

Right Behind Your Nose All Along

The Ultimate Multi-Purpose Field Instrument For Sorting Out The Good, The Bad, and The Ugly at Tank Closure is ... the Well Primed Human Brain

n light of EPA's UST rule, when permanently closing a tank owners/ operators must, among other things, determine if leakage from the discontinued system has damaged the surrounding environment. In response, many states are scrambling to develop site assessment guidelines that can be used by their own staff, local inspectors, tank owners, consultants or contractors. Likewise, owners, consultants, contractors and local inspectors are all looking for something from the government that says, "this is how you do it."

But a "how to" cookbook on field evaluation can be dangerously over simplified. The user runs the risk of habitually relying on the same few recipes, whether appropriate for the site or not. As many experienced field inspectors readily point out, each site is different, and while good field protocol is important, ultimately decisions boil down to good judgement. "Site assessment guidelines are useful as a starting point," Tom Bergamini of the Wisconsin Department of Natural Resources cautions, "but you don't want to lose the ability to take advantage of the best instrument you have ... the human mind."

And what better opportunity than at tank closure for the human mind to behold and fathom what evils lie amongst the pores, cracks and crevices of USTerworld ... especially if the tank has been removed. What an auspicious occasion for scrutinizing tank, piping, soil, groundwater, surround-

ing receptors to contamination, and hydrogeologic elements; an occasion when these objects of scrutiny can be seen and appraised in juxtaposition. Indications of leakage on the tank itself can be related directly back to telltale signs of soiled soil or a sheen on the groundwater (if present).

Indeed, a sensibly executed closure investigation serves not only health, safety, environmental and regulatory purposes; it also provides the tank owner/ operator with information that is now becoming critical to property transactions. Across the country, lending institutions, realtors, and potential buyers have caught on to the implications of USTs, often due to grievous lessons learned first hand.

"Proper site evaluation at tank closure is very im-

portant," says Jeanmarie Haney, a hydrologist with the Arizona Department of Environmental Quality. "It can save the tank and/or property owner much frustration, delay, and money during future property transactions. I have seen a number of property transactions fail because of the presence of underground storage tanks in dubious condition on the property, or because the owner did not properly

THE UST INSPECTOR

EXPLOMETER

document the removal of the UST system. If I were the tank owner, I'd be out there myself when the tank was removed."

What Mortals We!

If only *Superman* were here! X-ray vision would come in handy for scanning the recesses of retired tank installations. In fact, Superman might be

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Behind Your Nose, continued

just the ticket in situations where the tank is to be permanently closed inplace; an auspicious occasion where mortal judgement rides on prudent vapor monitoring and shots in the dark. It would clearly make everyone's job easier if there were a well calibrated Super-something that could actually see the true fate of a tank leak.

The mortal inspector will always have some limitations - being pitted against such subterranean perversities as sandy soils, cobble, clay lenses, bedrock - in short, nature. He or she must take the time to survey the excavation, follow up on whatever clues are available to the eye, the portable field screening instrument, or the lab sample; and finally, piece together all available information. Alas, the field inspector can only do the best he or she can. However, with proper priming, such mortal minds make excellent field instruments, because they can think.

Speaking of superheroes, any tank closure investigation demands utmost attention to personal safety the hard hat, steel toed boots, and an explosion meter, to check for dangerous levels of vapor. Watch out for swinging backhoes, breaking chains, open pits...anything goes. The environmental inspector's job description does not include heroics - no risking life or limb in the line of duty.

Sorting it Out

For the inspector, tank closure generally begins with notification from a tank owner or contractor that a tank

LUSTLine

Editor, Ellen Frye

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environmental activities of the States of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island and Vermont.

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Layout, Ricki Pappo

will be pulled or permanently closed in place on such and such a day, and...is that okay? do we need a permit? what do we do? The inspector will want to know some things about the tank and the site-age, size, product stored, plot plan of tank and pipe locations, site history, proximity to water supply, etc. It helps if the inspector has already gathered this kind of basic information back at the office.

Unless a leak has already been reported - through a tightness test, inventory discrepancy, odor, etc. - the inspector will generally not know whether a UST system has leaked or not until the site visit. The whole point of this initial environmental inspection is to determine the presence of contamination. It is a cursory sorting out process involving a near surface check of soils and groundwater to decide if things look "clean"; if a small spill or release can be handled with minimum soil removal and perhaps a monitoring well; or if the case needs to be elevated from an initial site assessment to a detailed site investigation.

A detailed investigation would be a much more in-depth effort to determine the amount of product that was released to the air, surface water, soil and groundwater. These investigations are more comprehensive and quantitative than an initial closure assessment, and information gleaned at this stage (usually at considerable expense) is often used to establish goals and techniques for cleanup.

So, here is how an initial site inspection might go: Assuming the tank is already out of the ground and safely blocked, the inspector begins by looking at the condition of the tank - noting any perforations and signs of staining. "When you look at the tank you can pick out the hot spots," says Ron Schwanderlik of the Tuscon, Arizona Fire Department.

Many state and local inspectors now point to piping as the most serious hot spot for product releases. At closure, they want to be sure that piping is removed and that excavated trenching is examined. "We worry a lot about the plumbing," explains Schwanderlik. "Something like 90% of our problems are in the joints, elbows, and fill pipe areas - you start to pay closer attention to these weaker parts of the system."

The area where the tank was buried is visually examined for staining in the soil, or sheen Many petroleum products leave a visible residue which can be anything from a dark to a very light colored staining. On the other hand, sometimes dark residues come from the tar coating on a steel tank. The inspector has to look carefully at all factors - soil wetness, color, etc. Products such as gasoline or kerosene-

based fuels can be associated with dead vegetation in the area, particularly for continuous releases over a long period of time. Petroleum contaminated groundwater or surface water will often have a sheen or film that is either uniformly dark or multicolored.

