New England Interstate Water Pollution Control Commission

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

LIVE AND LEARN

With Federal UST Regulations More Than 15 Years Old, It's High Time to Heed What We've Learned in the Meantime

by Marcel Moreau, Patricia Ellis, Ellen Frye

The 1998 deadline for removing, replacing, or upgrading substandard USTs was such an all-consuming push for regulators that some of the other particulars of the tank program (e.g., leak detection and operation and maintenance) enjoyed considerable freedom from attention.

But oh oh oh, when the tank regulation folks finally came up for air after the 1998 deadline passed, a troubling UST reality set in—those puppies were still leaking! And finding methyl *tertiary*-butyl ether (MTBE) cruising through the groundwater nether regions did nothing to help matters, except to focus our attention on the fact that USTs are still a problem—one that many, including state and federal legislators, were getting ready to consider over and done with.

While the fact that UST systems leak has not come as a major surprise to UST regulators, a certain amount of dismay and frustration tugs at their hearts and minds just the same. "How much more can we do," they ask, "when our resources have already been stretched beyond the beyond? How can we be effective at addressing changes in technology when the federal rule seems to have drifted into a state of stifling stagnation? How will we ever get this complicated set of rules across to a regulated community that relies on a continuously revolving and disinterested workforce to carry out day-to-day operations and maintenance?"

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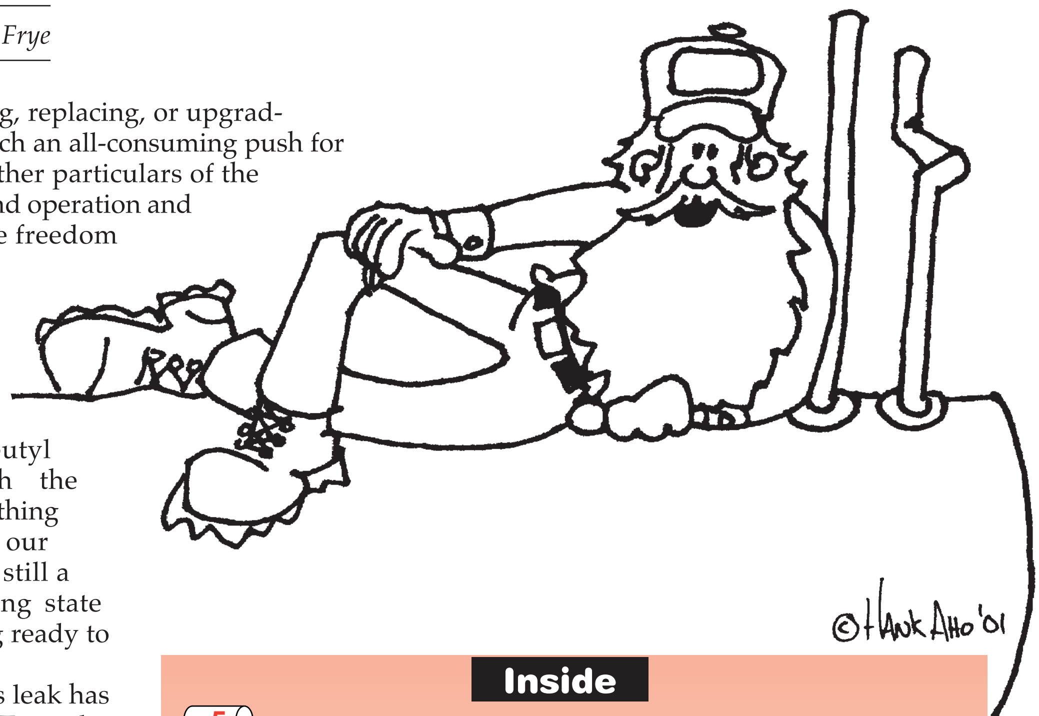

Inside

■ Live and Learn

continued from page 1

Don't get us wrong, the 1998 deadline accomplished some very important milestones with regard to USTs. Besides bringing substandard UST systems up to improved operational speed, it helped permanently close approximately 1.5 million of them, leaving us with that many fewer tank systems to worry about. Now we can focus on the remaining estimated 693,107 tank systems subject to federal regulation and the innumerable heating oil tanks, aboveground storage tanks, and "what not" tanks that are not subject to federal regulations. Keeping in mind that no tank is too small to cause a big headache, the headaches are bound to persist.

