (Figure 2). Tax parcel identification numbers were included if they were available from DHEC records. The map allowed the city to easily identify sites for follow-up with the department's liaison and was a valuable tool for stakeholders.

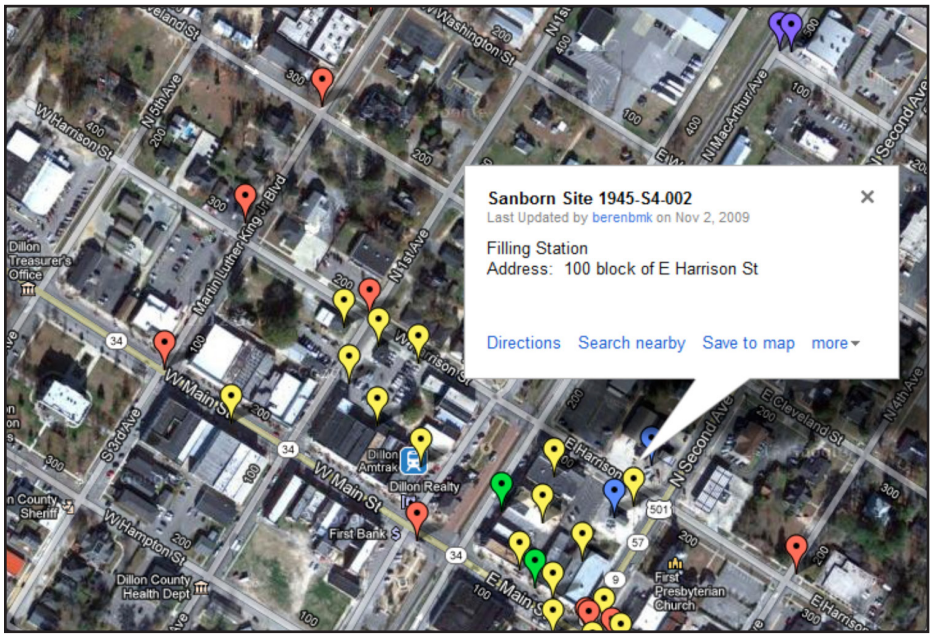

FIGURE 1. *A Google® map of downtown Dillon, South Carolina. Each placemark represents a petroleum source.*

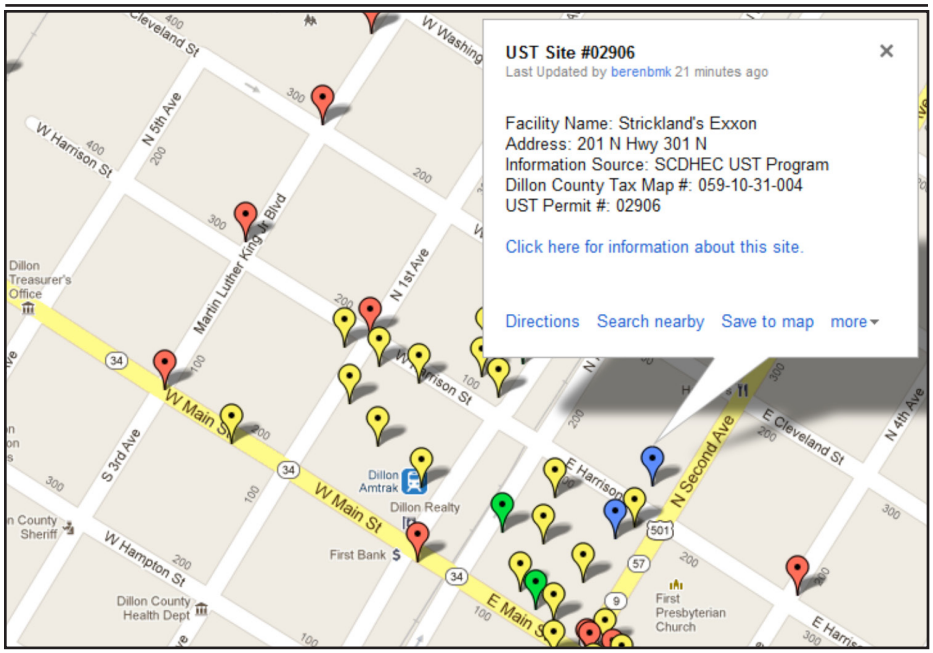

FIGURE 2. *Placemarks are color-coded. Clicking a placemark opens an information box for each site.*

The Payoff

By educating stakeholders, giving them the tools to easily identify sites, and providing them with a liaison, DHEC has enabled communities to begin building comprehensive petroleum brownfields inventories. Creating an inventory is just the first step in moving forward with a desired economic improvement goal. Absentee landlords, site qualification and access, mystery USTs, and assessment problems are future issues, but an upfront investment in time and resources can make the journey easier. ■

Mark Berenbrok is Petroleum Brownfields Coordinator with the South Carolina Department of Health and Environmental Control Brownfields Section. He can be reached at berenbmk@dhec.sc.gov.

What's the Deal with Methane at LUST Spill Sites? Part 1

by John T. Wilson, Mark Toso, Doug Mackay, Nick de Sieyes, and George E. DeVaull

This article (Parts 1 and 2) is specifically intended to discuss methane produced from releases of ethanol and gasoline-ethanol mixtures. There may be other sources of methane at a site, including leaks of natural gas or methane produced from the natural decay of buried plant tissues or from the decay of organic wastes in landfills. Since the explosion hazard associated with methane gas is pretty dramatic, and gets people's immediate attention, we will discuss this in Part 1. In Part 2 we will discuss methane gas specifically with regard to petroleum vapor intrusion at LUST sites.

The effects of methane can be direct or indirect. The direct effects occur in enclosed spaces, and the indirect effects occur in soil gas. In enclosed spaces methane can be a simple asphyxiant (displacing oxygen from air), or it can form an explosive mixture with air (HSDB, 2012). In soil gas there are two potential issues with methane: (1) the aerobic biodegradation of methane can use up oxygen that otherwise would be available for biodegradation of benzene and other petroleum hydrocarbons, and (2) the generation of such a volume of biogenic methane that existing soil gas is displaced. Because high concentrations of methane can limit biodegradation of benzene and other gasoline hydrocarbons, the chances of petroleum hydrocarbon vapor intrusion may increase. Displacement of soil gas and the flow of methane can result in further migration of the gasoline hydrocarbon vapors, which also increases the chances of vapor intrusion.

What's the Chance of an Explosion? When Should We Worry About It?

The direct acute hazard to people and property is associated with the accumulation of flammable concentrations within enclosed spaces, such as vaults, sewers, crawl spaces, basements, and sumps. A flammable gas can explode if it is confined. An explosion is simply a flame with no place to go. We will discuss the flammable range of concentrations instead of the explosive range. The flammable range defines the explosive range.

As will be discussed in detail later, methane is one end product of the anaerobic biodegradation of hydrocarbons as well as ethanol and other biofuels. The explosive gases at a fuel spill are actually a mixture of methane and petroleum hydrocarbons. Gasoline vapors and methane in soil gas are not immediately flammable. The thermal mass of the soil matrix "quenches" the propagation of a flame. The vapors must migrate to an enclosed space and mix and dilute with air (oxygen) and attain a concentration within the flammable range before there is a hazard.

The accumulation of flammable concentrations is most likely when liquid gasoline is present within an enclosed space (e.g., a vault, sewer, crawl space, basement, sump), or there is a direct connection between the liquid gasoline and the enclosed space. It is easy enough to smell gasoline at explosive concentrations, and most people who smell gasoline are smart enough to call the fire department before they call their state underground storage tank program. It is more difficult to detect a flammable mixture that is composed mostly or almost entirely of methane. Methane itself has no odor. The real concern is the flammability of mixtures of methane.

The flammable range of methane in air is usually described in a Coward's Diagram (Figure 1). The name of the diagram is no reflection on the courage of UST field staff. It is the family name of the chemist who first worked out the flammable concentrations of methane gas in coal mines (Coward and Jones, 1931). Figure 1 indicates that there is a very restricted range of concentrations that are flammable, as such. There is a much wider range of concentrations that can be flammable when mixed with more air.