Of course, the inspector uses olfactory senses to note any of the odors that characterize hydrocarbons; the nose is quite sensitive to gasoline. But, heed this warning, aside from smelling the obvious ambient odors, it is bad medicine to use the nose as an analytical screening device - sniffing gasoline is unhealthy. Use an instrument instead.

As the investigation progresses the inspector continues to note and process information ... groundwater not present ... soil staining in lower left hand corner... need TPH reading ... get samples from there, there, and there...doesn't look too bad...will want a monitoring well...ask the backhoe operator to get into the native soil beneath the excavation... right there... water supply off-site...commercialized urban area...sewer line over there. The mind at work! There is no other field instrument like it.

Field Measurement

The mind is also capable of discerning when and how to use portable field screening instruments, and when and how to take soil samples for lab analysis. The objective of an initial soil assessment is to determine whether or not free product has been released to the surrounding soils. This involves collection and field analysis of soil samples.

The debate continues about whether lab analysis is the key to good soil evaluation or whether the job can be done adequately using portable field instruments to screen for organic vapors. The answer to this dilemma is probably a function of common sense more than anything else - sometimes you need to sample more than other times; sometimes a lab analysis is useful and sometimes it isn't necessary. Again, it depends in the site and situation.

For initial site investigations, portable organic vapor detectors can be valuable field screening tools that provide quick information on relative levels of contamination. Currently available field instruments range from simple inexpensive colorimetric sorbent tubes, i.e., Draeger tubes, to sophisticated expensive portable gas chromatographs. There is debate as to which technology is better - Photoionization Detectors (PIDs) i.e., HNUs, or Flame Ionization Detectors (FIDs) i.e., OVAs. But, which tool you choose is

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EPA's Financial Responsibility Rule Hits the Streets

Insurance Availability Hits A New Pothole

EPA's financial responsibility requirements for owners or operators of petroleum USTs hit the streets in October and became effective as of January 24, 1989. While the final rule is far more sensitive to the realities of UST financial assurance than the April 1987 proposed rule in terms of per occurrence requirements, aggregate levels of coverage, compliance timing, and suspension of enforcement, new realities within the insurance world indicate that financial assurance for USTs will continue to be a frustrating uphill battle for the majority of tank owners - unless states, insurers, or Spiderman can make some moves and come to the rescue.

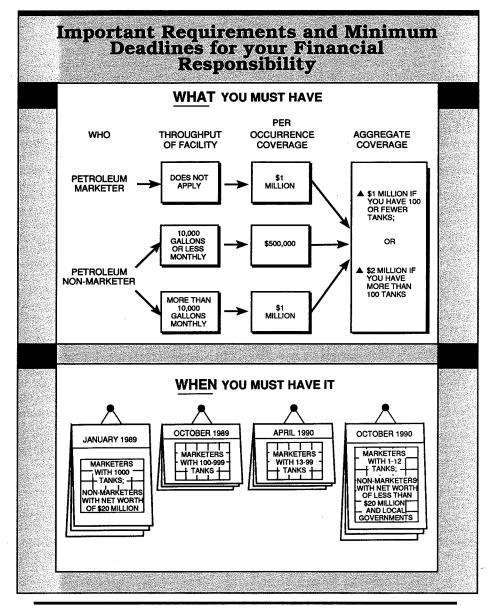
The problem is this: if you are a UST owner or operator, unless you are big enough to self-insure or you are part of some kind of group insurance pool, commercial liability insurance may well be unavailable to you. Why? A big reason is that a few years back, when insurance providers got the notion that USTs were too risky, many simply stopped writing such policies. Now this already dubitable road to insurance well-being has a big new pothole; there is now more of a gap in insurance availability than ever.

What is happening? According to Sammy Ng of EPA's Office of Underground Storage Tanks (OUST), until very recently there were three major providers of commercial pollution liability insurance: PETROMARK, Federated Mutual, and the Pollution Liability Insurance Association. They provided coverage to about 25% of the USTs. Self-insurance covers another 25% of the USTs, and the rest are either uninsured or covered by other sources. But, as of December 31, 1988, PLIA has dissolved.

The Commercial Insurance Scoop

PETROMARK is a newly formed risk retention group (see LUSTLine #8) offering coverage to petroleum marketers in all 50 states. So far, it has written policies to cover 575 tank owner/operators at 8,100 locations. The average premium is about \$2000 per facility. A one-time capital contribution equal to the insured's total annual premium is also required. The group offers coverage limits of \$1 million per occurrence and \$2 million annual aggregate, which meets EPA financial responsibility requirements.

Federated Mutual was, at one time, the biggest insurer of USTs. Currently, it provides coverage for over 80,000 tanks at 25,000 locations in 39 states.



UST coverage is offered as part of a total liability insurance package. Over the past year they have reduced their per occurrence coverage limits from \$1 million to \$500,000 (\$2 million aggregate), and reduced the coverage period from one year to six months. Apparently, they have paid out some very large claims, especially in California.

Recently, Federated announced additional increases in premiums, with insureds in some states paying double what they had been paying. In California, for example, insureds will be charged as much as \$20,000 per facility.

PLIA was a pool of 14 insurers writing pollution liability coverage for about 100,000 USTs. PLIA provided underwriting expertise and reinsurance for its members. Policies, limited

to petroleum marketers with 20 or more tanks, covered limits of \$1 million per occurrence and \$2 million

aggregate.

Despite PLIA's success and profitability in covering USTs, the Association dissolved this December. This move was triggered by the planned withdrawal of two of PLIA's largest members whose absence would increase the risk to the remaining smaller companies. Furthermore, the higher profitability of other lines of insurance made it less attractive for these other companies to remain. Existing PLIA policies will be honored and serviced until they expire, but the Association stopped issuing policies and renewals as of this January 1st. Some PLIA members may continue to offer coverage directly to some of their custom-(Continued on Page 4)

Financial Responsibilty, continued

What Now?