In Light of the GAO Report

The May 2001 General Accounting Office (GAO) report, *Improved Inspections and Enforcement Would Better Ensure the Safety of Underground Storage Tanks*, (**www.gao.gov/cgi-bin/getrpt?gas-01-464** or **www.gao. gov/new.items/d01464.pdf**) does a nice job of characterizing the UST dilemma. The report was undertaken in response to concerns expressed by members of Congress that the UST program is not effectively preventing leaks and that USTs continue to pose risks. The report is surprisingly discerning, due in large part to the fact that those who conducted the survey on which the report is based asked good questions and, more importantly, actually listened to the answers provided by state and federal UST program managers.

Based on state and EPA responses to the survey, the report estimates that about 89 percent of the total number of federally regulated tanks were upgraded by September 2000. It also estimates that about 29 percent of the regulated tanks were, as of the survey, not being operated or maintained properly, increasing the risk of soil and groundwater contamination.

Clearly, our problems with USTs have not gone away, and as the GAO report points out unequivocally, inspection and enforcement effectiveness is in serious need of improvement. According to the report, "22 states do not inspect all of their tanks on a regular basis, and therefore, some tanks may never be inspected." These states typically target tanks for inspection based on factors such as a tank's potential risk to the environment, proximity to groundwater, or the number of complaints lodged against it.

Clearly, any such improvement in inspection and enforcement requires increased resources—the eternal stumbling block. Those who hold the purse strings seem to have a preference for spending more money to clean up contamination than for spending less money up front to prevent it from occurring in the first place.

Then again, we must also acknowledge that the technical and operational compliance requirements for this program are humdingers to enforce. EPA estimates that a qualified inspector can visit 200 facilities in one year. (*Report to Congress on a Compliance Plan for the Underground Storage Tank Program*, June 2000, EPA 510-R-00-001.) However, based on the time it takes to perform a complete inspection and the follow-up involved, many program managers feel that this number is optimistic.

Another enforcement frustration that the report noted more than once is that most states and EPA lack authority to use the most effective enforcement tools, such as prohibiting fuel delivery to noncompliant tanks, and many state officials acknowledged that simplified enforcement tools and resources are needed to ensure tank compliance.

Another serious drawback with the tank program that was identified in the report is the lack of information on the extent and causes of the leaking tank problem, the effectiveness of current equipment and technology, and the effectiveness of existing standards.

Amazingly, in the 13 years since the federal regulations went into effect, precious little has been done to collect appropriate data and to evaluate and modify the rules. As one of its four UST program initiatives, the U.S. EPA Office of Underground Storage Tanks has undertaken a nationwide effort to assess the adequacy of existing equipment requirements to prevent releases.

Anecdotal Pearls

Heaven knows, those of us who have lived and breathed USTs over the years that the tank program has been chugging along have amassed tank pits full of opinions. And we can only hope that the pearls of wisdom—the down and dirty tank experiences that have accrued during these years—finally have some value. When the rules were developed in the mid-1980s, regulators had no tank history of their own from which to draw; they relied almost entirely on industry input.

We'd like to take this opportunity to add some of our history and our *opinions* to the story. (Altogether, the three of us who are authoring this article have over 45 years of UST history.) We'll tell it as we see it and then open up the podium to a broader group of distinguished and sagacious UST regulators, who will dispense their thoughts on what they

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have learned about USTs. Let's begin at the beginning.

Once Upon a Time, There Was a Problem...

It was that time around 1984 to 1988, a heady time at EPA. A new, important, and challenging program was being born. It was being crafted virtually from scratch. It was attempting to regulate a problem on a scale never before attempted. It's dynamic leadership was focussed on a single goal: Let's build a program that works.

Anything was possible, so long as it was grounded in the reality that there were more than two million underground storage systems in use, and more than a quarter of them may have been leaking toxic and flammable substances into the ground.

The architects of the UST program were young, committed, idealistic, and human. They sought and considered the advice and counsel of industry, other regulators, and equipment manufacturers. They spent lavishly on research to create defensible data on which to base decisions. They gradually became invested and enamored with the program that they'd crafted, a program that many of them felt could not fail.

