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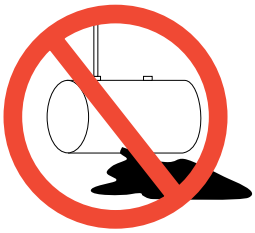

A Report On Federal & State Programs To Control Leaking Underground Storage Tanks

Looking for Leaks in All the Wrong Places

A Short Story with an Epiphany

by Marcel Moreau

The Chief looked over his reading glasses from the report he had been reading as his senior field inspector shuffled into his office. The Chief had sent him out that morning to investigate a recently discovered release at an UST facility. The Inspector slumped into the chair across from the Chief's desk.

"Well, what'd ya find?" muttered the Chief.

"Not much," was the noncommittal reply. "The usual stained soil and smelly excavation; no groundwater yet, but contamination likely. Water supplies a couple hundred feet away, MTBE in the gasoline." Though unspoken, both the Chief and the Inspector recognized that it was only a matter of time before this release hit the headlines—and there had been too many of these headlines of late.

"So what happened? What leaked?" grumbled the Chief. He didn't like sitting in the hot seat when some well owner's legislator called demanding an explanation.

"Dunno," said the Inspector. "Most of the site was dug up by the time I got there. Piping all gone. Saw the last tank come out. It looked okay."

"Great!" exclaimed the Chief, throwing the report down on his desk. "Reporters, legislators, lawyers, and well owners all breathing down my neck wanting to know why this is happening, and all you can tell me is 'Dunno!' How are we ever going to get to the bottom

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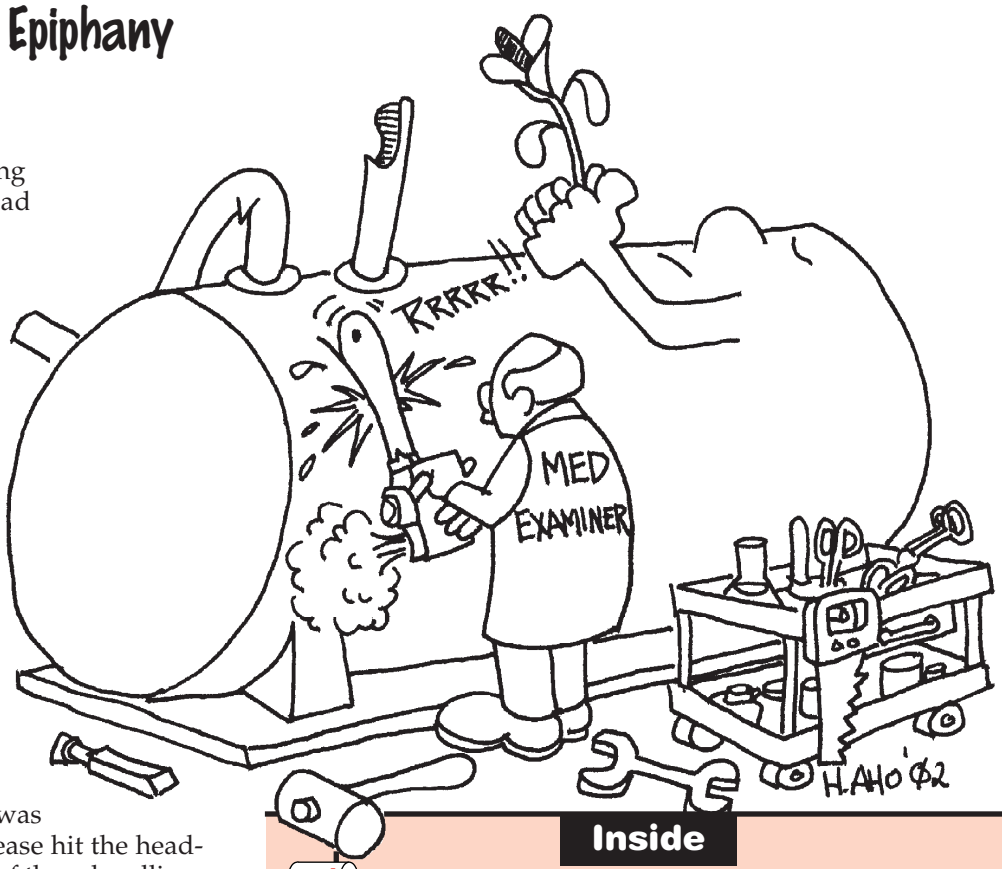