Naturally the events in insuranceland put an added strain on the realization of federal financial responsibility requirements. OUST's program philosophy and goal has been to build flexibility into the UST regulations while ensuring environmental protection. In writing the rule, the Agency tried to be realistic about how financial responsibility requirements could be implemented given the realities of the marketplace. The phase-in compliance schedule was based on a best estimate of who could obtain coverage and when (see chart); certainly having one major commercial insurance supplier dissolve and the other discourage customers, did not factor into this estimate.

"For now, EPA is monitoring what is going on with insurance providers," says Sammy Ng. "We don't see much movement from insurers to expand markets to USTs, and if they are, they are coming in at the expensive end of the market. There is nothing much for tank owners with few tanks and few assets. We will certainly be doing more to encourage and assist states to develop financial assurance programs, such as state trust funds or state insurance programs, to assist owners/operators in complying with our requirements."

As far as states are concerned, of all the federal UST regulations, EPA's financial responsibility requirements may be the easiest to understand, but the most painful to implement. For states to take up any of the financial assurance slack, legislatures will need to be fully sensitized to the dilemma.

Currently Virginia and Minnesota have UST assurance programs and North Dakota, Wyoming, Alabama, and Louisiana are trying to do something very soon. Florida and Delaware have established amnesty programs to pay for cleanup costs from petroleum leaks. Many states have state cleanup funds that pay part of the cleanup costs, but few will pay for third party damages. About 25 states are working on proposing or developing various approaches to the problem.

From the private sector, some lobbyists have informed Congressional staffers of insurance developments and plan to lobby for legislative changes to Subtitle I. For example, some feel the LUST Trust Fund could be used as reinsurance for commercial insurance; a possible lure for the wary insurer. The Dollars and Sense of Financial Responsibility

Congress dreamed up the concept of financial responsibility to ensure that tank owner/operators could pay for the costs of third party liability and corrective action caused by a tank leak, through insurance or other creative means. The goal was to provide a means of protecting the tank owner, who is liable for damages and cleanup costs, insured or not. In theory, the financially responsible tank owner would save some tax dollars if the government doesn't have to foot the cleanup bill.

Although, in response to comments, EPA instituted a phase-in compliance schedule, reduced per occurrence coverage for non-marketers of petroleum products, and reduced aggregate coverage, tank owners should understand that they are liable for any leaks or spills associated with their tanks. Thus, if they wait two years to obtain assurance, they could end up "paying through the nose" should anything happen in the meantime. Furthermore, they are still liable for any costs over and above those covered by insurance.

Two other major comment areas concerning EPA's proposed rule for financial responsibility were the com-

plex and burdensome "suspension of enforcement" procedures and requests for municipality exemption. "We looked at suspension of enforcement procedures and couldn't decide on a policy," Ng explains. "Therefore we will not promulgate procedures at this point, but will track developments to see what works best and issue final regulations at a later point."

In response to municipal concerns about financial responsibility, EPA did not exempt municipalities, but did promise two things: 1) governments are not required to comply until October 1990, and 2) before that period is up EPA will create a financial test they

can use to self-insure.

For the nitty gritty on financial responsibility, OUST has produced a user friendly booklet called, Dollars and Sense: A Summary of the Financial Responsibility Regulations for Underground Storage Tank Systems.

This booklet may be ordered from:

U.S. EPA

Office of Underground

Storage Tanks

P.O. Box 6044

Rockville, MD 20850.

Field Notes 🕮

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

Did you hear the one about the city manager of a small college town in Arkansas who called to ask if \$11,200 was a fair price to "acoustically" protect his tanks? He had the impression that underground sound waves were causing his USTs to corrode.

Then there was the fellow in Texas who called to ask if there was a better way to "rip open" the tanks that he was excavating. He explained that his standard practice was to pull the tank, set it next to the hole, and puncture it with the front of his bulldozer at "ramin' speed." He thought this method was a pretty decent way of purging vapors from the tank and rendering it unusable at the same time. When I asked if he feared an explosion, he replied that the front of the bulldozer would protect him from most anything.

And, finally, there is a tank testing outfit in California that has two prices for its tightness tests: for \$350 the tank owner can get the result that the test shows or for \$725 he can obtain whatever results he or she would like to have

I wish I could tell you these stories were the result of someone's colorful imagination. Unfortunately, they are all true. We deceive ourselves if we believe behavior has changed simply because UST rules have been published. Although we have done a good job in getting the word out, there are still many folks out there who have funny ideas about this UST business and who know little about the new federal UST requirements. It's important to keep up the outreach efforts, not only to tank owners, but also to the consultants, contractors, and testers who seek to provide services to the regulated community.

The Edison Study is Out Tra La

The long awaited EPA study on volumetric tank testing is now out, awaiting digestion and implemention by tank testers, regulators, and consultants, alike. New EPA UST regulations call for leak detection for underground storage tanks and provide a variety of options for doing this. The most widely used leak detection methods in the petroleum industry fall into a category called volumetric tank tests (also known as "precision," "tank tightness," or "tank integrity" tests). Seeing the potential to cash in on this newly escalated demand, tank testing companies have burgeoned, and so too the need for state and local regulators to make some sense of it all.

Because EPA recognized that volumetric testing would be used as a major mode of leak detection for many tanks, providing it proved reliable, the Agency embarked on this volumetric testing study in 1986 to evaluate performance claims of manufacturers of volumetric tests, and to learn more about how well the technology worked. The evaluations were conducted at EPA's Risk Reduction Engineering Lab in Edison, New Jersey. An experimental setup using one steel tank and one fiberglass tank was constructed especially for the evaluation.