Prevention, Detection, Remediation

The program had three major prongs: prevention, detection and remediation.

The prevention prong dealt with those areas that had been identified as the primary villains in the tank world: corrosion and delivery spillage. The antidote would include the installation of corrosion-protected new systems and the elimination of systems that were unprotected against corrosion by 1998. Spill containment and overfill prevention were to be implemented on newly installed systems immediately and added to all pre-1988 systems by the end of 1998.

The detection prong was a backup to the prevention prong. It was intended to stand vigil on the storage system and detect problems that might occur on existing systems before they were upgraded and that might still (though infrequently) occur on new systems.

The strategy was to reliably detect leaks soon after they occurred. The size of leak to be detected was set at the limits of the volumetric detection technology of the time. The established frequency of detection was one that was thought to be sufficient to catch leaks before they created large problems without creating an undue burden on storage system operators.

The remediation prong was intended as the measure that would deal with all preexisting problems and would also be the final barrier between future leaks and the protection of human health and the environment.

When the rules were developed in the mid-1980s, regulators had no tank history of their own from which to draw; they relied almost entirely on industry input.

Remediation standards were left vague, with the intention that states would fill in the blanks, but the door was explicitly left open so that site-specific standards could be set for cleanup. When fully opened, this doorway would eventually lead to risk-based decision making.

The unveiling of the final UST system regulations, though widely anticipated, caused remarkably little stir in the regulated community. Most people with knowledge of the status of the tank population recognized that the need to take measures to address the problem was overdue and noted that the rules relied heavily on existing industry practices. The timetable for implementation was ambitious, but 1998 seemed a long way off in 1988. There were a few murmurs of discontent, but, by and large, the industry set out to do what needed to be done.

A Report Card

So now that we have lived this bold plan for 13 years, what have we learned? Did the plan work as intended? Did it work in unintended ways? Did it fail in ways unforeseen and/or unforeseeable? Does hindsight reveal some serious flaws in the vision? There are, no doubt, many views on this. Here are ours—grades and all.

PREVENTION

Reducing the UST Population (A+)

As stated earlier, there is little question that the most wildly successful aspect of the national tank program has been the enormous reduction in storage system numbers. The better than 60 percent reduction in storage systems points to the vast number of nonessential storage systems that were in place in the 1980s (recognizing that many USTs have become ASTs with their own set of problems, but that is another story...). The only UST that is guaranteed not to leak or spill is the UST that doesn't exist.

Corrosion Protection for New UST Systems (A)

The regulatory program accomplished virtually overnight via the "interim prohibition," which went into effect on May 7, 1985, what manufacturers of corrosion-protected UST systems had struggled in vain to achieve for 15 years—the routine installation of corrosion-protected systems. By and large, these technologies have performed very well, though it remains to be seen how gracefully they perform in the long term.

Upgrading of Existing UST Systems (C-)

The upgrading requirements for protecting existing systems from corrosion have been somewhat problematic. The rules do not require the outright replacement of noncorrosion-protected UST systems, instead they allow existing systems to be "upgraded" via cathodic protection or internal lining technologies. While perhaps realistic in terms of making the program more affordable, the program erred in establishing a single date by which all systems needed to be upgraded rather than phasing in the requirement over several years.

The single-date deadline coupled with a lack of effective incentives to accomplish the upgrading work early, led to a massive demand for upgrading services in a short time frame. This was an invitation to entrepreneurs to prey on a population of tank owners that had little

■ continued on page 4

■ Live and Learn

continued from page 3

understanding of the technologies they were buying.

To compound the problem, most UST owners who went the upgrading route were primarily motivated by the need to beat the deadline '98 while spending as little money as possible. As a result, there is widespread regulatory concern that much of the upgrading work may have been substandard to downright shoddy. Though the data are sparse, there are indications that the upgrading technologies may not fare as well as the designers of the federal rule had hoped.

Spill Containment (D)

Spill containment has no doubt had some effect in containing small spills associated with fuel deliveries, but it has also posed a major maintenance headache for owners and operators. Because of inadequate design, poor installation practices, and abuse during use, keeping spill containment manholes functional has proven to be a distasteful chore that is most often ignored.