Inside

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of this with answers like that? How are we ever going to know if this program has accomplished anything? How are we going to continually improve the performance of storage systems if we don't know what's going wrong? How are we going to fix problems that we can't even be sure exist? How are we going to get to a place where our grandchildren aren't trying to solve the same problems we are? Look, I want some answers, and I want you to find them. Don't bother coming back until you figure out a way to get the information we need."

"Yes, sir. I'll get right on it."

The Inspector shuffled down the hall, grabbed a mug of black coffee, snaked his way past stacks of unread reports, journals, and guidance documents, and settled into his cramped quarters. He knew the Chief was serious about getting to the bottom of storage system leaks. But he also knew some disturbing facts.

LUSTLine

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Anecdotally Speaking

Fourteen years and over 400,000 releases after the federal tank rules went into effect, no one could tell him with any certainty where the leaks were coming from in today's systems. He knew there had been some attempts to answer the question, but the results of tank autopsy studies completed so far had been dismal. He had some hope that more recent studies might produce better results, but he doubted that they would produce the kind of information the Chief was after. The anecdotal evidence pointed heavily towards pressurized piping systems as today's dominant source of releases, but specifics on what was failing and why were nonexistent as far as he could tell.

If you want to really know which UST component has failed, you can't go at it with a backhoe any more than a coroner can do an autopsy with a chain saw.

He suspected the problem was in the data. It was not easy to come by. Because the state cleanup fund essentially provided "no fault" insurance to the tank owner, there was no financial incentive to find the cause of the release and seek cleanup cost recovery through the legal process from anyone who might potentially be responsible for the release.

There was also typically no one on site during repair or removal procedures who was there specifically to determine the origin of the release. He doubted that among his own staff he had people experienced in finding release sources, and he had never heard about any course on how to identify a leak.

Tank installers, though knowledgeable, had their own agendas. If they had installed or maintained the UST system, they were not likely to point out their own mistakes. Nor were they too keen on snitching on their competitors, for they knew that that competitor might some day be uncovering some of the mistakes that they had buried over the years. Tank workers were generally paid by the tank owner and were not anxious to point out that the release should have been discovered long ago through leak detection. Truth is, a great many more people had an interest in hiding the source of the release than in finding it.

Getting the answers the Chief wanted was going to take some good data, but he could see that this was not going to be an easy nut to crack. As his spirits began to flag in the face of the task, his eyes rested briefly on the top document in a pile that he had generally designated as his "reference" pile. The title, "EPA Requirements for Quality Assurance Project Plans," suddenly clicked into his consciousness.

The new department quality assurance guru had recently dropped it on his desk, saying, "It's dreadfully dull reading, but if you've got questions, here's a description of a process for getting answers." Hmmm, he thought, maybe there's something in it that would help…

The Cold, Hard Facts

A week later, the Inspector handed the Chief a slim document. "This isn't the answer, Chief, but if you want to get the answers, here's a description of what we need to do."

"Listen," growled the Chief, "I told you not to come back until you had answers. I don't need another report telling me what I already know we don't know."

"I know," replied the Inspector. Though their interactions were often gruff, the two had worked together since the beginning of the UST program and had great respect for each other's abilities.

"I have the answer, but it's not what you think. I've finally figured out the problem. The reason we're not getting any answers is that we're looking in all the wrong places with all the wrong tools. If you want to really know which UST component has failed, you can't go at it with a backhoe any more than a coroner can do an autopsy with a chain saw. We need to think in terms of crime scenes rather than demolition derbies. We need to be looking for fingerprints and stray hairs, not the getaway car."

"You've been reading too many whodunits," interjected the Chief, interested but still not convinced that he was going to hear an answer.

