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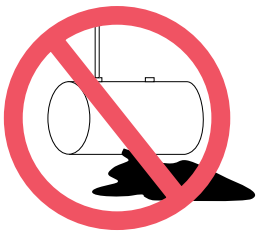

A Report On Federal & State Programs To Control Leaking Underground Storage Tanks

Transition

What's in Store for Tanks and Tank Programs Over the Next Decade—Part 1

by Ellen Frye

Change happens...all the time...every which way you turn...but these days, things seem to change at lightning speed. Communications technologies are passé almost before they get started. MP3? Facebook? Twitter? Enjoy your fifteen minutes of fame! Cell phones? It's only a matter of time before they're implanted in our brains so all we'll need to do is think a conversation. Even the climate can't be depended on. Change happens, and we all need to get with the program or be washed out to sea by that "gotcha" wave. And that means tank programs too.

So as we enter the second decade of this millennium, it seems as good a time as any to take a peek into ye olde crystal ball in an attempt to fathom what is clearly a transition into that great unknown looming on the fuel storage tank horizon, so that we, like the Boy Scouts, can be prepared to be prepared.

This exercise has taken the form of a series of questions formulated by a small group of industry and regulatory aficionados, including Patricia Ellis, Delaware NREC; Kevin Henderson, Mississippi DEQ; Robert Renkes, PEI; Marcel Moreau; Anne Hines, Arkansas Marketers Assoc., Inc.; Andrea Barbery and Hal White, USEPA OUST; Carol Eighmey, Missouri PSTIF; and Wayne Geyer, STI/SPFA. We have asked the questions and provided reasons for the questions, but we have not necessarily attempted to provide answers...maybe just some speculation. We have compiled so many questions that it has become necessary to split them between this issue of LUSTLine *and the next. The next set of questions will look more into UST/LUST program specifics. We welcome your thoughts and questions.*

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Inside

■ **Transition** *from page 1*

Just Wondering...

What will retail-fueling operations look like by the end of this decade?

When we talk about transitioning, the big question is: Transitioning to what? For gasoline-type vehicles, alternative fuels include alcohol, biobutanol, biodiesel, methanol, liquefied petroleum gas, compressed natural gas, hydrogen… What will retail-fueling facilities be selling? How will they accommodate the many potential choices, or will just one or two choices bubble up to the top? Today's fuel retailer is caught in the middle of this transition, needing to be competitive in order to be viable but having precious little control over how things play out.

Will fuel stations need to be mega-sized in order to handle all the available fuel types? Where, as you drive in, you are directed to an area for liquid fuels for cars (e.g., gasoline, ethanol-blends), an area for diesel-like fuels (e.g., diesel, biodiesel, blends), electric-vehicle recharging areas, and areas where there are fuels that are gaseous in nature (e.g., LPG, CNG, hydrogen)?

Then again, it seems very likely that we are transitioning to electric cars or solar fuel cells. Will these technologies even need a service station? Electric cars appear to be very much on the horizon, and it appears likely that charging stations will be located at places like garages and restaurants, where vehicles will be able to stay put for the 30 minutes or so needed for a charge.

The new "green" design Element Hotel in Lexington, Massachusetts includes a charging station for electric vehicles. The station is equipped with a universal plug-in for all kinds of electric vehicles including cars, buses, Segway scooters and bikes. Drivers can simply swipe a card, plug in, and charge up their electric vehicles at the station.

What is the fastest growing fuel-storage-tank sector?

The fastest-growing type of fuel storage tank being installed in the U.S. is the nonretail aboveground tank, and especially the generator-base diesel standby, or emergency generator, tank. Banks, credit card companies, phone companies, hospitals, governments, gas stations, and other entities that require continuous power are installing these systems by leaps and bounds nationwide. An industry source estimates there are over one million commercial diesel standby generator sets in the U.S.

While there doesn't appear to be a central source for tracking the size of this standby generator tank population, a rough guess from our industry source is that over 60 percent of them are fueled from standard cylindrical tanks (both above and below-ground) and about 30 to 35 percent of them are fueled from rectangular tanks, usually installed as a base for the generator set. The average tank ranges from 300 to 500 gallons in size.

Under the federal rule, underground generator fuel tanks are subject to all requirements except leak detection. The aboveground tanks are essentially unregulated, unless by a state. So the question here is: Are we comfortable with the fact that there are many aboveground storage tanks out there that are fully capable of leaking into the environment and yet fall between the regulatory cracks?

Emergency generator system.

L.U.S.T.Line

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Now that the major oil companies are all but gone from the retail end of the business (fewer than 5 percent of retail facilities are still owned by API members), who owns these facilities these days (mom and pops, jobbers, foreign oil companies, new non-English-speaking Americans)? What will the future ownership trends be, and what should tank regulators be doing now to prepare for those changes?

We have seen a variety of trends in tank ownership over the years, with implications for UST program implementation. For example, there was a major consolidation in the first half of the program, with many retailers leaving the business, replaced by fewer but higher throughput facilities. We also saw a major exodus of nonmarketers, choosing to forsake the convenience of having their own fuel supply in order to avoid the cost and liability of proper tank management. More recently, we've seen an exodus by major oil companies, with an influx of small, often single-station owners.

The good news is that as of September 2009, there are only about 611,000 active federally regulated USTs (at approximately 223,000 sites), in contrast with the more than 1.7 million substandard USTs back in 1984. But mind you, average tank size being manufactured has grown from about 8,000 gallons back in 1985 to a whopping 15,000 to 20,000 gallons today—fewer retail facilities, bigger storage capacity.

So regulators are dealing with about one-third of the pre-regulation tank universe. In terms of compliance with the UST requirements, as of September 2009, 66.4 percent of UST facilities were in "significant operational compliance" with both the release-prevention and leak-detection requirements.

But today's UST owners/operators have the increasingly daunting job of keeping up with the many responsibilities that go with owning these facilities. (See "If I Had to Choose Just One Way of Achieving UST Operational Compliance…" on p. 12). The majors were pretty good at keeping up because they typically had corporate management systems in place. Jobbers who have been in the business for years may be in good shape, but what about those who are new to the regulated and environmental liability-laden world of USTs?

Many of the new owners have retail backgrounds, but not necessarily backgrounds that include managing an underground storage tank system. The National Association of Convenience Stores (NACS) is the industry's leading advocate on motor fuels policy and represents 80 percent of the country's retail fuel sales. The majority of its members are small, independent operators. More than 70 percent of its total membership is comprised of companies that operate ten stores or less. Of the 145,000 convenience stores in the United States, 62 percent are owned and operated by someone who only has one store.

There is a good reason why retail gasoline marketing has become so often tied to the convenience store (C-store): The marriage has evolved as both necessary and symbiotic. With highly volatile net profits on fuel (lately in the vicinity of 2 cents a gallon on a good day) for gasoline retailers, business profit margins are well enhanced by sundry sales inside the store, but the fuel needed for our vehicles is the bait.

Will states need to go back to square one, or at least square two, to connect with new tank owners/operators and educate them about regulations and proper operation and maintenance? Which bring us to the next question…

> *"We are already seeing the number of petroleum suppliers, wholesalers, and retailers shrinking. It started back in 1998 and has been getting progressively worse. At one time we had 258 petroleum wholesale members in Arkansas. For the ones who are actually based in Arkansas, our membership is close to 160 now. And the number of retailers has also been shrinking. I have areas in South Arkansas (the Delta) where it is routinely 15 to 20 miles between retail locations. Now, that may not be much in Wyoming but in a populated area, it is a long distance.*
>
> *And, I think more and more of them will sell to a competitor or, what I am also seeing, just close their doors before they lose any more money. While I think gasoline will be a viable fuel for a number of years, we have been trying to position our members to where they can sell whatever fuel a customer wants."*
>
> *Ann Hines*
> *Executive Vice President,*
> *Arkansas Marketers Association, Inc.*

Will the operator training requirements of the 2005 Energy Policy Act (EPAct) have the desired effect?

It stands to reason that operator training and certification will afford operators a better understanding of what they must do to operate and maintain their UST systems and comply with UST regulations…but to what degree? It still all depends on enforcement. States have to be willing to provide frequent, consistent, slap-on-the wrist enforcement if owners and operators are to learn what they need to learn and then DO what they are supposed to do. There is still something to be said for the old "fear of getting caught" mindset. Without effective enforcement, the results of the operator training initiative are likely to be disappointing.

We must also take into account certain barriers that may well come into play with regard to the success of operator training:

- **Language** – Many single owners/operators may not speak and understand English well enough to engage effectively in state training programs.
- **Complexity** - Rules have become even more complex as a result of the 2005 EPAct requirements.
- **Economic** - Hard times dictate that many owner/operators must make choices. What will win out, paying the beer vendor or testing the automatic line leak detectors?