The engineering challenge of creating a spill container lid that is liquid tight, easy to remove and replace, and capable of operating at or near the ground surface has not yet been met. It is clear, as well, that spill containment manholes do not age gracefully, particularly in the rust belt where the corrosive action of road salt and the destructive activity of snowplows contribute to a short life expectancy. Unfortunately, the regulatory program has no provision to evaluate these systems over time so that they can be replaced in a timely fashion.

Overfill Prevention (F)

Prevention of spills from tank overfill events is an important element in reducing petroleum contamination. But regulatory efforts to address the problem have been compromised by a failure to consider the entire delivery system. Attempting to solve the overfill problem by installing equipment in the tank without consideration for the effects on the delivery operator or the workings of the delivery truck has lead to solutions that are perhaps worse than the problem. (See *LUSTLine* #21 article on overfill prevention.) The equipment industry also bears some blame here for failing to design overfill devices that work.

It seems that a complete revamping of the approach to overfill prevention is necessary for this source of spills to be effectively controlled. (See *LUSTLine* bulletin #31, "If Only Overfill Prevention Worked.")

• DETECTION (D-)

Leaks are an embarrassment that nobody in the UST-owning community wants to talk about. The major flaw in the leak detection strategy of the federal rule is that it assumes that tank owners will voluntarily come forward and confess their leaks to the regulators.

This assumption fails to take into account that humans hate to confess their mistakes. To regulators who have a hard time understanding this attitude, next time you are driving and notice that you have exceeded the speed limit, stop in at the next police station and turn yourself in at the desk. The abysmal failure of leak detection (at least as far as regulators can tell) is due in some significant measure to the lack of compliance with regulatory reporting requirements.

> ***We are in a position now to step back and look at all we have learned and honestly assess what has been accomplished and what remains to be done.***

But lack of reporting is only part of the problem. Too many tank owner/operators have little to no understanding of the leak detection equipment they own or the leak detection procedures required of them. Too many of them believe that with the investments they have made for new equipment and/or upgrading, they are protected against any and all leaks for the foreseeable future. To some extent, this attitude has been fostered by equipment salespeople who are anxious to make a sale and unwilling to acknowledge the limitations of their devices.

We need look no further than the widespread occurrence of MTBE in the environment to demonstrate that the goal of contamination-free UST systems is still far from being realized. One of the most daunting tasks facing regulators today is disabusing the regulated community, of the fantasy that their storage system worries are behind them.

And to top it all off, there is uncertainty (within the regulatory community, at least) of the real-world effectiveness of many of today's leak detection technologies. While anecdotal evidence of the failure of leak detection abounds, to date, little hard data have been gathered to document how well leak detection hardware is actually performing. Without substantial efforts to gather such data, it will be virtually impossible to change the status quo for the simple reason that the regulated community wants to believe that everything is working.

• REMEDIATION (B+)

Because the remediation prong of the federal rule had fewer technical specifications, leaving it up to the states to set cleanup standards and strategies, cleanup technologies have had the chance to evolve based on trial and error. As a result, we have learned an awful lot and have at our disposal a toolbox of technologies to help us do a much better job than we could have 10 years ago.

"It was summer of '86 when I climbed into my first excavation pit in Vermont," recalls Alaska DEC's Ben Thomas. "Back then my standard issue of equipment was a hard hat, buck knife, and H-NU meter. I would be lowered into the pit in a backhoe bucket, stab at the side walls with my pocket knife, sniff for soil vapors, and tell the backhoe operator where to dig. Those were the days when we closed out hundreds of sites based on vapor readings alone. Later, I was given an explosion meter, just in case."

Early remediation emphasis was mostly on source removal or free product removal. We typically didn't look for dissolved BTEX plumes or determine the direction of groundwater flow. Site characterization was limited to the few wells that were installed, and pump and treat was the only game in town. (Actually, it works better for our current MTBE problem than it did for BTEX constituents.)

State funds had a lot to do with changing the remediation dynamic. In the early 1990s, a considerable number of state assurance funds were created as means to cleanup sites and provide financial assurance to UST owners and operators. Within a relatively short window of time, state funds became the primary financial responsibility mechanism used by tank owners and operators.