Jewell and Wilson (2011) measured the concentrations of meth-

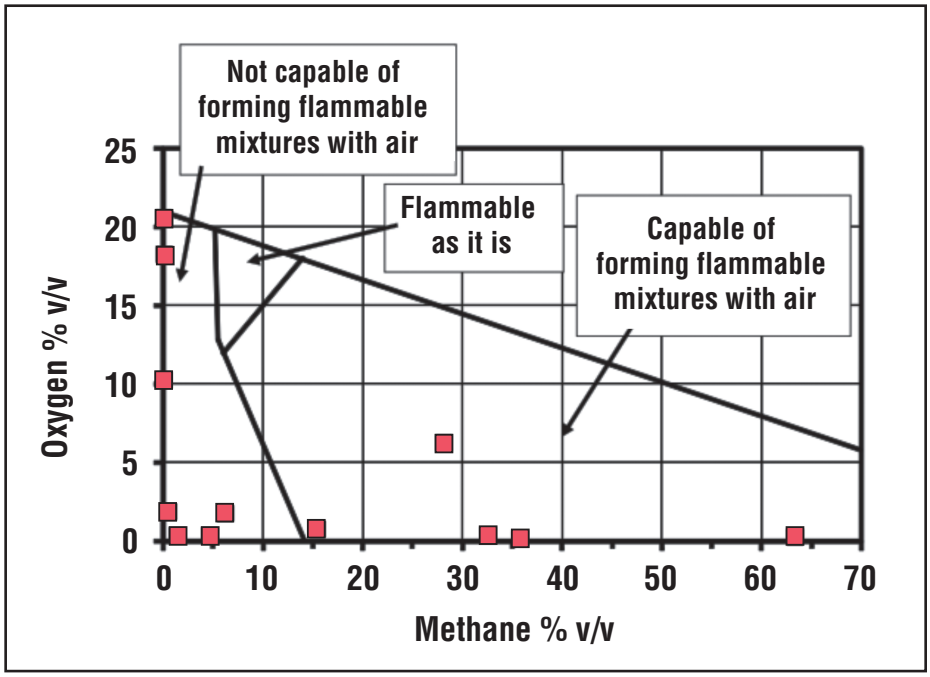

FIGURE 1. *Coward's Diagram showing the range of flammable concentrations of methane in air.*

ane and oxygen in soil gas at twelve gasoline service stations in Oklahoma with recent confirmed gasoline releases. The results are depicted by the red squares in Figure 1. The methane in soil gas at the sites was not flammable. However, soil gas at five of the twelve sites could theoretically be mixed with air to form a flammable mixture.

Explosions caused by methane have happened in the past. As a result, there are regulations and guidance to manage the risk from municipal landfills (CFR 40: 258.23), coal mines (CFR 30: 57.22001), natural gas distribution systems (ANSI/GPTC Z380.1), and oil and gas operations (API, 1997a, API, 1997b).

To our knowledge, there are no verified cases of fires or explosions directly attributed to biogenic methane at a spill of conventional gasoline or E10 at a gasoline service station.

If five of twelve gasoline spill sites in Oklahoma have potentially explosive concentrations of methane, why don't we see a problem at gasoline service stations? The answer may be related to mechanisms that move methane through the soil gas. If methane is redistributed in the soil gas by diffusion, the rate of redistribution is slow and is likely to be slower than the rate of biodegradation. If methane gas actually flows through the subsurface, there is a greater chance of attaining explosive concentrations in a building.

The air in a building turns over. As a result, a significant amount of methane must flow into a building before it reaches explosive concentrations. The flow of soil gas into a building depends in part on the difference in pressure between the indoor air and the soil gas beneath the building. For many buildings, explosive conditions will not develop unless that pressure difference reaches a critical value (Cal EPA, 2012; Sepich, 2012). The critical difference in pressure is usually on the scale of a few inches of water. The California Environmental Protection Agency has developed a systematic approach to evaluate the risk of an explosion in a building based on the concentration of methane in soil gas and the difference in pressure between the building and the soil gas (Cal EPA, 2012).

Aerobic Methane Biodegradation When Methane Diffuses to the Surface

If methane simply volatilizes from the soil water in the capillary fringe, and then moves by diffusion through the soil gas, there is a chance for aerobic microorganisms to degrade the methane before it escapes the soil gas. Oxygen can diffuse down into the soil from the atmosphere as rapidly as methane diffuses upward from the groundwater or smear zone.

In a recent paper, Ma et al. (2012) compared the vertical distribution of methane and oxygen in soil gas in a large sand tank experiment. They added a 10 percent solution of ethanol to flowing groundwater in the tank. The ethanol was biodegraded to produce methane and the concentrations of methane in the groundwater reached high levels (20 to 23 mg/L). At equilibrium, air in contact with water containing 20 mg/L methane would contain 800,000 ppmv methane.

Ma et al. (2012) used a flux chamber to capture methane that moved all the way through the soil gas and escaped the sand tank. The maximum concentration of methane in the air in the flux chamber was very much lower, only 21 ppmv. Table 1 compares an estimate of the potential rate of production of methane to the actual rate of escape of methane from the soil surface (the efflux) expressed in mg per square meter of surface area per day. The water table was 1.5 feet below the soil surface. Over this short interval, aerobic biodegradation reduced the flux of methane several hundred fold.

The aerobic biodegradation of methane in soil gas over short vertical intervals has also been documented below existing buildings. Lundegard et al. (2008) studied the vertical distribution of methane below a slab-on-grade house overlying residual petroleum NAPL. The NAPL source area was located 6 feet below the slab. The concentration of methane in soil gas at a depth of 6 feet was 14 percent. Methane was not detectable in soil gas at 1.6 feet below the slab. Fischer et al. (1996) monitored concentrations of methane below a slab-on-grade building at a gasoline service station. The concentration of methane in soil gas at a depth of 2 feet was 5.2 percent. At a depth of 0.7 feet, methane was not detectable (<0.15%).

Aerobic Methane Biodegradation When Methane Flows as a Gas to the Surface

Little is known of methane production associated with spills of gasoline with concentrations of ethanol higher than 10 percent. Spills of E85 or denatured fuel-grade ethanol (E95) have a greater potential to produce significant quantities of methane. If the methane comes out of solution in groundwater as bubbles, and the bubbles move into the unsaturated zone, enough methane may enter the soil gas to cause the soil gas to flow toward the surface. The methane is then redistributed by advective flow instead of diffusion. Oxygen would have to diffuse against the current of flowing soil gas. At some point the flow of methane would wash out

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Site	Depth	Potential Methane Production	Measured Methane Released	Reference
	feet	mg/m^2-day		
Experimental Aquifer in Houston, TX	1.5	7,430	20.9	Ma et al. (2012)
Tank Farm in Midwestern USA	7	23,500	8.3	De Sieyes (unpublished data)
Experimental Release at UST Spill Site	10	57,400	Not Available	Mackay et al. (2006)

TABLE 1. *Comparison of the measured release of methane at the land surface above a spill of ethanol to the potential production of methane from the release.*

■ Methane at LUST Spill Sites

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the diffusion of oxygen and greatly reduce the chances for aerobic methane biodegradation in the soil gas.

What is the chance that methane from a spill of E85 or denatured fuel-grade ethanol (E95) would produce so much methane that it would exceed the supply of oxygen and overwhelm the natural capacity for aerobic biodegradation of methane in the soil gas? Several of us are investigating that issue at a spill of fuel-grade denatured ethanol at a tank farm in Minnesota.

In December 2010, a leaking valve was discovered on the piping outside a 168,000-gallon ethanol storage tank. The total volume of ethanol spilled is unknown. During characterization of the spill site in October 2011, ethanol was detected in core samples that were taken six to ten feet below ground surface and as far as 18 feet from the leaking valve. Methane concentrations in the same depth intervals were as high as 23 percent.