■ *continued on page 4*

■ **Transition** *from page 3*

- **Culture/attitude** – Regulations are often not easily understood by some recent immigrants and are not viewed favorably by some longtime U.S. residents.

Can regulators mitigate these barriers?

? Will the goals of the federal Renewable Fuel Standard (RFS) be achievable if we continue in the direction(s) we are heading (i.e., mainly E10 and little E85, biodiesel, or cellulosic ethanol in production)?

The RFS program was created under the EPAct, requiring the volume of renewable fuel blended into gasoline to reach 7.5 billion gallons by 2012 (RFS1). Under the Energy Independence and Security Act (EISA) of 2007, the Renewable Fuel Standard program increased the volume of renewable fuel required to be blended into transportation fuel to 36 billion gallons by 2022 (RFS2). Of these modifications, several are notable. First, the required renewable fuel volume continues to increase under RFS2, reaching 36 billion gallons by 2022. The chart below shows the volume requirements from EISA.

In a February 16th speech at the Renewable Fuels Association conference, General Motors Vice Chairman Tom Stevens said that half of the company's vehicle line-up will be able to run on E85 by the 2012 model year. He noted that 12,000 or more ethanol stations are needed "to have ethanol fuel available for every one of our customers within about two miles of where they live." So it appears that at least automobile manufacturers are taking RFS2 requirements seriously.

? What impact will E15 have on existing UST systems and gasoline retailers?

Chances are that USEPA will give the green light to 15 percent ethanol (E15) in gasoline (a decision is expected by late summer 2010) for at least a portion of the existing vehicle fleet. Compatibility of most UST systems with E10 may not be much of an issue, although we can't be certain. On the other hand, UST systems storing E85 often need to be built from scratch with alcohol-compatible materials. At what point between 10 percent ethanol and 85 percent ethanol should the UST regulatory community be concerned?

And what about older cars and small engines (e.g., boats, lawnmowers, weed whackers) that are not compatible with higher ethanol percentages? It seems unlikely that very many marketers will give up E10 and sell only E15. But how many marketers have an extra tank lying around that they can use for E15? How many will want to invest the tens of thousands of dollars it will take to dispense E15? And how many customers will want to buy E15 when they see their mileage per gallon decreasing as the percentage of alcohol increases?

Storage system compatibility issues aside, what's a marketer to do if he wants to store, meter, and dispense E10 and E15 fuels? Chances are it will cost him more money but only yield the already slim profit margin. Will tank owners continue to fall by the wayside if they feel the investment will just put them deeper in a hole?

EISA Renewable Fuel Volume Requirements (in billion gallons)

Year	Cellulosic biofuel requirement	Biomass-based diesel requirement	Advanced biofuel requirement	Total renewable fuel requirement
2008	n/a	n/a	n/a	9.0
2009	n/a	0.5	0.6	11.1
2010	0.1	0.65	0.95	12.95
2011	0.25	0.80	1.35	13.95
2012	0.5	1.0	2.0	15.2
2013	1.0	a	2.75	16.55
2014	1.75	a	3.75	18.15
2015	3.0	a	5.5	20.5
2016	4.25	a	7.25	22.25
2017	5.5	a	9.0	24.0
2018	7.0	a	11.0	26.0
2019	8.5	a	13.0	28.0
2020	10.5	a	15.0	30.0
2021	13.5	a	18.0	33.0
2022	16.0	a	21.0	36.0
2023+	b	b	b	b

a *To be determined by EPA through a future rulemaking, but no less than 1.0 billion gallons.*

b *To be determined by EPA through a future rulemaking.*

Assuming that the fuel blend will change, what should tank regulators do to position themselves to accommodate the new fuels on the horizon without risking new releases or more challenging cleanups, and how can we anticipate and manage the unintended consequences of increased use of biofuels?

On the leak prevention end, regulators want to know that UST owners and operators are using equipment that is compatible with the fuel being stored. A number of states (including IA, NC, and WI) require UL-listed equipment or manufacturer's certification for use with ethanol blends greater than 10 percent. A good way for owner/operators to do this is verify the UL listing or contact the manufacturer. However, in cases where the owner/operator cannot show a UL listing or documentation from the equipment manufacturer that the entire UST system is compatible with mid-level blends (E15, E20, E30), are states willing to prohibit the storage of higher-level blends?

With regard to leaking underground storage systems, consider the fact that currently 80 percent of gasoline sold in the U.S. is E10, and yet we haven't really turned over all the stones with regard to ethanol's behavior in the environment. As we have seen time and again, a "fix" for one environmental problem can often create yet another environmental problem—unintended consequences—if the life cycle of the fix isn't examined adequately (e.g., MtBE).

Such new fuel consequences might include potential for vapor intrusion due to production of methane, changes in redox chemistry in plumes to mobilize arsenic and manganese, or solubilization of metals from water intakes. What minor components of biofuels, such as antioxidants, denaturants, and other additives, are of particular concern? It would be nice to know what is going to be in our fuel supply before it is added, not ten years later.

Will those of us in the groundwater protection sector ever be able to have a say on what is stored in petroleum storage tanks in order to ward off the chance of a release into the environment?

Right now, fuel content seems to be dictated by air programs and Congress. Wasn't that how we ended up with a multibillion dollar MtBE problem? The press happily covers issues concerning compatibility of automobiles with higher ethanol blends, but we never see any discussion of compatibility with tank systems and higher ethanol blends. There is a serious lack of consideration for how long it will take to implement storage and dispensing infrastructure retrofits or extreme makeovers, the costs, and who pays.

We need more coordination between air, water, and waste programs, as well as vehicle and other engine manufacturers, fuel dispensing equipment suppliers, transportation people, agricultural interests, health officials, and so on. And we certainly need more lead time to make changes in the fuel systems to avoid creating another generation of leaking tank systems.

"In early 1999, during the EPA Blue Ribbon Panel hearings on fuel oxygenates, one of the committee members (who happened to be a VP for one of the largest MtBE producers) stated that if the tank people would just finish getting all the bare steel tanks out of the ground, there would be no MtBE problem, because gasoline (and MtBE) wouldn't leak from a 1998-compliant tank. I believe that we have discovered that that wasn't true. "

Patricia Ellis
Delaware Department of Natural Resources & Environmental Conservation

What impact will ultra-low-sulfur diesel fuel have on fuel storage systems?

There are instances of excessive corrosion being observed, which would have in impact on our fuel-storage systems. How serious is this threat? (See more on ULSD on page 16.)

In what fuel/technology direction is the military going?

The U.S. military is collectively the biggest tank owner in the country. The EPAct of 1992 set requirements for the acquisition of alternative fuel vehicles (AFVs) by federal agencies. Starting in fiscal year 2000, 75 percent of light-duty vehicle (LDV) acquisitions had to be AFVs. Law enforcement, emergency, and military tactical vehicles were exempt. A subsequent amendment permitted federal agencies to use biodiesel to meet a portion of their alternative fueled vehicle (AFV) acquisition requirements.

Biodiesel, a cleaner burning alternative fuel produced from domestic renewable feedstock such as vegetable oils, is typically used as B20 (a blend of 20% biodiesel and 80% petroleum diesel). The use of 2,250 gallons of B20 equates to one AFV credit under EPAct.

ASTM D 6751, "Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels" is the spec used for blending biodiesel with petrodiesel in levels up to 20 percent by volume. Since there is currently no ASTM standard for higher percent petrodiesel blends, it is likely the military is using B20. However, biodiesel is not approved for use in tactical vehicles because of concerns regarding its long-term stability.

The bigger question for federal and state tank programs continues to center on the degree to which these entities are able to regulate and enforce military tanks. And an even more exciting futuristic question: Does the military have a secret underground cave where they are developing petroleum-free, pollutant-free, Star-Trek-like vehicles that will move us all into a new realm of transportation and put UST regulators out of business? ■

In the next issue of *LUSTLine* we will address more questions on the future of tank programs.

A MESSAGE FROM CAROLYN HOSKINSON

Director, USEPA's Office of Underground Storage Tanks

The LUST Recovery Act: One Year Later

In autumn 2008, I listened to the U.S. presidential candidates discuss the need for change in many aspects of our nation's modus operandi—economic, security, involvement in world matters, energy use, and more. I'm certain you heard many of those discussions and promises, too. At the time, I thought that some aspects of my life might be affected by those promised changes. But I certainly did not anticipate the magnitude of change that roared into USEPA as part of the American Recovery and Reinvestment Act (Recovery Act) of 2009. The Act included significant provisions for the leaking underground storage tank (LUST) program; provisions we refer to as the LUST Recovery Act.

Since February 2009, states, territories, tribes, and USEPA regions and headquarters have put much thought and effort into LUST Recovery Act issues. If asked to describe the last year, intense and exhausting are two adjectives that quickly jump to mind. And given a moment, I would add rewarding and exciting to my description. Although significant work is still ahead of us in implementing the LUST Recovery Act program, I would also like to raise a glass to the impressive progress that USEPA and our LUST Recovery Act partners have made over the last year.