The four major objectives for the study were to:

provide data to support the devel-

opment of new EPA regulations;define the performance of the cur-

rent technology;
• make recomendations to improve

make recomendations to improve current practice; and

• provide information that would help users select suitable leak detection systems.

Of the 43 known commercially available testing systems at the time, 25 elected to participate. The value of the completed study was not in ranking these various methods, but in identifying features common to methods with high performance. The testing equipment itself had no intrinsic ranking. Ranking depended on how the test method was used. Because procedural changes are readily implementable, any ranking implicit in the EPA study is already outdated.

The premise of a volumetric tank test is that any change in the volume of fluid within a tank can be interpreted as a leak. EPA UST regulations state that all volumetric test methods must, within two years, have the capability of detecting leaks as small as 0.1 gal-

lons per hour with a probability of detection of 95% and a probability of false alarm of 5%. The study found this to be a realistic goal in terms of the current technology. (Note: In order to achieve this level of precision, a test must be able to detect a leak at or less than half that size, i.e., .05 gallons per hour.)

The Edison experiments showed that volumetric testing is a sound concept and that available test methods can work well when applied properly. Through the study, EPA learned that:

• Volumetric test methods are capable of meeting regulatory requirements;

• To achieve a performance level that meets the regulatory requirements, most volumetric test methods need modifications; and

• In most cases, the area in need of modification is the testing *procedure*, not the instrumentation.

Leak detection methods have two components, equipment and procedure. Equipment refers to the physical devices used to measure leaks, plus any computer hardware or other instruments used to make measurements. Procedure refers to the way the test is conducted, including the role of the test operator, the data analysis scheme, detection criterion, temperature-compensation scheme, and procedures for calibrating instruments. During the experiments, when a method did not function as well as it could have, the cause was almost invariably some aspect of procedure. good news is procedural changes can generally be made with less effort than equipment changes.

EPA is now working toward developing test procedures which can be used to test equipment as it is introduced into the market - to provide states with some basis for comparison.

Looking For Good Testing Performance

A test method with good performance is one that meets or exceeds EPA regulations. When a regulator is considering approving a test method, or when an owner/operator is considering selecting a testing company, the first question should be, "Has the test method been evaluated systematically?" If it was one of the methods evaluated by EPA, the vendor should be able to explain what changes have been implemented in order to improve performance.

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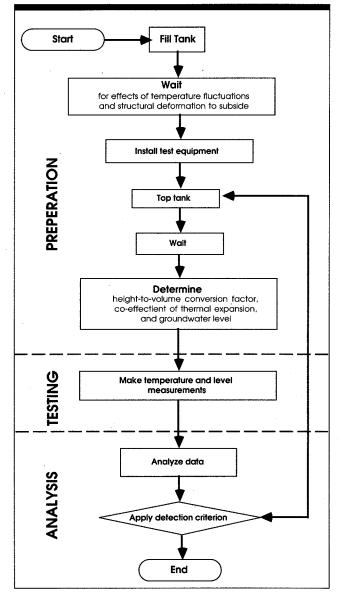


Figure 1. General procedure for conducting an overfilled tank test.

Checklist for Good Volumetric Tank Testing Performance

✓ **Instrumentation**A well designed testing system is not limited by its instrumentation.

• Instrumentation noise (fluctuations in level and temperature produced by the system itself) should be 3 to 5 times less than the minimum detectable leak rate (the fluctuations due to a leak).

• Temperature sensors must provide adequate spacial coverage of the tank, so that the data they record are representative of product conditions throughout the tank. Generally, one sensor is not sufficient, because the temperature at the top of the tank

may be increasing, while the temperature at the bottom is decreasing.

 All instruments should be calibrated periodically. Calibration ensures that measurements made by the sensors are accurate. A reliable test method incorporates field calibration checks before each test and regularly scheduled calibration checks as part of protocol.

Protocol

The predetermined steps that are followed in conducting a test are key to a successful test. With slight variation from one test method to another, protocol generally follows the description in figure 1. The seven items below are important components of good protocol.

• Groundwater level can affect the size of a leak. If there is any possibility that groundwater is above the level of the tank, an estimate of the height of the water table should be made. There should be a formal procedure for dealing with high groundwater levels

A test should not be conducted while the water table is fluctuating, which is sometimes a problem for tanks located in a tidewater area. In this situation, the tester must be aware that groundwater will affect the size of the leak, and test results must

• The height-to-volume conversion factor should be measured directly, rather than calculated from the tank's geometry. The former procedure is simple to do and is less subject to error than the latter.

Many test methods have temperature compensation schemes whose accuracy is directly influenced by the coefficient of thermal expansion. The coefficient is usually determined in one of two ways: it is calculated from a specific gravity measurement.

determined in one of two ways: it is calculated from a specific gravity measurement of the product in the tank, or an average value is calculated for a given type of product. The uncertainty of the coefficient is typically 5 to 10%.

• Tests should be conducted under nearly constant hydrostatic pressure. If a test is conducted under variable hydrostatic pressure, the product level is always fluctuating, making it impossible to convert product level to product volume.

• Adequate waiting periods must be observed after any change in product level, whether such a change represents the initial product delivery or a subsequent adjustment (topping) prior to starting the test. Any change in product level, no matter how large or small, disturbs the distribution of temperature in the tank, and produces structural deformation of the tank itself. These two effects will eventually dissipate. However, unless the waiting period is long enough to allow for this dissipation, the volume changes produced by the disturbances will obscure the leak, rendering the test results invalid.

It is recommended that a waiting period of at least 4 to 6 hours be observed after

results invalid.

It is recommended that a waiting period of at least 4 to 6 hours be observed after the initial filling of the tank, and that at least 3 hours be allowed to elapse after the occurrence of any other change, such as topping the tank.