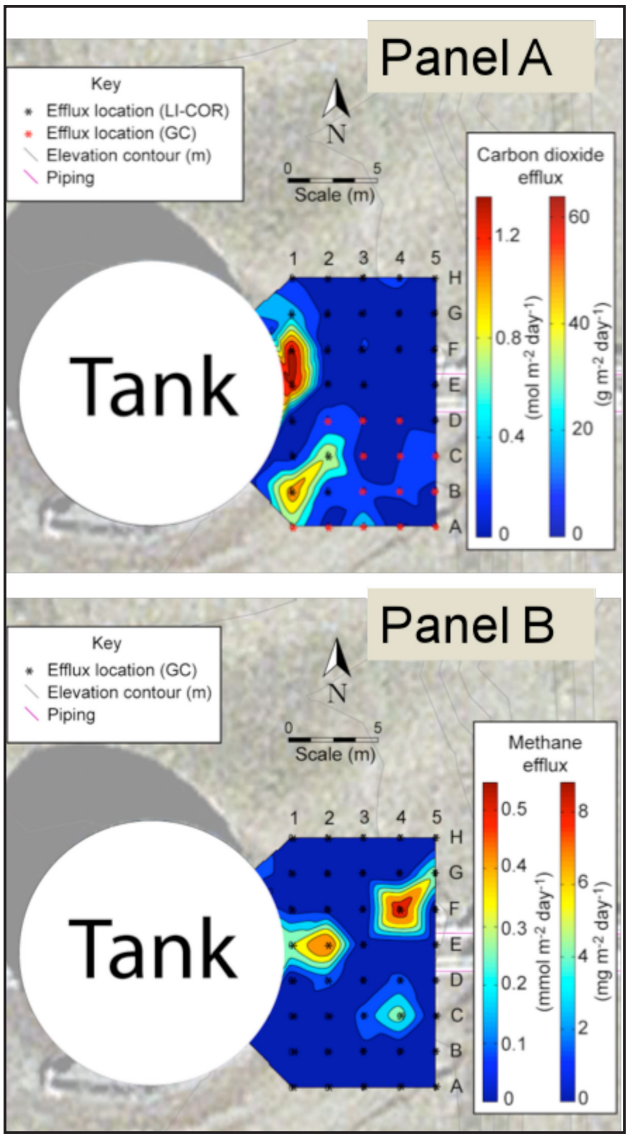


FIGURE 2. *Release of carbon dioxide and methane to the soil surface at an E95 spill site in Minnesota.*

Automated flux chambers (manufactured by LI-COR, Lincoln, Nebraska) were employed to measure the efflux of methane and carbon dioxide from the soil surface. They were deployed in a dense 44-point grid in the area of the spill. The maximum efflux of carbon dioxide at the ground surface was relatively high, approximately 60,000 mg/m^2-day (1.3 moles/m^2-day; Panel A of Figure 2). By comparison, methane efflux was detectable but orders of magnitude lower, with maximum values in the range of 9 mg/m^2-day (0.5 moles/m^2-day; Panel B of Figure 2).

Although the total measured gas efflux from the site was 43 moles of carbon compounds per day, only a very small fraction of this carbon flux occurred as methane. The data suggest that the six to ten feet of unsaturated material above the ethanol source was sufficient to oxidize the bulk of methane emanating from the site prior to discharge to the atmosphere. However, as the source zone matures it is possible that the rate of methane production will increase and thus that methane will make up a larger portion of the carbon efflux from the site.

Table 1 compares the reduction in emissions (measured as a flux from the surface) in the experimental sand tank aquifer in Texas and the field spill in Minnesota. In both cases, there was a substantial reduction in methane that escaped the soil, and there is little possibility that methane could escape the soil and attain flammable concentrations in an enclosed space.

This is in contrast to the behavior of methane at two sites in Minnesota where E95 was spilled after tanker cars on a railroad derailed. The sites are described in Spalding et al. (2011). The emission of methane at the soil surface was evaluated by measuring the concentration of methane in inverted galvanized steel tubs. At the spill sites at Cambria and Balaton, Minnesota, the concentrations of methane that accumulated in the air in the tubs were 1.6 and 2.7 percent respectively (Toso, 2008).

At the Balaton site the depth to groundwater was 12 feet and the concentrations of methane in soil gas were as high as 53 percent. At this site the efflux of methane was so great that 12 feet of unsaturated zone was not adequate to allow aerobic biodegradation of the methane and prevent emissions of methane at the land surface.

Summary

Impacts from methane can be broken out into direct impacts, such as explosions, and indirect impacts, such as petroleum vapor intrusion. Impacts can be also be assigned to two major categories of fuels, one category that includes conventional petroleum gasoline and E10 and the other category that includes E85 and denatured fuel grade ethanol (E95).

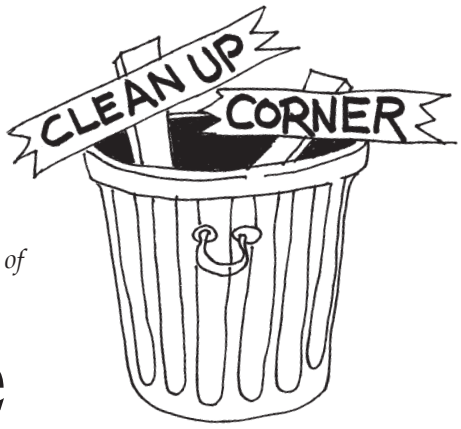
To date, there is no evidence that methane from biodegradation of conventional petroleum gasoline or E10 at LUST sites has caused an explosion. Less is known about the explosion hazard associated with methane from releases of E85 or E95. Studies at one field site and one pilot-scale study show that aerobic biodegradation of methane in the unsaturated soil can prevent explosive concentrations of methane from escaping from the soil surface. At two other field studies, the concentrations of methane that escaped the soil were just below the explosive limit.

In Part 2 we'll discuss the impact of methane concentrations on petroleum vapor intrusion.

■ *continued on page 13*

Cleanup Corner

A Neat Little Column by Gary Lynn



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Something's Gotta Give

It's the Clash of the Titans. On one side we have water associations, the beef industry, environmental groups, Americans for Prosperity, the National Taxpayers Union, and consumer protection groups. On the other side, we have the Renewable Fuels Association, Petroleum Manufacturer's Association, National Association of Convenience Stores, and a number of Big Agriculture trade associations. Why are these lobbying titans fighting each other and what issue could possibly create such an unusual grouping of allies?

It's a piece of legislation called the Domestic Fuels Protection Act of 2012, which has unified these disparate groups and deeply stirred the passion of numerous trade associations. To fully understand why this act is the subject of such fervor, you need to be aware of some of the issues involving alcohol that are not typically discussed in polite tank program circles.

Let's start with the Renewable Fuel Standard and the "blend wall." The Energy Independence and Security Act of 2007 mandates that U.S. refineries and petroleum importers use a steadily increasing percentage of renewable fuel in motor fuels. USEPA publishes the renewable fuel standard each year in the Federal Register, and the petroleum industry must purchase offsets if it does not achieve the standard.

In the January 9, 2012 Federal Register, USEPA specified a 2012 total renewable fuel standard of 9.23 percent. If all of the gasoline sold in the U.S. is E10 (10% ethanol) and ethanol is for all intents and purposes how the renewable fuel standard is reached, the maximum percentage of renewable fuel in gasoline is about 10 percent.

Given that gasoline in some parts of the country is not blended with ethanol, 9.23 percent hits a wall built by how much ethanol can be mixed into the E10 blend, hence the image of the blend wall. Next year the renewable fuel standard will rise and the blend wall will be blocking the petroleum industry from complying with the mandate. (Note: NHDES has recently tested gasoline samples and found the gasoline frequently tested at 11% ethanol. Perhaps this is the first phase of the response to hitting the wall.)

The Clashes

What are the issues? (Even if this Act fizzles, the issues won't go away.) For starters, the corn industry wants higher ethanol sales to help keep corn prices high. The beef industry wants the opposite, low corn prices. The Renewable Fuels Association is impatient with impediments to higher ethanol sales. The refiners and major oil companies are in a different bind. They are mandated to sell more ethanol and will be penalized when they cannot achieve the additional ethanol use because of the blend wall.

The easiest answer to the blend wall is to raise the ethanol content in gasoline by selling E15. Unfortunately, E15 poses some compatibility issues with older cars, older small engines, and older tank systems. For these E15 compatibility–related concerns, the Domestic Fuels Protection Act of 2012 requires the development of a federal compatibility standard and provides relief from liability issues that are impeding the introduction of E15.

What should the tank regulatory community position be on this piece of legislation? The misfueling liability relief provisions protect manufacturers from liability resulting from people using E15 in engines that are not compatible with the fuel. The consumer protection groups are unhappy with this provision of the legislation but there is a reasonable argument for liability protection when the federal renewable fuel standard essentially mandates the use of E15. My southern friends would say "we don't have a dog in that hunt." Other liability-related provisions are far more problematic, however.

The Liability Thing

Let's start with how the current version of the Act would override all state and local compatibility regulations and establish a precedent for carving out territory where state UST regulations cannot be more stringent than federal rules. The proposed legislation grandfathers as compatible all tanks, tank systems, or dispensing equipment listed by a nationally recognized laboratory as compatible with the fuel or fuel additive. The list of equipment that is compatible with pure ethanol is different than the list of equipment that is compatible with ethanol-gasoline blends. Under the current version of the legislation that distinction would be lost; the owner receives liability protection even if his equipment hasn't been found compatible with the ethanol blend as

■ *continued on page 10*

■ **Cleanup Corner** *from page 9*

long as pure ethanol is listed as compatible with his equipment.

