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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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.

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.

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.

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 a process for getting answers.” Hmmm, he thought, maybe there’s something in it that would help...

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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 0.01 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

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 if we have the answers? We need to 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, you have to figure out, but this is a concept with some meat to it. If you want answers, you have to figure out, but this is a concept with some meat to it. If you want answers, you have to figure out, but this is a concept with some meat to it. If you want answers, you have to figure out, but this is a concept with some meat to it. If you want answers, you have to figure out, but this is a concept with some meat to it. If you want answers, you have to
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.
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/qc-docs/xg4-final.pdf and http://www.epa.gov/quality/qc-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.”

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.