LUST Recovery Act Basics

For those of you who aren't familiar with the LUST Recovery Act, here's a quick recap of what it is, how much money USEPA received, and how the money is being spent.

The Recovery Act provided USEPA with $200 million from the LUST Trust Fund to assess and clean up contamination from federally regulated underground storage tanks (USTs). As one of only six USEPA programs to receive Recovery Act money, this investment illustrates the importance of protecting our nation's groundwater—the source of drinking water for approximately 50 percent of Americans and 99 percent of Americans in rural areas. This also shows an awareness that USTs are a leading source of groundwater contamination in our country.

USEPA allocated over $190 million in LUST Recovery Act money to states and territories, as well as over $6 million to assess and clean up eligible tank releases in Indian country. This infusion of more than three times the typical annual LUST allocation will help reduce the backlog of 100,000 releases that still need to be cleaned up. While this money is providing environmental benefits to our country, it is also helping to retain jobs and improve our nation's economy. Yet, this money brings with it requirements for unprecedented accountability and visibility, as well as additional implementation tasks.

See a sampling of "Cleanups That Are Making a Difference" on page 7

LUST Recovery Act Money = More Work

I acknowledge that the LUST Recovery Act money was a great boost to our cleanup program; but I also recognize that the additional money brought with it many requirements. I appreciate the significant contributions states and territories made and continue to make—providing input to the LUST Recovery Act program guidance; identifying candidate projects; undertaking ongoing assessment and cleanup work on projects; providing reports to USEPA on LUST Recovery Act performance measures, as well as ongoing recipient reports to ***www.FederalReporting.gov***, among others.

Realistically, I know states and territories are juggling the LUST Recovery Act work along with other ongoing efforts, such as Energy Policy Act requirements, traditional assessments and cleanups, and compliance and inspections. I fully appreciate the added workload the LUST Recovery Act requirements are presenting for states and territories, given that USEPA headquarters and regions are also dealing with increased workloads as a result of the LUST Recovery Act money.

Accomplishments

But now, at the one-year mark, I am buoyed as I recount the LUST Recovery Act accomplishments and successes I see from states, territories, and USEPA regions and headquarters. As of December 31, 2009, on a program-wide level, the following was accomplished:

- Ninety-eight percent of $197 million allocated for states and territories and for LUST-eligible work in Indian country has been obligated—this means the money is available for field work to begin.
- One hundred percent of recipients completed the necessary jobs and performance measures reporting for the first two quarters.
- Cumulative LUST Recovery Act performance measures results were as follows:
  - Site assessments – 323 initiated; 112 completed
  - Cleanups – 166 initiated; 46 completed
  - LUST Recovery Act money has also contributed to ongoing assessments and cleanups at a total of 554 sites that did not begin as Recovery Act projects and are not represented in the numbers above.
- More than 45 jobs were created or retained in the first quarter (July to September 2009) and over 150 jobs were created or retained in the second quarter (October to December 2009—in other words, LUST Recovery Act money is providing economic and environmental benefits. ■

LUST Recovery Act

Cleanups That Are Making a Difference

by Carolyn Hoskinson

States, territories, and tribal partners—along with USEPA support—are making significant progress in putting LUST Recovery Act funds to good use. I've been hearing about cleanups at LUST sites in communities across the U.S., thanks to help from LUST Recovery Act money. I want to share with you three examples from Alabama; on the Cheyenne River Indian Reservation in South Dakota; and in Pennsylvania.

ALABAMA: SELMA TO MONTGOMERY NATIONAL HISTORIC VOTING RIGHTS TRAIL

Alabama's Department of Environmental Management (DEM) and USEPA are working closely with local communities and citizens living along and in the vicinity of the Selma-to-Montgomery National Historic Voting Rights Trail to realize a local community vision for revitalization that is consistent with national historic site goals. The Trail runs through Dallas, Lowndes, and Montgomery Counties and is a pivotal civil rights location. It begins in Selma and continues along U.S. Highway 80 to West Montgomery. Unfortunately, today the route is a 54-mile corridor of high unemployment, health issues, lower educational and economic achievements, and severe rural isolation.

Alabama DEM and USEPA, along with a number of state and federal agencies (e.g., the Army Corps of Engineers, National Park Service, Department of Agriculture, and Federal Highway Administration), are collaborating with local communities to apply Recovery Act resources along the Trail. State and federal partners are supporting the local vision of enhancing the preservation of historic assets, while realizing the area revitalization goal of improving the economic situation of the area. The Trail communities of Hayneville, White Hall, Lowndesboro, Selma, and Montgomery have recommended a variety of reuses for abandoned UST properties, including local craft and gift shops that support National Historic Trail visitors, restaurants, and vegetable stands.

In addition to LUST Recovery Act-funded efforts, DEM and USEPA are devoting contract and in-house efforts to conduct site assessment activities for other petroleum and hazardous waste properties along the corridor. Sampling activities were conducted in 2009 and additional sampling efforts are ongoing in 2010. Combining targeted involvement and leveraging other federal and state resources, DEM and USEPA can facilitate community-based revitalization, environmental benefits, and economic development activities along the corridor.

There are many active and former gasoline stations along the Trail that have the potential to cause contamination from petroleum leaks. For example, the DEM and USEPA are addressing contamination at a former Gulf service station in Montgomery in an area bordered by mixed light commercial and residential properties. The site was formerly a retail gas station and is currently used as a car detail shop.

This site has petroleum contamination that dates back to at least 1986 or earlier, and in 1986 four 3,000-gallon gasoline tanks were removed. There are concerns about soil, groundwater, and possibly petroleum vapor contamination in surrounding residential neighborhoods. Site investigation activities are in progress. Groundwater monitoring and risk assessment activities are next, and cleanup activities are scheduled to be completed in late 2011. DEM estimates it will cost $350,000 to address contamination at this site and intends to clean up the site to a

■ *continued on page 8*

Drilling activities at a former Gulf station located along the Selma to Montgomery National Historic Voting Rights Trail route.

Local community visioning at one of the sites along the Trail.

■ **Cleanups That Are Making a Difference** *from page 7*

level protective of human health and the environment, which will allow for a greater range of property uses.

USEPA provided the DEM with $4 million to assess and clean up contamination released from federally regulated underground storage tanks. The DEM identified a list of 28 sites for initial assessment evaluation, and will identify additional sites for investigation and cleanup over the next two to three years.

SOUTH DAKOTA: CHEYENNE RIVER INDIAN RESERVATION

On the Cheyenne River Indian Reservation in South Dakota, USEPA Region 8's UST program is working in partnership with the Cheyenne River Sioux Tribe to use LUST Recovery Act money to clean up the Lantry Oil site. Work includes operating and maintaining an air sparge/soil-vapor-extraction (SVE) system, conducting two injection events of in-situ chemical oxidation, and reducing the dissolved groundwater plume by more than 60 percent. Originally a mixed-use property that

Remediation work on the Cheyenne River Indian Reservation, South Dakota.

once housed a gas station, auto repair facility, and plumbing business, the Lantry Oil site was abandoned approximately six years ago. The remediation activities, paid for by LUST Recovery Act money, have been instrumental in facilitating a property transfer of this site, which in turn will foster productive reuse of the property. In addition, the cleanup is creating several jobs in Lantry, a small community on the reservation.

In 1993, state inspectors documented petroleum odors and found soil contamination at the bottom of the pit when underground storage tanks were removed. Site soil samples indicated contamination of benzene, toluene, ethylbenzene, xylenes (BTEX); naphthalene; and total petroleum hydrocarbon (TPH). Beginning in 1997 when the site was eligible for federal LUST money, monitoring wells were used to determine the extent of contamination, exposure pathways, and risk receptors. After evaluating remediation options, USEPA chose an SVE system as the most viable option because it specifically targets residual hydrocarbons from the vadose zone. With the help of LUST Recovery Act funds, contaminant impacts to groundwater will be mitigated over time as the contributing source of hydrocarbons in the soil is reduced.

The more than 4,200 square mile Cheyenne River Indian Reservation is the fourth largest reservation in land area in the U.S. Approximately 14,000 people live on this reservation. The Reservation is just one example of how USEPA is investing a portion of the $6.3 million LUST Recovery Act money to assess and clean up eligible tank releases in Indian country.

PENNSYLVANIA: WARRINGTON TOWNSHIP IN BUCKS COUNTY

Pennsylvania's Department of Environmental Protection (DEP) is using LUST Recovery Act money in Warrington Township, Bucks County, to clean up petroleum contamination at an abandoned property. Malcolm's Gas Station and Auto Repair shop, an abandoned two-acre property, was a small family-owned facility that closed after petroleum releases and soil contamination were discovered in 2002. The property owner is deceased and the estate lacks the financial resources to remediate the site, which is located on Easton Road (Route 611), a busy corridor in Central Bucks County. It is on a neglected commercial strip that the township targeted for future improvement.