Overriding state regulations is also a problem. State authority to require removal of incompatible equipment will be lost in situations where compatibility problems are identified after a National Testing Lab lists the equipment as compatible. For example, the UL standard for non-metallic piping (UL 971) has undergone four revisions to address problems in flexible piping compatibility issues.

The legislation is silent on whether the liability protection applies only to the latest revised UL standard in place at the time of bill enactment or more broadly to any equipment that was listed as compatible by a national testing laboratory **at the date the equipment was installed.** For example, second generation Enviroflex piping was listed by a National Testing Laboratory as compatible under an older version of the testing standard. Owners of facilities that installed this product can argue that they were granted liability protection under the Act because they acted in good faith by installing an approved product.

If this interpretation of the Act is upheld, states would lose the ability to require removal or upgrade of second generation Enviroflex piping when piping deteriorates due to compatibility issues since the Act overrides liability under state and local law. To determine the full potential impact, all products ever approved by a National Testing Laboratory would have to be evaluated.

Finally, there is no time limit to the liability protection. Accelerated aging studies typically show equipment performance deteriorates over time. Thirty years in service is different than five years but the liability protection continues unchanged as long as the equipment was listed as compatible and the failure can be blamed on compatibility issues.

The Act puts financial assurance providers, such as state reimbursement funds, on the hook to pay for some of the liability. Sec 9014. Compatibility (b)(2) of the Act states: "A provider of financial assurance shall not deny payment for any claim on the basis [that the equipment] is not compatible with a fuel or fuel additive." This sets up a brand new appeal route when claims are denied.

Liability protection for tank system compatibility issues is very broad in the current version of the Act. It covers "any person" and extends to "any federal, state, or local law (including common law)" as long as the liability is related to tank system incompatibility. This essentially overrides existing state liability frameworks for releases. There could be a catastrophic spill related to a compatibility issue and no responsible party to clean up the release due to the liability protection extended by the Act. This would strain state spill cleanup funds that address sites without responsible parties.

What Is More...

Finally, the current version of the Act throws out all current and future litigation against impacts from gasoline additives that are approved for use in fuel. The liability protection is provided regardless of the behavior of the manufacturer. This provision of the Act has caused AWWA and other drinking water groups to oppose passage of the Act. Senator Waxman expressed the concern that liability protection is being extended to "7,500 registered fuel additives."

Allen Brooks of the New Hampshire Attorney General's Office stated that: "Given the sweeping nature of the immunity provided, we believe the petroleum company defendant will likely raise this immunity at every turn in an attempt to either dismiss or seriously curtail our groundwater contamination case." He was referring to the state's current MtBE litigation but the application of the Act would extend to other contaminants as well. Even Shimkus, the bill sponsor, noted in response to some of the liability concerns that he would be "eating some humble pie."

My concern about all of these poorly understood liability protection provisions is that at some point in time states are going to ask for spill cleanups or for reasonable equipment-related protective measures from tank system owners and the liability protection provisions of the Act are going to radically curtail the state's ability to clean up and prevent spills.

The ongoing drought drives home the need to review the current renewable fuels content mandate and reexamine whether the existing mandates are consistently achievable and make economic sense. The oil industry shouldn't be held hostage to the vicissitudes of weather and crop yields or the availability of cellulosic ethanol; providing more flexibility in the renewable fuels mandates of current law is the right answer to the current set of E15 problems.

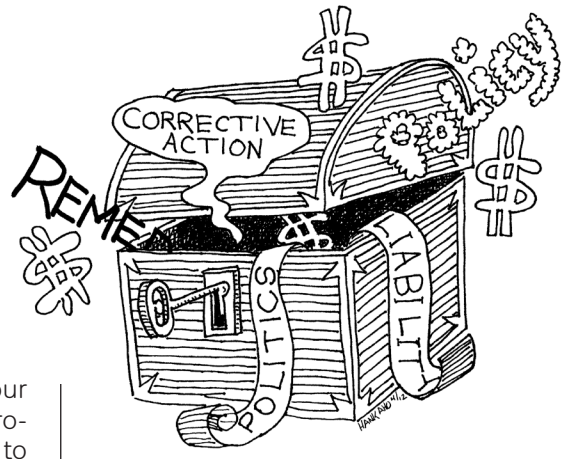
Something's Gotta Give Reprised

Something's got to give and it shouldn't be the current system of well thought out and smoothly operating state laws and release prevention efforts. The current version of the Domestic Fuels Protection Act takes the wrong tack on fixing this clash of interests. This year's domestic drought crises will impact the corn crop, run up corn prices, impact ethanol production, and increase ethanol prices.

The ongoing drought drives home the need to review the current renewable fuels content mandate and reexamine whether the existing mandates are consistently achievable and make economic sense. The oil industry shouldn't be held hostage to the vicissitudes of weather and crop yields or the availability of cellulosic ethanol; providing more flexibility in the renewable fuels mandates of current law is the right answer to the current set of E15 problems. This could be coupled with much more narrowly focused liability protection for misfueling to encourage states and retailers to use E15 if it makes sense based on economics and compatibility with hardware. Let's fix current law instead of wiping out laws that work. ■

Unlocking the Mystery of FR

A straight-talking column by Jill Williams Hall, Senior Planner with the Delaware Department of Natural Resources and Environmental Control (DNREC). She can be reached at jill.hall@state.de.us.



Getting Past the "Chicken Little Syndrome"

In the world of underground tank insurance, the most recent blip on our radar screen has been the decision by Zurich Insurance to no longer provide standalone UST insurance. My first reaction was somewhat akin to a favorite story I used to read to my children—*Chicken Little*. After a single acorn falls on her head, Chicken Little decides that the sky is falling and sets off to the tell the King that the world is ending. Ah, what turmoil a single acorn can create—or in the case of tank insurance, the loss of a single company. What we need to avoid in this situation is what has become known as the "Chicken Little Syndrome," which according to *Wikipedia* can result in "inferring catastrophic conclusions possibly resulting in paralysis."

So what do tank owner/operators do if their insurance carrier has left the building? Instead of invoking the Chicken Little Syndrome and becoming paralyzed, this can be a great time for them to review their insurance policy and be sure they are purchasing the best product they can. There are still many companies that offer UST and AST insurance. A list of known UST insurance providers can be found on the USEPA website at www.epa.gov/swerust1/pubs/inslist.htm or they can check with their state's Department of Insurance.

As I stated in my LL #70 article, tank insurance comes in a variety of flavors, all of which meet the minimum financial responsibility requirements. All policies must provide coverage in specified amounts for cleaning up contamination and paying for any resulting property damage or bodily injury (check state regulations for the specific required limits). After meeting these basic requirements, owner/operators will need to make choices on what they want in their policy. These choices will of course make a difference in cost and most importantly what the insurance will and will not pay for in the event of a release.

Building Your Policy Brick by Brick

Think of tank insurance like a building project. You get to select each brick needed to construct the policy of your choice. So what are your building material choices?

■ Suspected Release or Confirmed Release Policy?

While all tank pollution policies must provide coverage for cleaning up UST system releases, it is not a requirement that a policy cover the costs of investigating to confirm whether a release has actually happened. Costs such as tank testing, soil or groundwater sampling, and laboratory analysis will most likely *not* be covered under a confirmed release policy. The language in a confirmed release policy typically contains statements such as: *Any costs, charges, or expenses incurred by the insured to confirm the existence of a release shall not be considered cleanup costs*, or, *This insurance applies to pay for corrective action due to Confirmed Releases.*

The cost of a confirmed release policy may be less than that of a suspected release policy but be aware that if there is not conclusive evidence that a release has occurred from the UST system the owner/operators has to bear the cost of any investigation ordered by the state to confirm or deny a release.

Conversely, a suspected release policy typically covers the costs to investigate whether a release has occurred from the tank system covered by the policy. These costs may include testing tanks and piping for tightness, sampling soil and groundwater, or drilling test pits.

When deciding whether to choose a confirmed or suspected release policy you should clarify with your insurance provider exactly what will or will not be covered by the policy in the event you suspect there is a release or if a regulatory agency requires you to investigate such a possibility. You should be sure to ask the insurer if you must have a directive from a governmental agency requiring you to investigate before the provider will step in.

■ Noncompliance Exclusion or Not?