• Data collection is examined in terms of sampling interval and test duration. As a rule, the more data the better. Data should be sampled frequently enough to measure the fluctuations in temperature and product level.

• Dealing with vapor pockets is an important part of the protocol. The best solution is to eliminate trapped vapor from the tank. Although the amount of trapped vapor cannot be accurately estimated with current technology, its presence (or absence) can be determined. A reliable test method will check for trapped vapor and will call for bleeding the tank and lines until a subsequent check shows that trapped vapor is largely absent. vapor is largely absent.

Data Analysis and Detection Criterion

Many test methods either lack a defined data-analysis protocol or attempt to implement complicated analysis algorithms without knowing how they affect the test results. Here are some steps which should be followed:

1. Compute volume changes from product level changes (unless volume is measured directly) and from the product temperature changes.

2. Calculate the temperature compensated volumetric flow rate.

3. Once the volumetric flow rate has been estimated, compare it to a detection criterion, which has been predetermined as part of the test design.

Operator Influence
Since performance depends on a set, repeatable procedure, the most reliable test methods are those least subject to operator influence.

Edison Study, continued

If the method was not evaluated by EPA, the waters get murkier, but you can ask to see any evaluation that might have been done. The more times a testing method has been used in a particular evaluation, the better; one data point doesn't tell you much of anything. Also, the more realistic the conditions when the evaluation was performed, the better. Some vendors may explain that they have developed better equipment since the EPA study, so their test doesn't take as long. Be wary of such claims-the laws of phys-

ics tend to preclude short cuts.
States that rely heavily on tightness testing will do well to assign someone to keep on top of this subject and catch the rotten apples so that they don't spoil things for the bunch (see UST Exchange, Tabs on Testing in this issue). As one inspector noted, "We need to hang a few fast operators up to dry, to show testers there is no room for poor performance." Many reputable testers are entreating states to develop certification programs to help weed out the "can I give you a deal" businesses that undercut good testers and, potentially, the whole notion of environmental protection.

See the checklist for good performance in the insert, which represents features found in successful test methods in the Edison study.

The information for this article was taken from a soon to be released summary report of the Edison study called Volumetric Tank Testing prepared by Vista Research, Inc. for the EPA ORD. If you would would like copy, write to EPA OUST, P.O. Box 6044, Rockville, MD 20850.

The study itself, Evaluation of Volumetric Leak Detection Methods for Underground Fuel Storage Tanks, PB89-124333 Volume I, \$36.95 + shipping,and a Technical Appendices, PB89-124341 Volume II. \$73.95 + shipping, can be ordered from the National Technology Information Service by calling 703/487-4650.

Soil-Vapor Analysis Procedures Used for Leak Detection in Home Heating Oil Tanks on Cape Cod

Continued from Cape Cod Article in LUSTLine Bulletin #9.

Although several factors determine the extent of vapor transport in soil, a major determinant is pore space. Generally, the sandy soil on the Cape is conducive to vapor transport. At a site where fuel vapors are noted, vertical profiling helps rule out the possibility that incidental surface spillage, rather than a release from the system, is the source of the vapors.

Sampling protocol is summarized in the following steps:

1 Orientation and location of tank and piping is established using metal detector or small hand-pushed

probe.

2 A minimum of 3 hand-driven wells are placed as close as possible to the UST. Every effort is made to place wells in the backfill material of the UST, however, due to the inability to accurately locate all components of the UST (i.e., the supply line), a conservative placement of wells is often warranted.

Holes are driven with a 5/8" diameter rod. A PVC pipe attached to a vacuum pump is placed into the hole and sealed at the top with clay. The elbow of the pipe is fitted with a septum through which a sample can be withdrawn. (For a copy of Barnstable County protocol for well installation, contact Charlotte Stiefel, 508/362-2511 Ext. 334.)

3 A 500 microliter sample of ambient air is injected into the column of a portable gas chromatograph (GC) to measure any contamination of the syringe or ambient air.

4 Two replicates (500 microliters each) from each of the wells are injected into the GC and the responses are recorded and compared to "back-

ground" levels.

5 A 30-35 microliter sample from above the open fill pipe is injected into the column to verify that the GC is functioning and to note the pattern of the particular oil in the tank.

Based on the comparisons of chromatograms, additional sampling is sometimes performed, including headspace analysis of water from any wells on site. All responses are recorded on chart paper and affixed to a schema showing the location of all appropriate structures and wells at a site.

The equipment used for this process costs approximately \$12,000. This cost would be less if a simpler "total organics" detector was used rather

than the more precise GC.

Assuming only qualitative analyses are done (i.e., presence or absence of fumes) personnel with moderate technical backgrounds could be performing tests after initial training and one month of practice. A two person team can complete 6 to 7 tests per day if scheduled nearby each other. When sampling from previously installed wells, one person could test 10 to 12 sites per day.

EPA HQ UPDATE

• OUST's Santa Fe, New Mexico workshop, Making it Work, was held in November for state program managers and regional representatives. The three goals for the workshop were to: 1) facilitate peer exchange, 2) give states a chance to share and discuss what they were doing in their own programs, and 3) help improve state programs. It appears these goals were realized; the 265 participants gave the workshop high ratings and overwhelmingly urged EPA to do it again.

The workshop sessions were set up as panel discussions with state UST program staff on the panels and OUST staff serving as discussion moderators. The selection of discussion topics included corrective action, corrosion, compliance and enforcement, piping, financial responsibility, technical standards, state program approval, tank installation, and tank closure. OUST will probably offer another workshop sometime during October 1989. In the meantime, those of us at OUST need some input from the states on subjects in need of discussion.

• The **State Program Approval Handbook** is virtually complete. Plans are underway to distribute the final version around the first week in April.