Petroleum releases and soil contamination discovered at Malcolm's service station in Pennsylvania.

In January 2010, Ferrick Construction, a local, women-owned business certified by the DEP to conduct UST closures, began work. Seven USTs, along with dispensers and associated piping, were cleaned and removed in order to assess the extent of the contamination. Significant petroleum contamination was observed in some of the excavations, and approximately 300 tons of visibly contaminated soil were subsequently removed for off-site disposal. The DEP will review soil and groundwater sampling results to learn the extent and migration patterns of any additional

Cleanup work at Malcolm's service station in Pennsylvania.

contamination and determine if further assessment of soil and groundwater is needed to complete the cleanup. The initial assessment is expected to provide two to five temporary jobs.

Approximately 25,000 people live in the 13.8 square mile Warrington Township. Designated as the gateway to historic Bucks County, the Township is nestled amidst both agricultural and preserved lands. Cleaning up the former Malcolm's Gas Station and Auto Repair Shop site is an important first step that will allow the property to be returned to a useful purpose. Local residents and township officials are ecstatic that this community eyesore is on the road to redevelopment.

EPA provided the DEP with $6.163 million to assess and clean up contamination released from federally regulated USTs. Pennsylvania identified 71 eligible abandoned sites where USTs may have leaked, impacting soils and groundwater.

More Stories Abound

These three stories are but a few examples of the important role of LUST Recovery Act money in assessing and cleaning up UST releases across the country. I know there are other, untold stories similar to these throughout our nation. I am personally very proud to be a part of our work to implement the LUST provision of the American Recovery and Reinvestment Act of 2009. And I am pleased that together states, territories, tribes, USEPA, and other UST partners are making a real difference—for human health, our environment, and our economy. ■

THE TOP TEN LNAPL MYTHS

by Sanjay Garg

Typically, when liquid petroleum hydrocarbon, also known as light nonaqueous-phase liquid (LNAPL), is inadvertently released onto or into the ground, it migrates vertically downward, and, if sufficient in volume, it eventually reaches the water table. Depending on its saturation, the LNAPL may flow into observation wells. The terms "free product," "separate-phase hydrocarbon (SPH)," or "phase-separated hydrocarbon (PSH)" are also used to indicate the presence of LNAPL in observation wells. Irrespective of its occurrence in observation wells, LNAPL can act as a source of contamination for groundwater or vapor.

Existing technical and regulatory frameworks are robust in addressing groundwater and vapor pathways if there is no LNAPL in observation wells. However, when LNAPL appears in observation wells, the state of practice is generally lagging behind the state of knowledge, which has undergone significant development in recent years. This gap can result in suboptimal decision-making and the misdirection of effort and resources (e.g., performing hydraulic recovery of LNAPL, regardless of its recoverability, to reach an unrealistic thickness; inferring that LNAPL is absent simply because it is not observed in wells; pumping LNAPL to address dissolved-phase contamination or vapor issues).

Given that we have gained some very useful information about LNAPL, I'd like to point out the ten most common myths related to LNAPL and then set the facts straight.

MYTH 1: There is no LNAPL at a site because it has not been observed in observation wells.

Fact: If the site has persistent dissolved-phase or vapor issues, chances are there is LNAPL in the ground (exception being small vapor releases). If LNAPL does not show up in an observation well, there may be some perfectly good reasons why—it is below residual saturation; it is limited to the vadose zone; the observation wells are not in an area of high enough LNAPL saturation; the wells are not screened in the appropriate zone.

MYTH 2: LNAPL thickness in observation wells is exaggerated by a certain factor (e.g., 4 to 10) when compared to the actual thickness in the ground.

Fact: LNAPL thickness in a well is usually not an exaggeration of the LNAPL-impacted thickness in the ground. For unconfined conditions and in areas that are not greatly affected by water-table fluctuations, the thickness in the well is similar to (actually somewhat greater than) that in the ground (Huntley, 2000). In some specific cases, LNAPL thickness in wells can be exaggerated (e.g., when LNAPL appears under perched or confined conditions).

MYTH 3: The presence of LNAPL in observation wells means that all pores in the formation are filled with LNAPL (i.e., the LNAPL is present at 100 percent saturation).

Fact: We know that when a monitoring well contains groundwater,

■ *continued on page 10*

■ LNAPL Myths *from page 9*

the formation pores are practically 100 percent filled with water, so we tend to believe that LNAPL must be analogous. In reality, LNAPL is never at 100 percent saturation in the pores. Average LNAPL saturation can vary from less than 10 percent in fine-grained soils to greater than 50 percent in very coarse soils. For example, the API LNAPL parameters database contains LNAPL saturations ranging from 0.01% to 56% for 100 samples from varied soil types (API, 2006). LNAPL saturation depends on the observed thickness in the well and the soil type. For a given soil type, the LNAPL saturation is higher for a greater observed LNAPL thickness (e.g., a sand with 3 feet of observed LNAPL thickness will have a higher LNAPL saturation than that with a 6-inch thickness). For a given observed LNAPL thickness, a coarser-grained soil will have a higher saturation (e.g., a sand will have a higher saturation than a silt with the same thickness). This misconception often results in a significant overestimation of in-place volume, which is frequently calculated from measured LNAPL thickness in observation wells.

MYTH 4: Observed thickness of LNAPL in wells is a good metric for LNAPL recoverability.

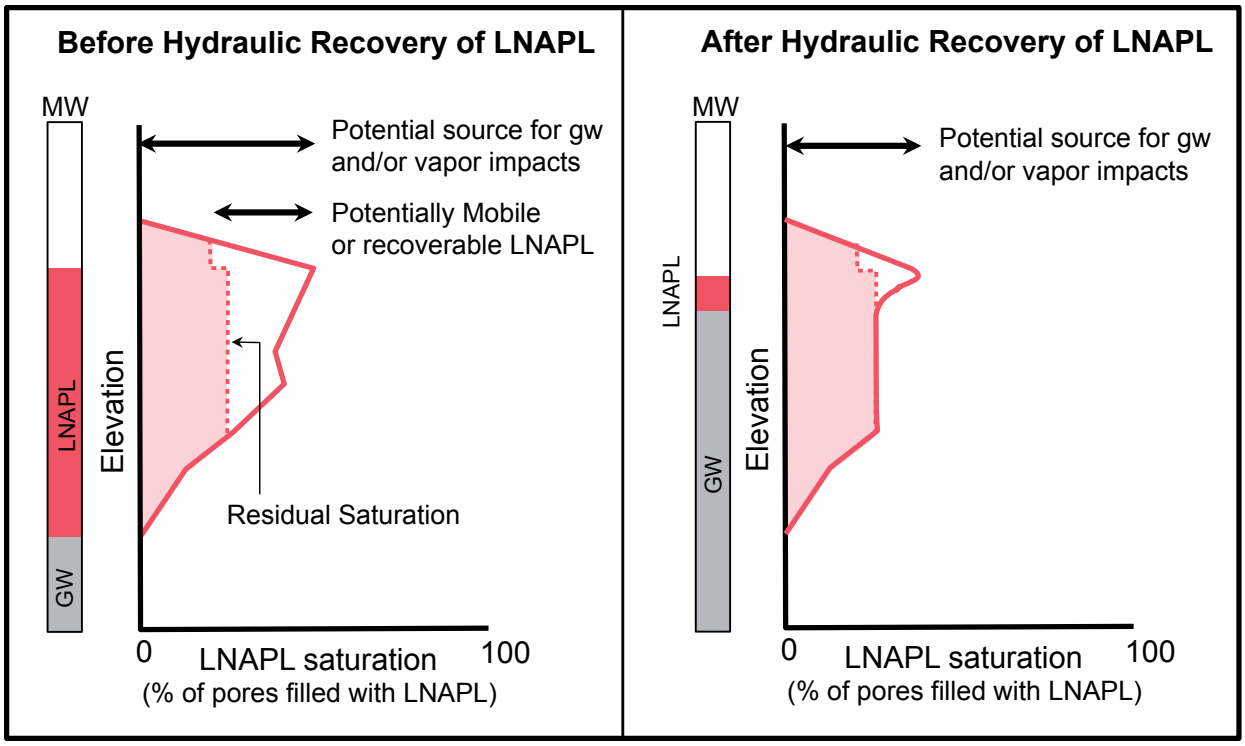
Fact: We know that the presence of groundwater in a well does not necessarily indicate recoverable groundwater and that its transmissivity, which is a measure of permeability and saturated thickness, is the true indicator of its recoverability. Similarly, LNAPL thickness in an observation well is also not a comprehensive indicator of LNAPL recoverability. LNAPL recoverability depends on the soil type, the thickness of the mobile LNAPL zone, and LNAPL saturation and viscosity. LNAPL transmissivity is a lumped parameter that accounts for all of these variables (Huntley, 2000; API, 2004a). LNAPL transmissivity is being increasingly utilized as a metric for LNAPL recoverability.