Many tank insurance policies contain language that allows the insurance company to deny a claim to pay for a cleanup if the tank system was not in compliance with regulations. This gets a little tricky because the language in the policy may contain wording such as "willful" or "deliberate" noncompliance. The intention of an action making it willful or deliberate can be debated and thus the grounds for denying a claim based on this exclusion can be open to interpretation and debate, from both the insured and the insurance company's point of view. Some policies do not contain any language stating that claims that are attributed to the insured's noncompliance are not covered.

■ What Is a Retroactive Date?

A release from an UST system is covered only if it occurred after the "retroactive date" stated in the policy. A retroactive date is the date stated in the policy that the coverage begins. Any release that occurred before this date will not be covered by the insurance policy. If you change insurance providers it is important that you hold on to the same retroactive date as that in the old policy. While it may cost more for a retroactive date that is several years back, it may be wise to do so. Tank

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■ "Chicken Little Syndrome"

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releases are often not discovered immediately and it may, in fact, be difficult to establish exactly when the release occurred. If the retroactive date is a month ago, and the release can be proven to have happened a year ago, the release is not covered by the insurance policy.

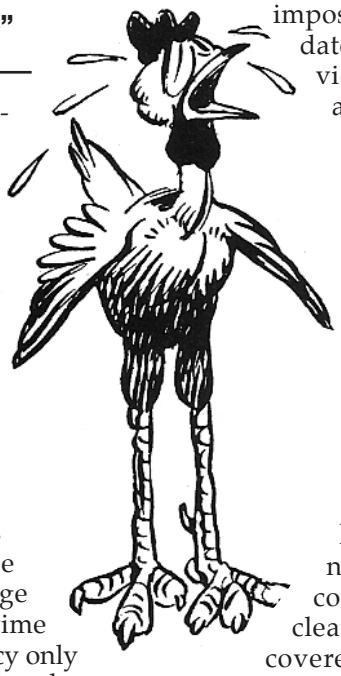
■ What Does Claims Made Mean?

Tank insurance policies are what is known as "claims made." This means that the policy only provides coverage for claims made during the time the policy is in effect. The policy only pays for releases reported during the time period the policy is in effect. Releases reported after the policy expiration date are not covered, even if the release occurred during the policy period. The insured does not typically have a choice in this as virtually all tank insurance policies are claims made.

■ What About Older Tanks?

If your tanks are beginning to reach maturity, typically around twenty years of age, you should inquire as to whether your insurance provider has any policy on issuing insurance on "older" tanks. Some companies have made decisions not to insure tanks over a certain age—typically about twenty years. What can happen in this instance is that if your tanks reach a certain age the insurance provider may offer several options which may or may not be acceptable to you. If you are considering purchasing an older tank and must obtain insurance you should thoroughly investigate what polices are available and at what cost. It may be more prudent to remove and replace older tanks or not to purchase them in the first place. Renewals on policies with tanks over twenty-six years old may be difficult to obtain or the cost may be prohibitive.

Issues on coverage for older tanks also include the fact that if the same insurance provider has covered a group of tanks for many years and maintained a long-standing retroactive date it may be difficult to



impossible to keep that date with a new provider. A new insurance provider may not be willing to issue a policy with a retroactive date back to the original or the cost to keep the original retroactive date may be very high. If you obtain a policy with a current retroactive date and if historic contamination is found, the costs of the historic cleanup might not be covered. Thus you end up with what is known as a "gap in coverage."

■ What Is an Extended Reporting Period (Tail Coverage)?

The federal UST regulations require that all tank insurance include a six-month extended reporting period. An extended reporting period does not extend the policy; it extends the amount of time you have to make a claim to the insurance company. The release must still have occurred during the time the policy was in effect and after the retroactive, but you have six months after the policy expiration date to make a claim to the insurance company. This is important because many releases are not discovered immediately and the policy may have expired before the release is discovered. While a six month extended reporting period is required by the federal UST regulations you may have the option to purchase a longer reporting period.

■ Natural Resource Damages Exclusion or Inclusion?

In both the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Oil Pollution Act (OPA), there are two parts to the "natural resources" definition. First, natural resources are defined broadly to include land, fish, wildlife, biota, air, water, groundwater, drinking water supplies, and other such resources. Second, the resource must belong to, be managed by, held in trust by, appertain to, or otherwise be controlled by the United States, any state, an Indian Tribe, a local government, or a foreign government. Damages are defined as injury to, destruction of, or loss of natural resources. The measure of damages under CERCLA and OPA is the cost of restoring injured natural resources to their baseline condition, compensation for the interim loss of injured resources pending recovery, and the reasonable costs of a damage assessment (see *www.epa.gov/superfund/programs/nrd/faqs.htm*).

Natural Resource Damage (NRD) costs can be significant. Some tank insurance policies may contain an exclusion that expressly eliminates coverage for such damages. You should check your policy to see if such an exclusion exists and if so determine the increased cost to include coverage. NRD damages and restoration costs can be significant.

■ What Is a Storage Tank Versus a Storage Tank System?

Be sure to understand exactly what part of your UST system is covered or not covered by your insurance policy. In the Definitions section of the insurance policy there is always a definition of "storage tank" or "storage tank system." Differences in definition can determine whether a release is covered based on the part of the tank system from which the rel ease is determined to have occurred. If the definition covers only the tanks and the connected piping, releases from other portions of the system such as the dispensing equipment may not be covered. A definition of an UST system that specifically includes the tank, piping, ancillary equipment, containment systems, and dispensing equipment is more likely to cover a release from any portion of the tank system.

■ What Are the Claims Reporting Requirements?

Policies differ in the time requirements for reporting a claim to the insurance company. Some use language such as "as soon as practicable" or "as soon as possible" or they may have a specific time limit, such as "within seven days of discovery." The bottom line is that some policies are more forgiving than others so in all instances report a release as soon as possible.

It's About Doing the Resarch

Research what you are purchasing and make informed decision before purchasing tank insurance.That way your tank insurance house will still be standing after a release occurs.

Further information can be found at: •

- ASTSWMO Guide to Tank Insurance: *http://astswmo.org/Files/Policies_and_Publications/Tanks/2011.10_Guide_to_Tank_Insurance_FINAL.pdf*
- EPA Dollars And Sense – Financial Responsibility Requirements for USTs*: http://www.epa.gov/OUST/pubs/dolsens.pdf*
- ASTSWMO Information for Evaluating UST Financial Responsibility Options: *http://astswmo.org/Files/Policies_and_Publications/Tanks/2002-UST-Financial-Responsibility-Options.pdf*
- EPA Financial Responsibility Webpage: *http://www.epa.gov/oust/ustsystm/finresp.htm*
- EPA List of Known Insurance Providers for USTs: *http://www.epa.gov/swerust1/pubs/inslist.htm* ■

Thoughts from OUST on Changes in the Insurance Industry

In June, OUST Director Carolyn Hoskinson sent the following [edited] memo to the states in response to news that Zurich American Insurance Company (Zurich) was getting out of the UST insurance business.

To ensure UST owners and operators (o/os) are buying and retaining appropriate coverage for their UST systems, they should understand and be attentive to the underlying language, terms, and conditions of their policies.

The particular development that sparked my desire to send this reminder was that USEPA recently learned that Zurich will no longer issue new UST insurance policies and will not renew existing UST insurance policies. Because Zurich has been one of the major national UST insurance providers over the years, USEPA is aware that many UST o/os across the United States have used Zurich's UST insurance policies to provide coverage against corrective actions and third-party damages. If you are one of them, and you are now converting to a new policy, now would be a great time to read it carefully and ensure you have the coverage that you need.

But I'm addressing this memo to all o/os, and the states who oversee them, because it is essential for everyone to carefully discuss their policies with their insurance agents or brokers to make sure owners fully understand the coverage they are purchasing and what their responsibilities are under their policies, should they have a release from their UST systems. You don't want to find out after a release that you bought a policy that isn't going to cover you.

To my state colleagues: remember that when you're inspecting your facilities, and confirming that they are meeting their FR obligations, it is important to ensure that not only do they have a policy, but that it meets the specific federal and state requirements.

See Jill Hall's article, "Unlocking the Mystery of FR," to see a list that includes Carolyn's recommended insurance resources. ■

■ Methane at LUST Spill Sites

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This paper has been reviewed in accordance with the U.S. Environmental Protection Agency's peer and administrative review policies and approved for publication.