- OUST has distributed the final FY 89-90 Compliance and Enforcement Strategy to Regional Program Managers, Regional Attorneys, and appropriate Headquarter individuals.
- OUST is developing a leak detection marketing campaign to help states reach individual tank owner/operators so they can meet deadlines for leak detection requirements, beginning December 1989 deadline for tanks 25 years or older.
- States have indicated they could use some means for determining a responsible party's financial ability to reimburse the state for LUST Trust Fund expenditures. OUST began looking into this subject in conjunction with Minnesota's cost recovery pilot project. We plan to test the EPA computer model ABEL in Minnesota and other states that have cost recovery cases. ABEL estimates a corporation's ability to pay based on corporate tax return information. Because ABEL is geared toward small businesses, we believe the model will apply to a significant portion of our regulated community with little modification.
- In March, OUST will send an orientation manual to the Regions and states. Tank Tour: Your Guide to the Federal Underground Storage Tank Program is a source book for new employees in the UST program. It is targeted for EPA Headquarters and Regional staff, but will also benefit those states that either wish to know more about the federal program or are setting up programs similar to the federal program.
- OUST is working with several pilot states and counties to expedite or simplify the process of enforcement. Dade County, Florida and the Ontario, Canada Provincial Government have had success with issuing field citations (tickets for violation). As a result, they have been able to effectively identify many non-compliers during routine inspections and expediently issue citations in the field.

We have met with Delaware, New Mexico, Connecticut, Minnesota and Suffolk County, New York on this matter. All have expressed enthusiasm and willingness to participate in pilot programs to develop such programs in their jurisdictions.

PUMPING PRODUCT

The Push Ups vs Pull Ups of Product Delivery Systems - Implications For Environmental Health

by Marcel Moreau

here are two fundamentally different ways of pumping petroleum products out of underground storage tanks and into vehicular fuel tanks: a pump can be submerged in the product in the tank where the liquid is pushed through the piping, meter, hose, nozzle and into the vehicle, or a pump can be placed above ground where product is pulled out of the tank through the piping to the pump, then pushed through the meter, hose, and nozzle into the vehicle. The "pushing" technique uses a submerged pump (the pump is submerged in the product) and is often referred to as a pressurized system (the piping is subjected to pressures of 25 to 30 pounds per square inch). The "pulling" technique uses a suction pump (the pump creates a vacuum in the piping to draw the product out of the tank) and is usually known as a suction system.

Suction based petroleum product delivery systems have been around for over a century, dating back to Jake Gumper's installation of the first petroleum pump in Fort Wayne, Indiana in 1885. Pressurized petroleum delivery systems at automotive service facilities are relative newcomers to the field, dating only from around 1956.

The pressurized system has become the favorite son of petroleum marketers, but has also achieved recent notoriety as the "enfant terrible" of the environmental community. In fact, pumping product is an important issue for both tank owners and environmental regulators. In the next few pages I will discuss the reason for this and point out some merits and demerits for both suction and pressurized pumping systems. By the way, this discussion is intended to be the first word, not the last on this topic. Your views, particularly contrasting ones, are invited.

PRESSURIZED SYSTEMS: THE FAVORED SONS

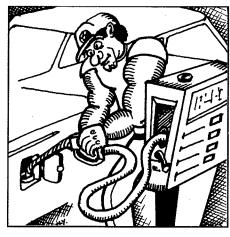
Pressurized piping systems have become very popular among petroleum marketer for a number of very sound reasons. The days of the full-serve, four-nozzle, two product, 50,000 gallon per month throughput service stations are over. In today's market, the "pumper" or "super pumper" station is the trend, with full and self-serve islands, dozens of nozzles, three or more products, and hundreds of thousands of gallons per month throughput. This change in marketing has created compelling reasons for using pressurized pumping systems in today's retail outlets; reasons like cost savings, simplified piping layout, and elimination of vapor lock.

• Cost Savings - While a suction pumping system requires a pump for each nozzle, a single submerged pump can service a large number of nozzles. Submerged pumps are significantly more expensive than suction pumps, however, the economics still favor the submerged pumps as the number of nozzles increases. As a rule of thumb, if there are more than two nozzles for a single product, a pressurized system with a single pump will be cheaper than a suction system which requires a pump per nozzle.

• Simplified piping layout - Economies can also be made in the labor and material costs of building a pressurized piping system as opposed to a suction piping system. In a pressurized system a single feed or trunkline can be run to the vicinity of the dispensing islands and then branch lines can be run to the individual dispensers.

In the traditional suction pump piping layout, a pipe must be run from each pump all the way back to the tank; if a branching pipe layout were used, an active pump would tend to "steal" product from the inactive pumps and lines, introducing air into the piping network and causing problems when the other pumps were started. This problem can be avoided, however, by placing the check valves under the pump rather than on top of the tank. Placing the check valve in this location closes off the inactive piping run so that product will be drawn from the tank rather than the other pipes in the network. This is the way that European service stations are piped. This placement of the check valve also serves a leak prevention role, as we will see later.

• Elimination of Vapor Lock - One of the prime functional advantages of pressurized systems is they are not



subject to "vapor lock". Gasoline is a very volatile substance; it goes from a liquid state to a vapor state very readily. As we learned in basic science class, when you lower the pressure on a liquid, you lower the boiling point the point where a liquid turns to a vapor - which is why water boils at a lower temperature on top of Mt. Ever-

est than in Death Valley.

A suction pump reduces the pressure on the product in the piping between the pump and the tank, which therefore reduces the boiling point of the gasoline. Warming the product (as tends to happen beneath black pavement on a hot summer's day), or lowering the atmospheric pressure (as happens at high altitudes in the Rockies), tends to exacerbate the problem. If the rate at which the vapor forms in the pipe exceeds the pumping rate of the pump, the system pumps only vapors and no gasoline can be dispensed. This is not a good situation on a hot summer day when many otherwise happy vacationers are lined up at your pumps waiting to buy gasoline so they can get to the beach.