MYTH 5: LNAPL can be fully recovered from the subsurface by hydraulic methods (e.g., pump and treat, dual-phase extraction, skimming).

Fact: The theoretical limit for recovery of any fluid from a porous media is its residual saturation (Mercer and Cohen , 1990). For example, once squeezed, a kitchen sponge is at the residual saturation of water. Further, transmissivity of a fluid decreases with decrease in its saturation and is ultimately zero at residual saturation. For these reasons, it is easier to initially remove water from a wet sponge but it gets progressively harder as the water content decreases. LNAPL too cannot be pumped effectively once it approaches its residual saturation; at this point LNAPL transmissivity is greatly reduced. The remaining LNAPL can continue to be a source for dissolved or vapor phases (Mercer and Cohen, 1990; Huntley and Beckett, 2002). Typically, the fraction of LNAPL recovered is greater in the case of new releases (a few days to a few months after the release) and significantly less for older releases. Early recovery efforts also prevent the LNAPL from expanding, which in turn reduces the LNAPL footprint to be managed or remediated in the long term.

MYTH 6: Risk-based frameworks are not applicable until LNAPL is recovered from wells.

Fact: LNAPL is present in the formation before and after the hydrau-



LNAPL, at best, can be removed to residual saturation range via hydraulic recovery. LNAPL can be a source of groundwater or vapor impacts even after it is removed from monitoring wells. When LNAPL is observed in monitoring wells (as SPH) additional consideration is the evaluation of its migration potential.

lic recovery of LNAPL. Thus, there should be little change in how the risk pathways (dissolved phase, vapor, or soil pathways) are evaluated. When LNAPL is observed in a well, the additional concern that should be evaluated is its potential to migrate. If LNAPL is migrating, then future receptors also need to be evaluated for risk (API, 2004b).

MYTH 7: Hydraulic recovery of LNAPL substantially reduces vapor- or groundwater-related risks.

Fact: These risks are primarily a function of LNAPL composition and not its saturation (e.g., the mole fraction of benzene in gasoline determines its concentration in groundwater and not the amount or saturation of gasoline). Saturation generally affects the longevity of risk (Huntley and Beckett, 2002). A suitable way to alter LNAPL composition (e.g., soil vapor extraction and air sparging) may be more appropriate to reduce risk than hydraulic recovery of LNAPL.

MYTH 8: If LNAPL is present in a well, then the LNAPL plume is migrating.

Fact: If LNAPL appears in a well, the LNAPL is locally mobile near the well, but additional analyses are required to determine whether the overall LNAPL body is migrating. Most LNAPL bodies come close to a stable state within a few years after a release. For LNAPL to move, a certain minimum amount of LNAPL pressure is required to displace the preexisting groundwater—known as the pore entry pressure. This means that LNAPL may be present in observation wells at the edge of the LNAPL plume, but the plume may not be able to migrate into pristine downgradient pores if the pore entry pressure is not overcome. Pore entry pressure is lower for coarser-grained soils. There is no pore entry pressure when LNAPL flows into pores that previously contained LNAPL (e.g., LNAPL flow to a recovery well located in the middle of a LNAPL plume). Charbeneau (2007) presents the development of a critical LNAPL thickness in a well, below which there can be no lateral migration into pristine medium.

MYTH 9: Like groundwater, LNAPL plumes move indefinitely until they reach a natural boundary such as a river.

Fact: While this is true for groundwater, which is essentially infinite, it is not the case for finite LNAPL releases. In this case, as LNAPL migrates, progressively less and less LNAPL is present at each subsequent downgradient location (i.e., LNAPL conductivity continuously decreases as the plume migrates). Eventually the LNAPL in the leading edge of the plume is insufficient to migrate, and the plume stops.

MYTH 10: Sophisticated site characterization is always necessary for sound decision-making at sites with free LNAPL (e.g., petrophysical data, CPT/LIF).

Fact: Many different data-collection techniques are available, including standard soil- and well-sampling techniques, and newer coring and petrophysical techniques. Selecting the right tools depends on what is needed to fill a knowledge gap, the magnitude of risk, and the complexity of the site. For the most part, especially for smaller sites, conventional data (soil, groundwater, soil-gas data) are adequate for decision-making. In some cases, where there is a need for additional information or for larger, complicated sites, advanced data collection techniques can be applied. For example additional data may be required if the following types of information are necessary for decision-making: total LNAPL volume in the subsurface; recoverable volume of LNAPL; migration potential of LNAPL; high spatial density characterization of the area; and mathematical modeling.

LNAPL Scenarios

In summary, LNAPL presence at sites can be classified into three scenarios:

A. LNAPL is present in the subsurface but not in observation wells (i.e., it is below residual saturation).

B. LNAPL is present in observation wells but the LNAPL plume is stable.

C. LNAPL is present in observation wells and the LNAPL plume is migrating.

In all three cases, the LNAPL can result in the generation of dissolved-phase and vapor-phase contamination. In all cases, these risks can be evaluated using the well-established risk-based procedures. From a risk and remediation perspective, Scenario B is usually more similar to Scenario A than it is to Scenario C. Yet, significant resources are spent to hydraulically recover LNAPL from Scenario B. Scenario C can pose additional risks due to the expansion of the LNAPL plume that need to be identified and addressed. Distinguishing between the three scenarios (especially between B and C), and making appropriate remedial decisions, can significantly improve resource and risk management at LUST sites. ■

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Selected Resources

- ITRC: *http://www.itrcweb.org/teampublic_LNAPLs.asp*; Training and Documents.
- API Website: *www.api.org/lnapl.*
- NAPL Cleanup Alliance: *www.rtdf.org/public/napl.*
- ASTM: *http://www.astm.org/*; ASTM LNAPL Decision Guide (E50.04 July 2005).
- SABCS British Columbia *http://www.sabcs.chem.uvic.ca/docs.html.*

Tank-nically Speaking

by Marcel Moreau

Marcel Moreau is a nationally recognized petroleum storage specialist whose column, ***Tank-nically Speaking****, is a regular feature of* LUSTLine*. As always, we welcome your comments and questions. If there are technical issues that you would like to have Marcel discuss, let him know at* **marcel.moreau@juno.com.**

If I Had to Choose Just One Way of Achieving UST Operational Compliance...

Sometimes, because we work with tank issues on a daily basis, we forget the simple truth—operating a tank in today's world is a complex task. I was reminded of this recently when an associate, who is a professional engineer but not a tank professional, reviewed an UST-operators manual I've been working on and proclaimed, "Wow, there sure is a lot to operating a tank!" Indeed. There is leak detection for tanks and piping, spill containment, overfill prevention, corrosion protection, financial responsibility, spill reporting and cleanup, investigating suspected releases, and a lot of regulatory paperwork. Besides that, UST operators have to be concerned with product compatibility and quality issues (ethanol), minding fuel inventory, pricing fuel, keeping the appropriate amount of inventory on hand, customer drive-offs…and, oh yeah, how about being sure the fire extinguishers have been serviced?

UST operators in the C-store business have a much longer list of concerns, everything from whether the cash register person has shown up for work, to liquor and cigarette sales to minors, expiration time of the food, temperature of the beer cooler, and cleanliness of the public bathroom. It is no wonder that issues near and dear to an UST regulator's heart, such as appropriate response to a leak alarm, might get buried among the day-to-day tasks of most UST operators.

Would I Choose Operator Training?

And while bathroom cleanliness and even alcohol sales to minors tend to be concerns that the average person is at least somewhat familiar with, understanding the significance of an "L1 Fuel Alarm" is not something that parents commonly teach their children. It makes sense, therefore, that there should be some formal education associated with operating UST systems. For many UST operators, however, taking an UST operator course will have all the allure of a course in intermediate algebra, and the retention of information will be commensurate with the interest.

Would I Choose an Operator Checklist?

A number of states are instituting the use of periodic checklists to help UST operators remember what it is they should be doing. The checklists serve to document that UST equipment has been visually checked and found to be in operating condition. The Petroleum Equipment Institute (PEI) Recommended Practices (RP500 for dispensers, *www.pei.org/RP500*, and RP900 for UST systems, *www.pei.org/RP900*) provide good models for those who are interested in adopting such checklists. (In the interest of full disclosure, I was the consultant who worked with PEI committees to produce both of these Recommended Practices.) While having UST operators visually check on the condition of their facilities on a daily and monthly basis is a great idea, I also see the potential for rampant "pencil whipping" of checklist forms, where a checklist that is supposed to be completed at a dispenser or tank pad in 10 or 15 minutes is completed in seconds back in the office.