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A Message from Carolyn Hoskinson

Director, USEPA's Office of Underground Storage Tanks

Alas, the Lingering UST Release

In the December 2010 *LUSTLine*, I wrote about USEPA's study to reduce the underground storage tank cleanup backlog (see "Move Over Sisyphus, Here's a Real Challenge: Reducing The National LUST Cleanup Backlog"). That study, which we released in September 2011, provided us with an insightful look at the remaining UST cleanups. Since then we have been working with states to develop strategies and keep all UST release cleanups moving forward to closure.

I readily admit we still have lots more work ahead of us to address the approximately 85,000 UST releases remaining to be cleaned up. Conversely, I readily concede that over the past few decades the UST program has toiled long and hard to close a whopping 419,000 releases, or 83 percent of UST releases. That is great progress! (Dare I say "eat your heart out" to other cleanup programs?) Nonetheless, I want to ensure we continue using a wide array of strategies and approaches to keep cleanups moving toward completion.

Our decades of experience show that the process of confirming a release, cleaning it up, and closing a site takes time—an average of five to seven years for that process to reach completion. Just as cleanup costs at leaking UST sites can vary widely depending on the extent of contamination and whether or not groundwater is affected, so too can the time to clean up and close a site vary. Other factors such as speed of the selected remedy and geology of the contaminated area also affect the length of cleanups.

That said, I believe we can all agree that many UST release cleanups are not moving along according to that average time, or even what I believe is a reasonable amount of time. Many UST release cleanups are not progressing at a steady pace and are taking much longer to reach completion.

The bottom line is that we all want to see UST releases, including those stalled ones, cleaned up. That's our job, and along with preventing releases, cleaning up releases is one of the key goals of the UST program. Plus it is the right thing for our environment and our health.

What Did the Study Show Us?

Our September 2011 study provided a thoughtful, methodical look at a large portion of the UST release universe. We gained useful insight from the study about the remaining UST releases. Based on data in the study and what we heard from states, UST releases to be cleaned up essentially fall into two categories: current workload (those releases the UST program is actively addressing) and legacy releases (those releases that linger on the to-do list).

I fully expect that state UST programs will continue to do what they have done for decades. They will make significant and meaningful progress on releases in the workload pipeline. It is those stalled, legacy releases that warrant additional attention. USEPA will focus our sights on those releases to determine what the national UST program can do to address them.

Based on data in the study and conversations with states, there are common themes that impact cleanups: money (or rather lack of it, including releases not covered by insurance or outside state fund coverage); technical issues; abandoned releases; and recalcitrant owners and operators. While there are many similarities in states' approaches to cleaning up releases, each program is unique. That means states are tailoring the strategies they use to address legacy releases to meet their state-specific circumstances and needs.

What Are States Doing Now?

Many states are currently using a wide range of strategies to successfully chip away at their legacy releases. Here are some examples of proven techniques states are using now.

Money. Although money is always an issue, sometimes we can get a bigger bang for the buck or find another rock to peek under.

- **Florida** recently allocated money to screen UST releases based on their threat to human health and the environment. Florida determined that releases posing a threat will receive money for cleanup and those not posing a threat will be closed. Florida intends to screen approximately 8,000 releases under this initiative.

Inventory Assessment. Whether a file-by-file review or targeted search for release cases close to closure, understanding which types of UST releases still need to be addressed helps identify opportunities for closing releases.

- **Missouri** successfully used technical contractors to review files. Augmenting state staff, contractors assisted with reviewing paperwork for both low and high priority releases. The result was closing several lower priority releases and faster cleanup at higher priority releases. In particular, Missouri closed 113 low priority releases through this project and significantly cut review time for high priority releases.

Staffing Solution. Limitations on the number of state staff for oversight can slow cleanups. Using an alternative to state staff can increase the number of cleanups.

- **New Jersey** in 2012 started a program where licensed site remediation professionals (LSRPs) directly oversee cleanups. New Jersey's statute lays out proscriptive requirements that LSRPs follow when overseeing

Message From Carolyn Hoskinson, *continued*

cleanups. New Jersey licenses LSRPs, audits LSRPs' work, and conducts program enforcement. In the first half of fiscal year 2012, New Jersey completed 350 cleanups, which is more than they addressed during fiscal year 2011.

Where Do We Go from Here?

At a basic level, cleaning up releases is one of the UST program's key goals and a cornerstone to what we do. And that includes cleaning up all releases, the current workload as well as legacy releases.

We all need to work toward the common goals of moving UST release cleanups forward, looking for efficient ways to close release sites, and ensuring our solutions protect human health and the environment. I believe that eventually our UST cleanup program will reach a steady state, where legacy releases have been addressed and only workload releases remain. I'm looking forward to that day. ■

Drought-Devastated Corn Crop Leads to Calls for USEPA to Revisit Ethanol Quota

by Ellen Frye

U.S. Department of Agriculture July 30 reports indicate that 48 percent of the nation's 2012 corn crop was rated in poor to very poor condition, a result of the worst drought the U.S. has experienced in 55 years. USEPA has been under intense pressure from groups, including livestock producers, governors and members of Congress from livestock-producing states, humanitarian interests such as the U.N. Food and Agriculture Organization, and the American Petroleum Institute, to change or at least temporarily waive the Renewable Fuels Standard (RFS). The RFS, created in 2005 as a bipartisan effort to establish more investment in domestic energy production, mandates that 13.2 billion gallons of ethanol be produced this year—42 percent of this year's corn crop.

A central issue for those who want the waiver (aside from those concerned with increasing petroleum sales) is concern that the growing share of corn as a fuel source is driving up the price of corn as a food source, and the drought has dramatically exacerbated this problem. The International Food Policy Research Institute has recommended the U.S. immediately stop using corn to make ethanol for fuel "to prevent a potential global food price crisis."

At the other end of the spectrum are groups such as the Renewable Fuels Association, the National Corn Growers Association, and other agribusinesses. Although a number of ethanol plants have reduced or temporarily halted production, plunging U.S. ethanol production to a two-year low, these interests argue that corn ethanol is helping ensure U.S. energy independence, keeping gasoline prices lower, reducing pollution, and protecting U.S. companies and jobs.

US EPA is requesting public comments on the RFS waiver requests filed by Arkansas Governor Mike Beebe and North Carolina Governor Beverly Perdue in mid-August. The request was published in the *Federal Register* on August 30. Comments will be accepted for 30 days, unless an extension is sought and granted. Publication in the Federal Register begins the clock on the 90-day period in which USEPA must rule on the petition request. That makes a decision likely in mid-November.

There is currently no indication from USEPA that it will waive the RFS mandate. The International Energy Agency (IEA) says for the RFS to be waived "it needs to be proved that it is inducing economic harm on livestock producers who can not afford to pay for corn at the heightened price levels." According to the IEA, "Most refiners have adjusted to replace around 10 percent of their gasoline production with ethanol and in addition have adopted ethanol as an octane enhancement for regular gasoline, both of which could mean domestic demand might remain strong even without the mandatory ethanol quota in place."

The good news is that scientists are working on profitable substitutes for corn to make ethanol, including grain sorghum. Now if we could only do something about that feast or famine weather—one year its the floods, the next the droughts?

Gearing Up for E15?

Meanwhile, on June 15, USEPA gave final approval for 57 companies to sell gasoline-ethanol blends containing up to 15 percent ethanol (E15).

This action came as a result of USEPA's final approval of the companies' misfueling mitigation plans (MMPs). This means that these 57 companies have met all Clean Air Act requirements related to E15 and may lawfully introduce E15 into the marketplace. Petroleum marketers are reminded that there are a number of additional factors, including requirements under other federal, state, and local laws, that may affect the distribution of E15. YEP! ■

But You Can Judge a Tank by Its Standards

by Wayne B. Geyer

At the 2012 National UST Conference in St. Louis (and also in the December 2011 LUSTLine*), Marcel Moreau reported on double-walled and jacketed tank failures in Maine over the past five years. Marcel and I happened to sit next to each other at a luncheon the day after his presentation in St. Louis. I expressed my surprise to Marcel that the Steel Tank Institute (STI) had not "experienced" a rash of failures in its administration program for STI-labeled tanks. Marcel, in turn, was surprised that STI was not aware of the Maine data. I expressed an interest in doing some further investigation.*

What's Behind the STI Label?

In order to continue, I need to take a moment to discuss what makes a tank an STI tank. *LUSTLine* readers are probably familiar with underground storage tanks bearing the STI label, but they may not be aware of the program STI administers that permits a manufacturer to label a tank as an STI technology.