Two other factors have exacerbated the vapor lock problem in recent years. First, the increase in the volume of the service station tanks has increased the diameter of the tanks from six to eight feet. This means that the bottom of the tank is deeper below the ground surface and the height which the product must be lifted has increased. The greater the height the liquid must be lifted, the greater the negative pressure which must be produced in the pipe. This means the boiling point is lowered, and so too, the temperature at which vapor lock will occur.

Second, the vapor pressure of today's gasolines is significantly greater than it used to be. Vapor pressure is a measure of a liquid's tendency to volatilize; the greater the vapor pressure, the lower the boiling point. Summer gasolines in Maine in the 1940's had vapor pressures of about 7 psi. By the late 70's, the vapor pressure had risen to 9 psi, and today it averages around 10.5 psi. The legal range of gasolines in the United States today 9 to 13 psi. The vapor pressure is varied with the season (higher vapor pressure gasolines enable engines to start more easily in winter) and with the latitude of the product's destination.

The increase in vapor pressure (i.e., reduction of boiling point) over the years has limited the effective lifting height of gasoline suction pumping systems to about 15 feet. Today's deeper tanks (8 ft diameter tank + 3 ft of cover + 2 ft height of pump above grade = 13 ft lifting height) are pushing suction pumps close to the limit of

their operating range. In Europe, I was toId that the effective lifting heights for gasolines are on the order of 21 feet. I marveled at this number and asked whether Europeans had better pumps, but I was told that the pumps they used

were American. I can only conclude that European fuels have lower vapor pressures.

PRESSURIZED SYSTEMS: L'ENFANT TERRIBLE

From the discussion above it is easy to see why petroleum marketers in the United States have converted to pressurized pumping systems. But the picture is not all rosy. Suction piping systems operate under negligible pressures, so they tend to drip or weep when they leak; pressurized systems operate at 25 to 30 psi (about the pressure of the average home water system) so when they leak, they spurt.

When suction systems malfunction, air is usually introduced into the system and the pump begins to behave erratically, notifying the observant operator that something is amiss. When pressurized systems malfunction, there is no indication that anything is amiss. In addition, the entire piping system is pressurized whenever the submerged pump is turned on, so the system leaks whenever any nozzle is used.

Of course, there are leak detectors for pressurized pumping systems, but their leak detection capabilities are limited: 3 gallons per hour is the smallest reliably detectable leak, however, they are inexpensive and will help prevent major releases. Unfortunately,

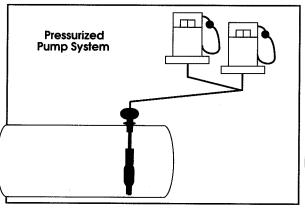
it is estimated that half of existing systems have no leak detection capabilities whatsoever. This is a result of storage system owners pinching pennies (a mechanical leak detector costs about \$165) in the original installation, or the devices being removed because of excessive false alarms. False alarms result from air pockets in the system or faulty check valves that cause the leak detector to diagnose a leak condition.

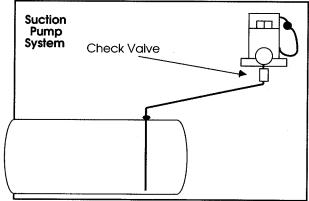
It has been estimated that a typical release from a pressurized system without a leak detector ranges from 600 to 6,000 gallons, with catastrophic releases up to 20,000 gallons in one day. At an EPA sponsored round table discussion among a group of

suction pumping systems. My suspicion is that this trend is driven by economics rather than environmental consciousness, but regardless of the motive, it is a trend worth encouraging. Minimizing the number of pressurized pumping systems in operation will be an important strategy in the long term prevention of leaks from piping systems.

• What about leaks from suction systems?

The way suction pumping systems have traditionally been installed in this country, they still pose a leakage problem, albeit of lesser magnitude than pressurized systems. However, the





tank installers in 1987, it was reported that "each installer present said he could easily cite at least 10 cases of significant damages caused by releases from pressurized piping failures." I am personally aware of a site where over 50,000 gallons were lost over several months, and this at a site where inventory records were purportedly kept.

There is no doubt that pressurized pumping systems offer cost and engineering advantages over suction systems. It is also clear that they are now, and are likely to remain, the most environmentally threatening aspect of underground petroleum storage systems.

Those Day to Day Pressure vs Suction Queries

• Are the days of suction pumping systems numbered?

There are those who claim suction pumps are doomed to go the way of the model-T and the bare steel tank, but theirs is a myopic view. There is no question that the large new retail motor fuel tanks in outlets will be equipped primarily with submerged pumping systems. But retail outlets comprise less than half of the motor fuel tanks in the United States. It is estimated that 90% of new, non-retail motor fuel outlets continue to use

recently published EPA regulations acknowledge the intrinsically safe capabilities of suction pumping systems, when the check valve is located directly under the pump.

Check valves are installed in liquid piping systems so that liquid will flow in only one direction. They are used in both pressurized and suction pumping systems to keep the piping full of product during periods when the pump is turned off. Thus the product is instantly available at the nozzle as soon as the pump is turned on.

A suction system with a check valve under the pump is like a soda straw full of liquid with your tongue plugging the top of the straw. If there are any leaks in the straw, air is drawn in, and the liquid falls back into the glass, but there is no leakage to the tablecloth. The same physics hold true for underground storage systems. Use of the check valve under the tank has been dubbed the "European approach" to piping leak detection because of its widespread use in many European countries. It is clearly the cheapest and safest form of piping leak prevention available.

• But I've heard that check valves under pumps don't work....