Would I Choose an Annual Operational Inspection?

In my book, the most important inspection checklist in the PEI documents from an operational compliance standpoint is the annual one. A qualified technician who has all the required tools and training to perform any typical service-related operation pertinent to USTs, as defined by PEI RP500 and RP900, conducts the annual inspection. The qualified technician, in other words, is a professional UST service person, not your typical UST owner or operator. The annual inspection, besides checking on all the things that the UST operator should be routinely checking, also goes into much greater depth (e.g., operation of line leak detectors, crash valves, nozzles, cathodic-protection systems, overfill-prevention equipment, emer-

gency shut-off switches). In short, the annual inspection is comparable to an annual automobile inspection, making sure that all the essential systems are in good operating condition.

The annual inspection has many things to recommend it, including:

- **A knowledgeable person reviews the entire system.** UST systems today are beyond the ken of all but a few UST operators. Routine visual inspections are good, but how many operators really have a clue about what they are looking at and what they should be looking for? Qualified technicians look at this hardware day in and day out. They know the weak points and the strong points of most common equipment and can tell when something is not "right." Qualified technicians also have the skills and equipment to actually put important equipment through its paces and verify that it actually works the way it should.
- **One phone call does it all.** An UST operator doesn't have to remember to have line leak detectors tested, lines tested, cathodic protection tested, ATGs maintained, interstitial sensors tested, crash valves checked, spill buckets looked at, overfill prevention checked, etc., etc., etc. All he or she has to do is make one call and say, "I need an annual inspection," and the qualified technician does the rest. The checklist of what must be done should be specified by the state, so if the operator wants to get several quotes, all technicians are bidding on the same work, and the bids should be directly comparable to one another.
- **The UST system gets "exercised."** Folks who operate emergency generators typically run them for a short time once a month or so to "exercise" them. Mechanical things with moving parts need to move on a regular basis so they don't freeze up. Many of the critical parts of UST systems like crash valves, overfill valves, interstitial sensors, and emergency shutoff switches may sit idly by for long periods of time, but it is critical that they operate properly when they are needed. Like emergency generators, they need to be exercised once in a while so they don't freeze up.
- **A third party takes an objective view of the system.** While a facility operator may be completing a facility checklist and marking everything as being in good condition, a qualified technician inspecting the same facility might notice a deep cut on a dispenser hose, a leaking breakaway, or a spill bucket that has corroded through. These are all things that the UST operator should have noticed but didn't see for reasons ranging from near-sightedness to over-sightedness to carelessness.

A conscientious owner of this facility who is comparing the operator checklist to the technician checklist might decide that the operator needs a little "refresher" training in what to look for during an inspection. A not-so-conscientious facility owner might be thinking that he's glad the UST operator is not wasting time completing a checklist that the darn fool regulators want him to complete.

Either way, the problems are identified and will hopefully be fixed. Of course next year the not-so-conscientious UST owner might hire a not-so-conscientious UST inspector in hopes of finding fewer problems, so keeping a close watch on the quality of the work done by

■ *continued on page 14*

The annual UST inspection is an in-depth look at the condition of all the peripheral components of an UST system to verify that they are operational and in good condition.

Qualified, conscientious UST technicians are an essential component of an annual inspection program.

■ **Achieving UST Operational Compliance** *from page 13*

inspectors is important as well.

- **Problems can get fixed.** Maine initiated an annual inspection program a good many years ago. In 2000, I conducted a study for the State of Maine to review the effectiveness of the program (the report is available at: *http://www.maine.gov/dep/rwm/publications/ussinspectionreports.pdf)*. Among the findings were that about 30 percent of facilities had problems discovered during annual inspections, indicating that problems routinely occur with UST equipment. A more disturbing finding was that some 39 percent of the problems discovered had not been addressed by the following year. For an inspection program to be most effective, there has to be enforcement. Since 2000, Maine has beefed up enforcement of the annual inspection requirement by requiring that annual inspections be submitted to the state. The Department of Environmental Protection also has the authority to prohibit deliveries if annual inspections are not completed or problems discovered are not corrected.

So What Would I Choose?

I do believe that operator training is a step in the right direction, but it is only a step. Routine checklists completed by UST operators are another good step, but UST operators are limited in what they can evaluate. If I had to choose just one approach to assuring proper UST operation, I would pick annual inspections by qualified technicians. I believe annual inspections have great value because they simplify the UST operator's life and standardize what constitutes "proper" operation of a UST system. In addition, annual inspections verify that all the equipment that is just "standing by," such as interstitial sensors and line leak detectors and overfill-prevention equipment, is really ready for action. And isn't that what properly operating an UST is all about?

What Would You Choose?

Send your choices and reasoning to: marcel.moreau@juno.com. ■

Observations on Cathodic-Protection Operation and Testing

by Chris Prokop

I work in USEPA Region 9's Underground Storage Tanks Program, and one of my duties is inspecting UST facilities in Indian Country. So far in my career with the agency, I have conducted some 150 UST-system inspections. I would estimate that roughly 25 percent of these systems employ some type of cathodic protection (CP) for the tanks, piping, and/or metal connector elements associated with piping. My purpose in writing this article is to share three examples associated with my experiences with CP system operation and testing in Region 9 Indian Country. The examples illustrate a larger problem that has to do with determining how well the CP tester is doing his job. I hope that what I have learned will be of benefit to all of us who inspect tank systems.

[Editor's note: For more detailed information on CP operation and testing, see the *LUSTLine* Index, which lists several articles we have published on CP. Among these titles are "Effective Corrosion Control—Qualified Personnel" (LL #23), "Combating CP-Test Heartburn" (LL #32), and "Evaluating CP Data" (LL#44). A particularly good article relating to the subject of this article is "Testing Cathodic-Protection Systems" (LL #25) by Marcel Moreau. We have freshened up this article and put it on the NEIWPCC website (*www.neiwpcc.org*). Click on *LUSTLine* and then "online-only supplements."

CP Regulation

Pursuant to the federal regulations (and, by extension, state and local regulations), UST systems must be protected from corrosion in order to minimize the potential for petroleum releases. This can be achieved by using non-metallic components such as fiberglass, by coating the metal to isolate it from the electrolyte, or by using cathodic protection. For older UST systems, where metallic USTs, piping, and/or connector elements are in contact with soil, some form of CP must be used.

The two types of CP used to meet federal regulations are: (a) galvanic systems (utilizing sacrificial anodes), and (b) impressed current (IC) systems (utilizing rectifiers). Both galvanic and IC systems must be designed by a corrosion engineer (though galvanic systems may be "pre-engineered" by the manufacturer), and both systems must be tested at least every three years by a person with knowledge and/or training in CP testing (a "CP tester"). For IC systems, voltage and amperage readings (e.g., voltage, amperage, hour meter readings) from the rectifier must be recorded on a written log at least every 60 days.

The basic rule for compliance during the testing of both types of CP systems is that the polarized voltage potentials at all surveyed points of the UST system must be at least as negative as -0.85 volts or demonstration that 100 mV of polarization has been achieved. See the NACE International (formerly known as the National Association of Corrosion Engineers) Standard RP0285 for information on the design of galvanic and impressed current systems. NACE Standard RP0285 also provides good background on the basic CP test criteria, and NACE Standard TM0101 addresses the testing techniques for CP systems.

Example: Failure to Consider Voltage Drops During the Testing of IC Systems

Until a few years ago, I was not

aware of the significance of obtaining "instant-off" voltage potentials during structure-to-soil CP "surveys" of IC systems. At that time, the potential data from CP surveys provided by most UST facilities in Region 9 Indian Country did not, for the most part, contain instant-off-potential data or consider voltage (a.k.a. IR) drops. Instead, the potential measurements were only obtained with the rectifiers "on."

Obtaining instant-off potentials is important because accurate polarization potentials cannot be obtained on IC systems when the rectifier is on. Turning off the rectifier results in more accurate measurements of the true "polarized" conditions of the UST systems being protected. Test Method 1 under NACE Standard TM0101 allows CP system "on" measurements as long as voltage drops are "considered," and the standard lists five methods for considering voltage drops.

However, none of these five methods are particularly applicable to storage tank systems, and all are beyond the expertise of most CP testers. As a result, I have begun requiring CP testers to obtain instant-off potentials because this is the only practical way for considering voltage drop in IC systems. These instant-off potentials are typically obtained after the current from the rectifier is interrupted, either manually (by a second technician) or by means of a device designed for that purpose.

In follow-up to my observations of this problem at one UST facility, I contacted the CP tester to explain my concern, and I also explained NACE International's "100 mV polarization shift" criterion (see Test Method 3, NACE Standard TM0101). In response to my phone call, the CP tester agreed to retest the facility. The new CP survey data for this facility yielded 14 of 24 instant-off potential measurements that were more negative than the -0.85 volt standard (i.e., 14 measurements passed the test and 10 measurements failed), while 23 of the 24 measurements "passed" the 100 mV polarization change criterion (following a two-hour depolarization period).