"Yes, sir," replied the Inspector, "Look, if you're serious about getting quantitative answers, it's not going to happen overnight. Here's what we need to do. We need to identify our questions and carefully define the kind of data that we need to answer our questions. We have to figure out how to get quality data, go out and get it, review it to see if it's any good, and then look at it to see what it's telling us. We need a Quality Assurance Project Plan, a QAPP. I know it sounds bureaucratic, and I had to wade through a pile of jargon to figure it out, but this is a concept with some meat to it. If you want answers, this is how to get them. I've got to run to meet a contractor, but here are my thoughts. See what you think." With that, he headed out the door.

The Chief reluctantly picked up the few pages, and this is what he read.

A PLAN TO FIND THE SOURCE(S) OF AN UST RELEASE

■ Step One: Define the questions that we are trying to answer.

We can gather data 'til the cows come home, but how will we know we have the answers unless we are very clear about the questions. The questions, as I see them, are as follows:

- Which components of today's UST systems are responsible for releases into the environment and how frequently do they fail?
- Why did these components fail?
- Did release detection find the release? Why or why not?

■ Step Two: Define the types of data required to answer the questions.

The types of data (listed in the order that they might be gathered) that are useful in answering these questions include but are not limited to:

- **Review all available records.** Look carefully at leak detection records, inventory records, maintenance records, repair records. It may be that the leak has already been detected and repaired before the regulator ever appears on site to try to track down the source of a release. Have leak-detection equipment (e.g., ATGs, line leak detectors) checked out to be sure that they are operating properly and can detect the required leak rate.
- **Make a visual observation of the operating system.** Many leaks can be observed with a simple visual investigation of the dispenser and submersible pump sump (while it is operating) before anything has been disturbed. If a leak is observed but its exact origin cannot be pinpointed, drain the piping, pressurize the system with nitrogen, and conduct a soap test to pinpoint the defect. Document the defect with pictures and a detailed description.
- **Tightness test the piping system.** If no leaks can be observed in the piping, conduct a standard piping tightness test. Use a piping test that uses a threshold of .01 gph. Conduct a tightness test even if leaks are found in the observable portions of the liquid-carrying system—there could be multiple leaks. If piping is double walled, air test the secondary piping and water test the dispenser and piping sumps.
- **Locate the approximate release point.** If tightness testing indicates a release that is not visible without excavation, conduct a helium test to locate the approximate point of the release.
- **Excavate with care.** Saw cut and remove paving. Do not use a jackhammer! Excavate with a hand shovel, then carefully with a hand trowel as you get close to the piping. If piping is backfilled in gravel, use a heavy-duty shop-type vacuum to clear away the backfill immediately adjacent to the piping.
- **Conduct a nitrogen/soap test.** When the area of the release is uncovered, conduct a nitrogen/soap test of the uncovered pipe to pinpoint the release.
- **Document the defect with pictures and a detailed description.** Take pictures to document the release site. Makes notes of all surrounding conditions (e.g., backfill, proximity of other components such as electrical conduit, other piping runs, grade stakes).
- **If piping is tight, proceed to investigate the tank.** Conduct a tightness test—one you have confidence in. Test the spill bucket by filling it with water to determine if delivery spills might be contributing to the source. If the tank is suspect, inspect it internally, or excavate it carefully. When the tank is removed, clean off all adhering soils and arrange to have it nitrogen tested and soaped to locate any perforations. Look especially carefully at the bottom of the tank where hard-to-detect internal corrosion holes may occur in steel tanks. Document perforations with pictures and a written description.

  Early in the excavation process, examine soils around the fill pipe and submersible pump and all other tank-riser pipes for evidence of contamination. Document staining or other visible evidence with pictures and written descriptions. Back up with PID and laboratory samples to document contamination.

■ Step Three: Gather reliable data.

Develop detailed protocols on steps to follow in the investigation, including how to document it and how to ensure the quality of the data. Select a few of the most experienced and knowledgeable personnel, and designate them as an elite leak-detective corps. Whenever a release is suspected, they are to be called in immediately, before evidence is disturbed or destroyed. Provide ample classroom and field workshops on how to carry out the protocols.