- Tanks bearing the names ACT-100®, sti-P3®, Permatank®, and ACT-100U® are fabricated to written standards. All revisions to the standards are reviewed by tank fabricators and approved by the governing body. STI's staff engineers administer STI standards.
- STI's underground tank technologies meet the requirements of codes and regulations mandating that tanks be listed by third-party test laboratories. STI staff work closely with Underwriters Laboratories and is thoroughly involved in the UL standards development process, while also ensuring that STI tank technologies are in compliance with those standards.
- STI employs a full-time quality control director who oversees an inspection team. These personnel randomly perform industry-supported inspections of tank fabricator construction processes, assuring high-quality workmanship and compliance with STI and UL requirements. Many of the inspectors are former quality assurance personnel in tank fabrication shops.
- STI mandates that tank fabricators labeling tanks with the STI name must purchase third-party warranty and environmental impairment insurance. The insurer has a strong claims-handling reputation, and STI and the fabricators receive regular feedback to validate steel tank performance and compliance with quality standards and design requirements. For example, based on over two decades of claim-handling experience, we know that external corrosion failures of properly installed and maintained STI-labeled steel USTs is a thing of the past.
- Every tank built with the STI label is required to have an associated inspection form on file. STI also expects tank owners to file a warranty validation card with STI. STI maintains a database of over 400,000 tanks, recording tank capacities and dimensions, year of fabrication and installation, type of fuel stored, tank installation locations, and other important information.

The Investigation

So, Marcel agreed to furnish me with data from the State of Maine records, including facility name, location, tank manufacturer name, capacity and product stored, type of tank, and dates of installation and discovery of liquid in the interstice. I also received a history of third-party warranty insurance claims in the State of Maine. While the records were considerably more complete than I had anticipated, there was some important information lacking. For example, the cause of release to establish how liquid entered the interstice was not identified in a majority of incidents.

I compared some of these records against STI's database and the insurance claim dates and was able to determine that approximately 10 percent of the tanks had the STI label. This low number was perhaps the reason STI was not aware of the failure history in Maine. I performed additional evaluation of the data (again with the caveat that not all the data were available; nor did I discuss the data with State of Maine regulators), and here is what I found:

- Over 40 percent of the tanks were built to a non-STI labeled jacketed tank technology by a manufacturer in the Northeast who later went bankrupt. This company was in business for less than 10 years. There was no industry-supported quality inspection program or third-party warranty insurance program.
- More than 20 percent of the tanks were a non-STI labeled polyethylene jacketed tank technology. The company providing the jacket to steel tank manufacturers made polyethylene flexible pipe systems, and is also no longer in business. There was no industry-supported quality inspection program or third-party warranty insurance program.
- Some systems built by a company in Canada were noted to be cathodically protected. These tanks may have been built to ULC standards. The Canadian company is no longer in business. There was no industry-supported quality inspection program or third-party warranty insurance program.

Quality Versus Commitment

Readers will draw their own conclusions from these data, but at STI, we believe that our program makes a difference in performance.

I must add one more important comment. Many STI tank fabricators are second- or third-generation, family-owned businesses. As such, they are in business for the long term, not just to make a quick buck today without caring about the future

integrity of their product. I remember one such company with a long and successful history. When it was bought out, the new owner began offering performance commitments far beyond the industry norm, only to go out of business several years later.

Tanks manufactured by companies with a substantial track record show better performance, regardless of whether the tank is labeled and registered with STI. They have good reputations in the industry for servicing their customers and providing a high quality product.

The good news is that double-walled steel tanks and jacketed tanks are functioning the way environmental regulators intended them to function. Releases from secondary-contained steel tanks are usually small and within the interstice, rather than catastrophic releases into the external environment; as a result, no hazardous liquids are released.

Over the next decade of tank operations, regulators and owner/operators will continue to face challenges in preventing releases to the environment. A new generation of sumps, overfill protection devices, and similar equipment should address some of these concerns. Compatibility with new fuels will continue to challenge existing elastomeric and nonmetallic materials. Owner/operators will face the persistent challenges of keeping tank bottoms free from water and sludge and filters free from clogging.

The importance of tank fabrication standardization, industry support of technology, quality inspections, and cause-of-release investigations will only expand in significance to the industry. ■

Wayne Geyer is Executive Vice President of the Steel Tank Institute/Steel Plate Fabricators Association. He can be reached at wgeyer@steeltank.com.

NEIWPCC Providing Timely Training for State UST/LUST Personnel

by Jaclyn Harrison

The New England Interstate Water Pollution Control Commission (NEIWPCC) has been working with USEPA's Office of Underground Storage Tanks (OUST) for over 25 years to enhance information sharing among state, territorial, and tribal UST, LUST, and Financial Responsibility programs. Funded through a cooperative agreement with USEPA OUST, NEIWPCC has been actively developing inspector-training opportunities for the past two years. Due to the success of these offerings, this year, NEIWPCC will be expanding its training initiatives to include corrective action topics.

Our goal is to develop and deliver training courses—available both in-person and online—that reflect the needs of the states and are directed toward protecting the environment and human health from potential UST releases. The courses assist in increasing national UST compliance by enhancing the quality of UST enforcement inspections. Likewise, corrective action training will help establish or improve employee technical capabilities, increase LUST and Financial Responsibility program performance, and hopefully minimalize the impact of releases to the environment.

Our challenge is to come up with a menu of different options and approaches from which regions can pick and choose and at the same time provide consistent national opportunities. NEIWPCC works with advisory committees to develop regional and national trainings that meet the needs of each USEPA region. The committees are comprised of state, tribal, and federal staff who are willing to lend some of their time and expertise to training development. Regions have a variety of options to choose from based on the recommendations of these committees and are able to choose the programs that best meet the needs of the states in their region.

In a time of increasing budgetary constraints, more and more state UST/LUST program staff are trying hard to do more with less. Many agencies do not have funding for training or funding to reimburse travel expenses to attend out-of-state training opportunities. NEIWPCC is trying to step in and fill this niche both by offering free training to state, territory, and tribal employees and reimbursing travel expenses for these employees. The result is training that leads to increased job satisfaction and motivation, efficiency and consistency, capacity to adopt new technologies and methods, increased innovation, and reduced employee turnover.

Two Types of Training

We provide state UST/LUST program personnel with two types of training:

Online, Issue-Specific Training. Our webinars are given live and then recorded and archived on the NEIWPCC website for future viewing. This way those who were not able to participate in the live event can download and view the webinar at their convenience. Subjects offered in these webinars have included tank and line testing, secondary containment, corrosion and cathodic protection, new installations, high-throughput facilities, and automatic tank gauges.

In-Person Advanced Classroom Training. Sessions last approximately two days and include information delivery and attendee discussions on identified topics, as well as involvement from manufacturers and vendors to learn about new products. NEIWPCC works with a planning team to identify key questions and topics that should be addressed in each session. Examples of classroom training include alternative fuels and compatibility, inventory control and SIR, Veeder-Root, interstitial monitoring, and leak detectors. At one training session, Crompco, a tank

■ *continued on page 20*

Field Notes

from Robert N. Renkes, Executive Vice President, Petroleum Equipment Institute (PEI)

PEI Publishes UST Equipment Testing Recommended Practice

USEPA's 1988 underground storage tank regulation required owners and operators to install improved UST system equipment to detect and prevent releases; however, it did not require proper operation and maintenance for some of that equipment.

USEPA believes that owners and operators need to properly operate and maintain their UST system equipment in order to prevent and quickly detect releases. As a result, USEPA proposed in November 2011 to add requirements for periodic spill, overfill, secondary containment, and release detection testing and verification. These tests, according to USEPA's proposal, must be conducted according to one of the following:

- Requirements developed by the manufacturer of the equipment;
- A code of practice developed by a nationally recognized association or independent testing laboratory; or
- Requirements determined by the implementing agency to be no less protective of human health and the environment than the first two bulleted items.