The one failing measurement under the 100 mV criterion was 89 mV, just 11 mV shy of the standard. The CP tester's conclusion in his cover letter was that the UST system had adequate CP based on the 100 mV polarization criterion. I supported the CP tester's conclusion based on the overall strength of the CP data and the facility's favorable history of UST and CP system operations. In addition, NACE Standard TM0101 notes that extended polarization-decay time periods (even days) may be needed to achieve a 100 mV polarization shift.

With regard to galvanic systems, it is my understanding that conducting instant-off testing is generally not practical because, at least in the case of STI-P3 tanks, the anodes are typically welded to the USTs. In addition, galvanic systems are intended to be used with well-coated UST structures where the exposed metal surfaces potentially requiring CP are relatively small ("holidays"), and voltage-drop effects are minimal.

After my experience with the facility described above, I contacted two other CP testing firms that do work in Region 9 Indian Country, and they verbally agreed to modify their testing procedures.

We need to be able to ensure that CP tests are performed properly, according to standards developed by nationally recognized associations (such as NACE International). Otherwise what is the point of doing the tests?

Example: Taking Voltage Potential Measurements Over Asphalt or Concrete

Judging from my discussions with some CP testers, I have come to believe that CP surveys incorrectly conducted over asphalt or concrete may be a pervasive problem. Both NACE Standards RP0285 and TM0101 state clearly that potential readings "shall not be taken through asphalt or concrete." Furthermore, RP0285 indicates that contact with soil can be achieved through existing design openings, or by drilling through the asphalt or concrete to access the soil beneath. At least one CP tester has told me, however, that he has, on occasion, placed his reference electrode directly on asphalt. It should be noted that asphalt is a petroleum-based compound that is not a conductor.

I have also heard at least one CP tester refer to placing the reference electrode directly on concrete following thorough wetting of the surface. Potential measurements over concrete are commonly erroneously elevated (which would be exacerbated by the presence of rebar). It is worth repeating: CP readings made with the reference electrode placed on asphalt or concrete are NOT valid.

Example: Electrical Continuity Testing/Surveys

I am briefly mentioning this topic because continuity/isolation testing is clearly important to the successful operation of CP systems. NACE Standard TM0101 provides specific procedures for demonstrating appropriate electrical isolation for galvanic systems and electrical continuity for IC systems. The standard also lists a number of "invalid techniques" for conducting continuity testing. However, I rarely see continuity surveys in the CP data sets for my UST facilities. I think it is important that inspectors request continuity surveys as a part of CP testing.

What Testers Need to Know, What Inspectors Need to Look For

We need to be able to ensure that CP tests are performed properly, according to standards developed by nationally recognized associations (such as NACE International). Otherwise what is the point of doing the tests? A number of states have developed CP test protocols and forms that testers must fill out, sketch survey finding on, and sign. Sloppy CP testing behavior is not going to change until inspectors refuse to accept improper test results. As inspectors, we need to be out there, understanding what we are looking at and what it means, and then make sure the tester knows we are watching. ■

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Field Notes

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

Concerns Grow Over Ultra-Low-Sulfur Diesel Fuel

When the American Society for Testing and Materials (ASTM) reduced the sulfur content of diesel fuel from 500 parts per million (ppm) to 15 ppm in response to new USEPA mandates that took effect in 2006, it was good news for the environment. What's not to like about lowered emissions and cleaner air?

At the time, ASTM knew of one possible side effect—the process of removing sulfur may also reduce the fuel's natural lubricity. Recognizing this was a serious concern, ASTM added a minimum requirement for diesel fuel to provide protection for certain engine components. Most fuel suppliers turned to lubricity additives to meet this new requirement.

In a little over a year since the country made the switch to the 15 ppm ultra-low-sulfur diesel (ULSD), another possible side effect began to make itself known. The first rumblings came late in 2007. A handful of ULSD users on the Petroleum Equipment Institute (PEI) Forum posted issues with clogged filters, seals breaking down, excessive rust, and other damage to their ULSD storage and dispensing systems. Since then, the number of reports and questions surrounding ULSD has grown. What's causing the deterioration? How bad is it? And where do we go from here?

In January, PEI convened a meeting of industry stakeholders (oil marketers, additive manufacturers, USEPA, equipment groups, trucking industry, and standards organizations) to discuss this matter. PEI called the meeting because we have received accounts of this problem from all regions of the country, in both newer and older equipment, in high- and low-use situations. But the corrosion problems don't appear everywhere and excessive deterioration does not seem to appear at all facilities in a particular market.

The joint between the submersible pump motor casing (aluminum on the left) and the steel piping on the right. This joint area would normally be submerged in the fuel.

Corrosion on the inside of the fill pipe. Corrosion is visible on the steel fill riser and the brass fill adapter. There was no drop tube present in this fill pipe.

Corrosion on the inside surface of the submersible pump manifold (the part of the pump that sits above the tank). This area would be exposed to fuel vapors but would not normally be in contact with any liquid product.

Participants in the meeting stressed that they had firsthand knowledge of only a few incidents of corrosion and by some accounts reports had not increased over time. Although many at the meeting had not seen corrosion on a large scale, a fair number of them were still in an information-gathering mode.

The stakeholders group agreed to take a two-pronged approach to investigate the problem. The first step is to determine if the corrosion problem is isolated or more widespread. A task force of the stakeholders group developed a brief survey for fuel suppliers, tank owners, equipment manufacturers, ULSD-facility service providers, and tank and/or equipment inspectors to try to get a handle on how pervasive the problem is. The online survey takes less than two minutes to complete and can be found at *www.ulsdsurvey.com*. The deadline for completing the survey is Tuesday, April 6 (unfortunately, this issue of *LUSTLine* will hit the streets slightly after the deadline).

If the results indicate substantial, widespread issues, then the second step will be to conduct a systematic, integrated evaluation of the problem—with probably another, more in-depth survey—and suggest a solution. ■

From Our Readers

A Cautionary Note About DEF

The following letter is from a former UST regulator.

It was with some dismay that I read the article titled "DEF, It's as easy as One, Two Three, as Simple as Do Re Mi" in the latest issue of *LUSTLine*. The urea in diesel exhaust fluid (DEF) contains nitrogen. Most of us are familiar with nitrogen as a plant fertilizer, but nitrogen in groundwater can cause something known as blue baby syndrome (methemoglobinemia)—a nitrogen compound called nitrite interacts with hemoglobin forming methemoglobin. The methemoglobin cannot carry sufficient oxygen to the body. This condition is most common in infants in areas where nitrate-contaminated water is used to make up baby formula and other infant drinks. Bacteria in the human body, in food, and in soils convert the nitrate to nitrite as part of the nitrogen cycle. USEPA has established a drinking water standard of 10/mg/L for nitrates because of the human health hazard. This is an acute standard, and little work has been done on determining what the physical effects of long-term exposure to lower levels of nitrate might be.

Although nitrate is not a petroleum product, it can have negative health effects and if stored in an underground tank some sort of leak detection monitoring of the tank and associated underground piping would seem to be appropriate, especially at locations near public or private drinking water wells.

I worked as a regulator of underground oil tanks for 15 years and now work as a compliance inspector for wastewater treatment facilities. It is this work that has made me aware of the health issues associated with nitrates in drinking water. State regulators should consider this issue when deciding whether and how to regulate tanks storing DEF.

I bring this to your attention simply because my job experience has made me aware of the hazards associated with nitrates. I am speaking solely as a private individual whose experience has given me the knowledge to recognize this hazard. ■

Would You Prefer to Skip the Paper and Read LUSTLine Electronically?

For those of you that don't know, the current issue of *LUSTLine* is available for download as a PDF at *www.neiwpcc.org/lustline*. Besides having a full-color version of the current issue, the *LUSTLine* website also features online-only supplements, archived issues dating back to November, 2000, and the *LUSTLine* Index, which provides a complete list of every article ever published in the bulletin, broken down by category. NEIWPCC would like to encourage our readers to take advantage of this electronic, paper-saving deal.

If you are interested in accessing *LUSTLine* online, rather than receiving a print copy, please let NEIWPCC know! We will send you a notification via email when the new issues are posted. Simply send your Name, Organization, and Email Address to lustline@neiwpcc.org to remove your name from the hard-copy mailing list and receive the electronic notifications.

Thank you!

SNAPSHOTS FROM THE FIELD

Retired But Still Busy

The perfect truck garage.

The perfect storage shed.

FAQs from the NWGLDE

…All you ever wanted to know about leak detection, but were afraid to ask.