Provide a budget so that inspectors can pay for investigative procedures such as tightness testing, manual excavation, and nitrogen testing—things for which the tank owner may be unwilling to pay. Preapprove contractors so inspectors can immediately call in someone to do the work. Resources should be expended only where a preliminary

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assessment indicates there is a good chance of obtaining quality data.

■ **Step Four: Have an independent review committee look at reports submitted to determine if data quality is adequate to answer the questions posed.**

Only reports deemed to be of acceptable quality (the review committee determines that a leak has been positively identified) are entered into the database. Discard reports found to be inadequate, but study them to determine if a change in procedures should be made to improve data reliability. The review committee should include people versed in statistics, knowledgeable staff, and perhaps some stakeholders, such as tank installers and large tank owners.

■ **Step Five: Analyze the data.**

Study the data carefully to extract information that answers the questions originally asked. Note that we are only gathering data about known failures. If we really want to get a handle on leaks, we would have to do a study involving a random sample of operating UST systems.

SUMMARY

This is not a project for the faint of heart. It will take a significant investment in time and expertise to develop a project plan, let alone carry the project through to a meaningful conclusion. Though everyone wants answers now, the fact is we don't have the data now, and it's going to take considerable time to gather it. But, if we keep doing what we've been doing, we're going to keep getting what we've been getting. If a nationwide project plan could be developed and implemented by interested state agencies, more data could be gathered sooner.

Epiphany

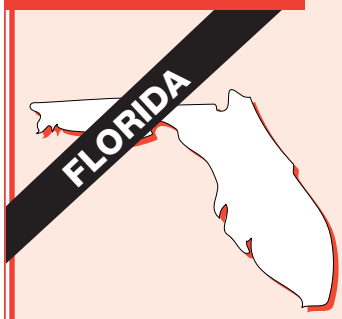
The Chief laid down the report. His brow furrowed as he sipped his cold coffee and recognized how radical the ideas he had just read really were. And suddenly, it dawned on him how dramatically times had changed.

He remembered that when he had started in the tank business, the leak problems were mostly pencil-sized corrosion holes in the tanks. You could easily spot them just by scraping the dirt off the tank after it was out of the hole. He realized that while everyone was pointing to the holes in the tanks and saying, "There's the problem," there were no doubt less-obvious leaks that were also present but going unnoticed. Now that corrosion holes were mostly a thing of the past, the other leak culprits were getting some long overdue notice.

But while the problem had now shifted from obvious corrosion perforations to the more subtle failings of joints and fittings, leak investigation techniques, if applied at all, had failed to develop. Inspectors still tended to look in the tank excavation for information that wasn't there. They were looking in the dirt, when the answers were in the equipment. They needed to trade their backhoes for facility paperwork, trowels, whisk brooms, and soap solutions.

The Inspector's report made sense to him, but he would have to sell it to the powers that be. And he would have to change the way his people did business. He'd have to change a lot of things. But what were his choices? Bumble on into the future, fighting all the little fires and wishing that things would change? Or start a process that would lead to data that would support changes that would make a difference to human health and the environment? It seemed a no-brainer to him, but he recognized that there would be a lot of inertia to overcome. But at least now he had a direction to head in and a compass to guide him on his journey.

Leak Prevention



Florida Launches a Storage Tank System Cause of Leak Study

The Florida Department of Environmental Protection (FLDEP) Storage Tank Regulation Section has initiated a Florida Cause of Leak Study, a joint U.S. EPA/FLDEP effort to investigate the causes of releases from underground and aboveground storage tank systems. The study will not consider leaks from older steel tank systems that were not protected from corrosion. Instead, it will focus on data from discharges that occurred after January 1, 1995, ensuring that only facilities that are protected from corrosion, constructed of corrosion-resistant materials, or that have secondary containment are included—the state database has 6,549 post-1995 Discharge Report Forms (DRFs).

FLDEP will hire temporary employees who are experienced County Local Program Inspectors to perform a file review of the DRF sites, fill out the survey forms, attach supporting information, and mail the data on a monthly basis to FLDEP. They will also investigate Incident Report Forms, which indicate potential leaks. The inspectors will perform these file reviews after their regular work hours.