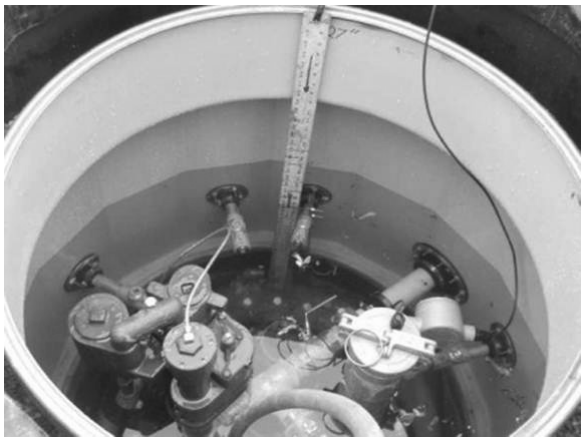
In the November 18, 2011, *Federal Register* notice, USEPA wrote that it knows of one code of practice currently being developed that may address tightness and operability testing of equipment. That code of practice, PEI's *Recommended Practices for the Testing and Verification of Spill, Overfill, Leak Detection and Secondary Containment Equipment at UST Facilities* (PEI/RP1200), was finalized in July and is now available to those who wish to know more about the subject. USEPA plans to review the recommended practice and decide whether to include it in the final UST regulation.

The plumber's plug provides a leak-tight connection to draw a vacuum on the tank interstitial space.

The test methods in this recommended practice relative to integrity testing of spill buckets, containment sumps, and secondary containment are based on current industry practices and are intended to demonstrate that a leak from the primary containment will be detected before it reaches the environment.

The document describes the wet (liquid-filled) and dry (vacuum) method for testing the integrity of tank secondary-containment systems. A pressure test (5 psig) is used to test the integrity of piping interstitial space.

The document outlines hydrostatic and vacuum test procedures for single-walled spill buckets and a vacuum method for testing the integrity of the primary and secondary containment of double-walled spill buckets. The integrity of containment sumps is tested hydrostatically. While vacuum test methods are available for containment sumps, the recommended practice does not describe how to use that test method but rather refers the user to the manufacturer's instructions.



The test fluid level in the tank sump must be at least 4 inches above the highest sump penetration or sidewall seam.

Although the effectiveness of overfill prevention devices can be tested by attempting to overfill a UST with product and determining how well the device functions, this approach is not recommended by the committee responsible for writing this recommended practice. The committee stresses that any malfunction in the overfill prevention device when attempting to overfill the tank could result in a product release that could cause a threat to public health and safety as well as environmental damage.

Instead, automatic shutoff devices (flapper valves), ball float valves, and overfill alarms are inspected to verify that they are installed correctly, operating properly, and will shut off flow (flappers and ball floats) or provide a warning (alarms) at the specified level required in the federal UST rules.

The inspection and testing of electronic monitoring systems and automatic line leak detectors (mechanical and electronic) are covered in PEI/RP1200, as are shear valves and emergency stop switches.

Sample test data sheets that can be used when conducting testing and verification of spill, overfill, leak detection and secondary containment equipment, shear valves, and emergency stops at UST facilities are included in one of the appendices. Electronic versions of the forms also are available at *www.pei.org/rp1200*.

Field Notes continued

PEI's document is not without its detractors. Several comments to USEPA's proposal assumed (correctly, in our opinion) that since many of the UST equipment manufacturers do not have prescribed methods for testing their equipment while in-use, the only method for meeting USEPA's testing requirement will be a code of practice developed by a nationally recognized association. This causes heartburn for some tank owners. The Fuel Merchants Association of New Jersey commented that the testing and inspection procedures described in PEI's document use untried, overly aggressive methods.

The Louisiana Oil Marketers and Convenience Store Association (LOMCSA) is concerned that testing parameters will be followed that will lead to a high rate of failure resulting in the unnecessary and very costly replacement of otherwise functional and structurally sound UST components. Moreover, LOMCSA objects to USEPA's reliance on industry standards for testing and inspection procedures developed by organizations that stand to benefit financially for the sales and installation of new UST equipment. LOMCSA believes such standards are biased against small business petroleum marketers who have no real input or influence over the drafting of such standards.

And finally, the Petroleum Marketers Association of America maintains that given the impact this recommended practice will have on regulatory compliance costs, USEPA should withdraw the proposed rule until after a final PEI/RP1200 is published and an Initial Regulatory Flexibility Analysis (IRFA) can be conducted based on the known costs of the proposed interstitial testing requirement.

It is now up to USEPA to decide whether or not to include the recommended practice in its final UST regulations. I believe the committee that wrote the document—made up of representatives from equipment suppliers, tank owners, leak detection and release prevention testers, industry-related association and the regulatory community—were fair and open to all people and organizations who commented on its draft publication.

The single-copy price for PEI/RP1200 is $40 for PEI members: $95 for nonmembers. Member pricing is extended to all regulatory officials. For more information about this special pricing for regulators, contact Sondra Sutton at PEI: 918-236-3967 or ssutton@pei.org. ■

Report on Ultra Low Sulfur Fuel Equipment Corrosion Blames Acetic Acid

Since 2007, the fuel storage industry has been reporting unexpected corrosion of metal components in systems storing and dispensing ultra low sulfur diesel (ULSD). Reports and pictures received from Petroleum Equipment Institute (PEI) members show (gross) corrosion coating the majority of metallic equipment in both the wetted and unwetted portions of USTs storing ULSD. Robert Renkes, PEI Executive Vice President, has been keeping us up to date on this in *LUSTLine*.

To investigate the problem in an objective manner, eight stakeholders in the industry, including PEI, funded a research project through the Clean Diesel Fuel Alliance (CDFA). That project, undertaken by Battelle Memorial Institute, has now been completed, and a 146-page PDF report, *Corrosion in Systems Storing and Dispensing Ultra Low Sulfur Diesel, Hypotheses Investigation*, discussing the findings has been posted on the CDFA website (*www.clean-diesel.org/pdf/ULSDStoringSystemCorrosion.pdf*).

The report concludes that corrosion in systems storing and dispensing ULSD is likely due to the dispersal of acetic acid throughout tank systems. The acetic acid is likely produced by Acetobacter bacteria feeding on low levels of ethanol contamination. The cross-contamination could be due to switch loading or manifolded vent systems, although the report urges further study to establish the "causal link."

The acetic acid is deposited throughout the system when it is dispersed into the humid vapor space (ranging from 72 percent to 95 percent) by the higher vapor pressure and by disturbances during fuel deliveries. This results in a cycle of wetting and drying of the equipment concentrating the acetic acid on the metallic equipment and corroding it "quite severely and rapidly."

Battelle recommends further research on this issue. For example, Battelle suggests a larger and more diverse sample set, with the sites sampled multiple times over a period of time. In particular, Battelle proposes that steel USTs and tanks without corrosion problems be investigated. Furthermore, Battelle advises that the source and magnitude of the ethanol contamination should be determined.

So, in the next issue of *LUSTLine*, Robert Renkes, in his Field Notes column, will discuss the next steps in this ULSD conundrum. ■

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■ **NEIWPCC Training for UST/LUST Personnel** *from page 17*

testing company, opened lids, pulled drop tubes, and then walked trainees through some of the testing they do.

At the completion of each training session we ask attendees to respond to an online feedback survey, which covers the webinar/class structure, content, and opportunities for improvement. Results are compiled and provided to the speakers and advisory committees to enhance the development of future training. These surveys also provide an opportunity for attendees to suggest future topics for classroom or webinar trainings.

To find information on webinars, classes, and other online resources, visit www.neiwpcc.org/ust.asp. Please continue to check back regularly as we expand our online clearinghouse for corrective action training. If you would like the opportunity to provide feedback and guidance on training needs, contact Jaclyn Harrison, NEIWPCC's tanks program manager, at 978-349-2507 or jharrison@neiwpcc.org. ■

What Classroom Training Participants Are Saying…

"This was a very good training meeting. There were a lot of newer inspectors there and inspectors that do not remove equipment during inspection. These new inspectors go to see equipment and find out how they work."

"The information was clear and concise, the presenters were enthusiastic in their discussions, and the information shared will definitely improve my performance and perspective. I thoroughly enjoyed this training."

"The presenters were very effective in their delivery of the material. They all answered questions from the group as they came up—some unrelated to the material being presented, but specific to a question the inspector had been involved in. This was very helpful to the class. Relating to actual examples, as well as giving the general presentation was very beneficial and will help me in my job during the future."

"Great course…great overview and I'd love to participate in more events that allow states to discuss their different approaches to solving problems."

What Webinar Participants Are Saying…

"Loved it! I am grateful that much-needed training was offered for inspectors in a time when financial constraints and lack of funding will not allow it."

"Keep it up. Now that we can't travel, this is a good way to share information."

"Thanks for the effort from all involved in giving us valuable information on doing our jobs."

"I have learned more about corrosion protection from these three presenters than I had in five years of on the job training. Thanks!"

"Thanks for the opportunity to get a good overview from experts in the field."