The funds effectively dealt with a huge number of cleanups. To preserve fund resources and deal with the overwhelming backlog of contaminated sites, EPA and the states began to focus on the need for cleaner, faster, cheaper remediation alternatives, encouraging the exploration of innovative technologies. LUST cleanups had initially been the consultant's dream come true—protracted and lucrative.

The problem was that many sites that went beyond standard dig-and-dump procedures had become victims of years of ineffective pump and treat cleanup efforts or endless monitoring without any closure on the horizon.

At the behest of EPA, many regulators adopted the industry view that contamination in the ground is okay as long as it doesn't hurt anybody. This cleanup approach, originally called risk-based corrective action (RBCA) and more recently risk-based decision making (RBDM), helped direct resources to the higher risk sites.

States viewed this approach as a way to move sites to active remediation or close them out due to the lack of environmental risk—eliminating the endless monitoring. The new philosophy was directed less toward how much you could cleanup and more toward how much you could safely leave behind. Monitored natural attenuation became the new mantra.

But now that remediation technologies have improved tremendously, we have the capability of doing a better job of cleaning up sites and still keeping the costs down—so let's do it.

We need to stress source reduction and rapid response in cleanups. We've got new tools for site characterization that allow us to perform on-the-fly plume delineation with direct-push technology and field labs. No more multiple rounds of monitoring well installation and weeks or months between each drill rig mobilization.

At a minimum, we should attack residual contamination in the source area. Using our technology toolbox, we can perform source area and plume remediation where needed, *then* let natural attenuation do the rest.

We don't need to leave impaired properties behind. None of us have a crystal ball to tell us what a site will be used for five years from now. Must we emphasize human health and safety and forget about the environment?

Finally, let's remember the root cause of the UST problem—it was cheaper to leak than not to leak. If state funds pick up the cleanup tab and leave the tank owner/operator free of compliance responsibility or financial repercussions, leaks will continue. The UST problem will not be solved until it becomes more expensive to leak than not to leak.

Stepping Back and Going Forward

The UST program is an enormous balancing act in which many factors and outcomes must be considered. The program has had notable successes, and the overall storage system population is much healthier today than 20 years ago. But we are in a position now to step back and look at all we have learned and honestly assess what has been accomplished and what remains to be done. The goal of this article is not to provide answers but to spark discussion and perhaps movement so that the dreams of the founders of the UST program may ultimately come to fruition. ■

*If you have any comments or responses to this article, please let us know. In an effort to encourage dialogue on where we are going with the UST/LUST program, we will publish your thoughts in the next issue of **LUSTLine**.*

ASTM's Standard Guide to Microbial Contamination in Fuels and Fuel Systems Available

Uncontrolled microbial contamination in fuels and fuel systems remains a largely unrecognized but costly problem at all stages of the petroleum industry from crude oil production through fleet operations and consumer use. Microbes growing in fuel systems can cause system component damage, degrade fuel quality, or both. We plan to cover this subject in more detail in the next issue of *LUSTLine*. Meanwhile, check out a new American Society of Testing Materials (ASTM) document, "D 6469 Standard Guide to Microbial Contamination in Fuels and Fuel Systems," available from ASTM's Web site: **www.ASTM.org.**

This guide provides those who have a limited microbiological background with basic information on the symptoms, occurrence, and consequences of chronic microbial contamination. Most importantly, it provides personnel responsible for fuel and fuel system stewardship with the background necessary to make informed decisions regarding the possible economic and/or safety impact of microbial contamination in their products or systems. It also addresses the conditions that lead to fuel microbial contamination and biodegradation and the general characteristics of and strategies for detecting and controlling microbial contamination.

The information in the guide applies primarily to gasoline, diesel, aviation turbine, marine, industrial gas turbine, kerosene, gasoline, and aviation gasoline fuels (specifications D396, D910, D975, D1655, D2069, D2880, D3699, D4814 and D6227) and fuel systems. However, the principals discussed also apply generally to crude oil and all liquid petroleum fuels. The guide complements and amplifies information provided in ASTM Practice D 4418 on handling gas-turbine fuels. ■