The information will be scanned into the state's tanks database and will also be transmitted on a CD to EPA on a monthly basis. EPA's contractor will compile the information and summarize the results. This study will contribute to EPA's UST System Evaluation initiative, and the results of the study will help the agency make future decisions on how best to prevent and detect releases from UST systems. FLDEP plans to use the information to assist with rule development and program management.

The inspectors will review discharge files from nine counties, representing about 62 percent of all of the post-'95 discharges. The inspections will take place from April 15, 2002, through August 30, 2002. For more information, contact Marshall Mott-Smith at (850) 488-3935 ■

Marcel's Postscript

What I have outlined here is the basic process of defining data quality objectives and developing a quality assurance project plan (see **http://www.epa.gov/quality/qs-docs/xg4-final.pdf** and **http://www.epa.gov/quality/qs-docs/g5-final.pdf**). A fully developed plan would involve much greater detail. But the point is, data quality for UST leak-related studies that I have reviewed to date has been very poor. If the questions are worth answering, then data are worth gathering, and we must expend the effort required to obtain quality data. The techniques for doing this are well defined; they only need to be applied to the questions at hand. The goal of this article is not to present a final solution but to plant the seeds of quality assurance project planning in the UST world. Your thoughts are invited.

Many additional procedures for finding leaks in tank systems are described in Appendix D of California's "Guidelines for Investigation and Cleanup of MTBE and Other Ether-Based Oxygenates." (See *LUSTline* #37.) ■

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.**

Field Notes

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

PEI Members Weigh in on UST System Performance

The Underground Storage Tank Branch of the Delaware Department of Natural Resources and Environmental Control offered these comments about the current status of the state's UST program in the most recent issue of its quarterly newsletter, *Think Tank:*

> *Just because the tanks have the equipment that is needed to meet the regulations doesn't mean that the equipment is being maintained, or that the equipment is operated properly. Upgraded tanks can leak, too, so . . . no, we cannot rest on our laurels. Now we must make sure that operating UST systems have the equipment they need and that they are maintained and operated in a manner that complies with the regulations.*

So what are the regulators in Delaware and other states likely to find when they check to see how the new tank systems are performing? The Petroleum Equipment Institute (PEI) was wondering the same thing when the organization surveyed a representative sample of its members in May. An average of the responses received from 28 members operating in 45 states is shown below. For purposes of this survey, a leak was defined as a visible wetness due to petroleum outside of the primary containment system (e.g., tank, pipe, dispenser, pump).

If you opened 100 dispenser cabinets at operating facilities, how many times would you find leaks in the following equipment?

Impact valves	8
Unions	16
Filters	7
Meters	9
Solenoid valves	5
Other	2

If you opened 100 submersible pump sumps, how many times would you find leaks in the following equipment?

Functional element	5
Base of line leak detector	6
Line leak detector vent tube	6
Packer O-ring	7
Union	8
Swing joint	5
Flex connector	4
Ball valve	2
Other	1

If you conducted 100 piping tightness tests of FIBERGLASS piping, how many leaks in each of the following would you expect to find between the impact valve and the submersible pump? (Do not include any leak areas already described above.)

The piping itself	1
The piping joints	6
Flex connectors	3

If you conducted 100 piping tightness tests of FLEXIBLE piping, how many leaks in each of the following would you expect to find between the impact valve and the submersible pump? (Do not include any leak areas already described above.)

The piping itself	1
The piping joints	7
Flex connectors	3

With regard to secondary containment systems, if you tested 100 of each of the following components (water test for piping and dispenser sumps, 5 psi air test for piping) how many of each type would FAIL the test?

Piping sumps	39
Dispenser sumps	33
Secondary piping	19

When the number of reported leaks in the dispensers and submersible pumps are considered together with the failure rate of the dispenser and piping sumps, it seems likely that a good number of petroleum delivery and storage systems are not tight and could be leaking product into the ground. The industry is close to getting the job done, but it's not there yet. ■