Evaluating ATGs for a 0.1 gph Leak Rate

In this LUSTLine *FAQs from the National Work Group on Leak Detection Evaluations (NWGLDE), we clarify how ATGs are listed after being third-party evaluated for detecting a 0.1 gph leak. Please Note: The views expressed in this column represent those of the work group and not necessarily those of any implementing agency.*

Q. ***If an automatic tank gauge (ATG) is certified to find 0.1 gph leaks, can it be used as a tank tightness test?***

A. Automatic Tank Gauges (ATGs) that have been certified to detect leaks of 0.1 gph are evaluated using the *EPA Standard Test Procedures for Evaluating Leak Detecting Methods: Volumetric Tank Tightness Testing Methods* in addition to the ATG protocol, *EPA Standard Test Procedures for Evaluating Leak Detecting Methods: Automatic Tank Gauging Systems*. The Volumetric Tank Tightness Testing (VTTT) protocol requires the method to demonstrate that it can detect leaks as small as 0.1 gph with at least a 95 percent probability of detection (Pd) and no more than a 5 percent probability of false alarm (Pfa).

There is an important difference in the third-party evaluations for ATGs and Volumetric Tank Tightness Testing methods. While the ATG protocol *does not* require the determination of groundwater depth during third-party evaluations, VTTT methods *are* required by the protocol to determine the depth to groundwater in the tank excavation backfill. This is done to see if groundwater is at or above the bottom of the tank. This is important because groundwater above the bottom of a tank can result in water intrusion into a hole in a tank due to high hydrostatic pressure. Any tank that can take on water has the potential to release fuel if there are fluctuations in the groundwater level, or if fuel is added to the tank, causing the hydrostatic pressure relationship between fuel inside the tank and water outside the tank to change.

The VTTT protocol also requires these test methods to have a means to account for and compensate for the presence of groundwater if it is detected at or above the bottom of the tank. Methods designed for compensation due to groundwater adjust the product level in the tank to create a positive pressure from the product at the bottom of the tank, thus negating the effects of a high water table.

There is no such requirement for ATGs in the USEPA ATG protocol. ATGs are not required to detect the depth to groundwater in tank excavations and compensate for groundwater if it is at or above the bottom of the tank. In regions where groundwater levels are typically below the bottom of the tank and groundwater is not a factor, the use of an ATG to conduct a tightness test may be acceptable. In other areas where groundwater is above the tank bottom, slow water ingress might go undetected until it reaches the ATG level where the high-water alarm is activated. Be aware that a static ATG test only evaluates the portion of the tank that is holding fuel when the test is conducted, and most tests are conducted when the tank is less than full. Therefore, a static ATG test result would only be representative of a portion of the tank. Another method, such as an ullage test, would need to be used in conjunction with an ATG test if the objective is to test the entire tank. VTTT underfill tests would also only test the wetted portion of the tank, but typically these tests are supplemented with ullage testing that would test the remaining unwetted portion of the tank.

Since ATG test methods do not account for groundwater levels, they are not listed by NWGLDE as a VTTT method. Whether to accept the use of a 0.1 gph ATG test as equivalent to a VTTT and, if so, under what conditions, is ultimately the decision of each implementing agency. ■

About the NWGLDE

The NWGLDE is an independent work group comprising ten members, including nine state and one USEPA member. This column provides answers to frequently asked questions (FAQs) the NWGLDE receives from regulators and people in the industry on leak detection. If you have questions for the group, please contact them at questions@nwglde.org.

Oops!

In the last FAQs from the National Work Group on Leak Detection Evaluations (LUSTLine #63, "More Questions on Throughput!"), we left out some important words at the very end of the answer to the question: Why do some listings have throughput limits while others do not? So, please accept our humble apology and note the complete text for the end of that question:

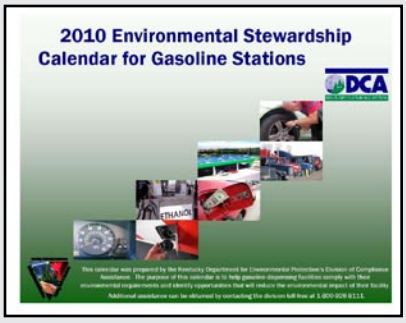
> "Unfortunately, the current SIR protocol does not include a throughput limit like the CITLDS protocol. Because of this, the NWGLDE has included the throughputs from the data sets used during the third-party evaluation of the SIR methods. **The NWGLDE provides this information for state agencies that may want to consider using this monthly throughput as a throughput limit."**

Kentucky's Compliance Assistance Calendar for Gas Stations

The Kentucky Division of Compliance Assistance in partnership with the Division of Waste Management's Underground Storage Tank Branch has developed a multimedia *2010 Environmental Stewardship Calendar for Gasoline Stations.* The calendar is the first step in a series of outreach efforts targeted at this sector. It is part of a pilot project to evaluate the effectiveness of repeat communication and contact with gas station owners resulting in increases in compliance and environmental stewardship behaviors.

The calendar covers topics ranging from compliance with UST, air quality, water, and waste regulations to encouraging green behaviors such as recycling, energy efficiency, and resource conservation. In addition to the calendar, the pilot counties will receive follow-up materials such as a green scorecard, compliance checklists, and targeted training on new regulations such as the National Emission Standard for Hazardous Air Pollutants for Gasoline Distribution Facilities Subpart 6C.

A primary goal of the project is to increase compliance rates and at the same time encourage positive environmental stewardship behaviors and membership into Kentucky's environmental leadership program, KY EXCEL. Upon completion, the project outcomes will also be used to evaluate future environmental stewardship and compliance outreach and communication materials for the sector statewide. For more information, contact Kenya Stump at 502-564-0323. To see the calendar, go to *http://www.smallbiz-enviroweb.org/Compliance/calendarfiles/KYgasstationcalendar2010.pdf.* ■



UST Program Pioneer Bill Torrey Says Goodbye Tanks, Hello Gardening and Fermenting

In November 1984, while working in USEPA Region 1's (New England) RCRA Subtitle C Hazardous Waste program, Bill Torrey was asked to help start a new program to rein in the problem of leaking underground storage tanks in the region. Region 1 had been working closely with its states for several years to enhance awareness of a broad spectrum of groundwater management and protection issues. In fact, since January 1984 the New England Interstate Water Pollution Control Commission (NEIWPCC) had been providing a forum for the six New England states and New York State to meet and share experiences regarding leaking underground storage tanks and formalize and foster compatible state UST regulatory programs. Bill Torrey guided the states all along the way.

On November 8, 1984, USEPA's mandate to regulate underground storage of petroleum products and hazardous substances (RCRA Subtitle I) was signed into law. USEPA headquarters turned to the experiences of the New England states, which already had initial statutory authorities to regulate tanks, one had already initiated a notification/registration process, and all were set to get busy writing regulation. Bill Torrey helped make the connections with his states and the new federal program. He even wrote a column in the first issue of *LUSTLine* in August 1985, giving other states a sense of how things were taking shape in New England.

Bill was a steadfast, guiding presence for the New England state tank programs for more than 25 years, but in December 2009, he bade his friends in the tanks program farewell. While he may have retired from tanks, we all know what this brewmeister/gardener par excellence is up to. We'll miss you Bill, but we also know you are having lots of fun doing what you really love. ■

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TANKS CONFERENCE & EXPO

The 2010 National Tanks Conference will be held September 19–22, 2010 at the Westin Hotel Boston Waterfront in Boston, MA. The National Tanks Conference Website (***www.neiwpcc.org/tanksconference***) contains all conference information including agendas, registration, exhibitors, hotel, and destination information, and much more. Exhibitor registration is currently open and attendee registration is expected to open in May. Please check the website often for more information and updates!

www.neiwpcc.org/tanksconference

Exhibiting at the 22nd National Tanks Conference and Expo

As in the past, the 2010 National Tanks Conference and Expo will showcase the latest and greatest in tanks-related products and services. We invite you to join us in Boston to exhibit your product or service to the 500+ anticipated attendees. Interested in exhibiting?

Contact Michele Piazza (mpiazza@neiwpcc.org, (978) 323-7929) for more information or visit the Exhibitors section of our website!

L.U.S.T.LINE INDEX

August 1985/Bulletin #1 – May 2009/Bulletin #61

The *LUSTLine* Index is ONLY available online.

To download the *LUSTLine* Index, go to *http://www.neiwpcc.org/lustline/* and then click on *LUSTLine*.

NOTE: If you were fascinated and/or grossed out by Bob Renkes' article and photos on ultra-low-sulfur diesel fuel, page 16, you might want to read an excellent article titled "Microbes and Fuel Systems: The Overlooked Corrosion Problem" by Fred Passman in *LUSTLine* #39, November 2001. We have put this article on the NEIWPCC website (*www.neiwpcc.org*). Click on LUSTLine and then "online-only supplements."