The limitations imposed by the (Continued on Page 10)

Pumping Product, continued

vapor pressures of our gasolines discussed above must be kept in mind when designing suction pumping systems. But placing the check valve under the pump has also introduced some new wrinkles into the start up of new storage systems.

The assembly of piping is performed in a less than sterile environment, with less than surgical cleanliness. Even the most careful craftsman is likely to introduce a little dirt, dust and grit into the inside of the pipe. Check valves must seat perfectly

tightly in order to work.

With the check valve under the pump, as opposed to over the tank, any particulates in the new piping will pass through the check valve before being caught in the fuel filter. If any particles get caught on the check valve seat, it will not seal and the piping will empty itself of product after every use, causing delays every time the pump is restarted. All particulates must be flushed from the system before the system will operate as intended. Extra care should be taken to keep suction piping clean during installation to minimize this problem, and is advisable to install an under pump check valve which can be cleaned with a minimum of fuss to ensure a trouble fee system.

The under pump check valve is also a very sensitive leak detection system, for the system must not only be liquid tight, it must be airtight. Installers in Maine with whom I have spoken have generally not had any

operational problems once all the particulates had been flushed through the system. One installer did admit, however, that he had discovered how hard it was to put together a really tight piping system.

• But will suction systems work in hot weather?

Problems of vapor lock during summer can be minimized by burying the piping at proper depths and by placing a narrow sheet of styrofoam insulation over the piping to insulate it from the sun's heat. The increasing vapor pressure of today's motor fuels can be a problem, but perhaps we will see limitations on the allowable vapor pressure of gasolines in the interests of ozone reduction. Reducing the vapor pressure from 10.5 to 9 psi is estimated to reduce volatile organic carbon emissions in the State of Maine alone by 3,750 tons per year. In any case, diesel fuels, the mainstay of many fleet fueling operations, are not prone to vapor lock because of their much lower vapor pressures.

• Should pressurized pumping systems be banned?

Not at all. The course of the petroleum marketing industry in this country has been set. Service station layout and dispensing equipment design are based around pressurized distribution systems. We have too much invested in the status quo. New regulations have introduced a new cost factor, leak detection, into the pumping system design equation. Thus, we can hope that today's standard of leak detection ranging from three gallons per hour to outright neglect will not persist much longer.

New, microprocessor controlled versions of the old mechanical line leak detectors offer some hope of improving our vigilance over existing pressurized systems, but at a cost of many thousands of dollars per site. But, for yet to be installed piping systems, there is no question in my mind of the cost effectiveness and environmental protection capabilities of double containment systems for pressurized piping. Leak detection and secondary containment costs are very small relative to the total investment represented by a state-of-the-art high volume retail outlet. Marketers need only be persuaded that an investment in environmental risk reduction is worth at least a small fraction of what they spend on their canopies.

A Last Word ...

In Germany, suction pumping technology is the rule, even for the large "pumper" operations which rival any in this country. In a tank tour through Germany a few years back, I remember a discussion with a marketing engineer on the topic of suction versus pressure pumping systems, "the operations engineers tell me we must push product because it is a much more efficient method," he said, "but, I reply to them, 'with suction pumps I can sleep more soundly at night." ■

Marcel Moreau, a regular contributor to LUSTLine, is a petroleum storage specialist with E.C.Jordan in Portland, Maine.

REGIONAL UPDATE

USTs in Mountain, Plain, Canyon and Desert

EPA Region VIII states span rolling short grass prairie, rugged Rocky Mountain terrain, deeply etched canyon land, and luminescent desert land. The Regional Office has been working with all its states to develop Memoranda of Agreement for implementing federal UST regulations prior to program approval. We expect to finalize these agreements within the next few months and anticipate all states will assume the major tasks associated with program implementation.

Montana

The Montana Hazardous Waste Act, as amended in 1985, provides the State with authority for all aspects of a UST regulatory program except tank closure, which will be addressed when the legislature meets this early this year. The State also has authorities for

This, our final Regional Update, focuses on EPA Region VIII and is written by Debra Ehlert, Region VIII UST Coordinator (303/293-1489).

remedial action, emergency action and cost recovery under the Environmental Quality Protection Fund Act, and for corrective action the State's Water Quality Act is being used at this time.

Montana has authority to adopt rules that are more restrictive than EPA's, and will probably adopt rules that will differ in many areas from EPA's. For example, the State proposes to regulate the same UST population as the federal program *plus* heating oil tanks, farm and residential tanks, and any underground pipes connected to a storage tank used to contain or transport a regulated substance, regardless if it is above or below ground. Technical standards will

be developed after the 1989 legislative session. The State will look to local fire officials to help implement the UST program.

North Dakota

The North Dakota Department of Health has drafted State UST regulations based on the final federal regulations. These regulations will probably be adopted by this summer. Also, in an attempt to make tank owners and operators more "insurable," the State legislature is currently considering a bill which would establish a State fund to be used to reimburse UST owners for corrective actions up to \$100,000.

for corrective actions up to \$100,000. Although the State's universe of UST's is small compared to other states - around 7,000 - there has been progress in several areas. They have completed 24 site investigations, begun 8 cleanups, and completed 2 cleanups.

Wyoming

The implementing agency for the Wyoming UST/LUST program is the Department of Environmental Quality (DEQ), Water Quality Division. A UST bill was introduced in the 1988 legislative session, but failed because the federal rule was not final. A bill will be introduced again this session and is expected to pass without major obstacles. In addition, a State financial assurance fund is being considered.

DEQ has identified about 220 leaking sites. Approximately 70% of these sites have appreciable contamination (30% soil, 70% groundwater problems). The primary responsible parties participate in the cleanup for these tank leaks; the more expensive incidents generally go to litigation.

Utah

The Department of Health, Bureau of Solid and Hazardous Waste is the UST implementing agency in Utah. In 1987, the legislature enacted a UST law; in 1988, the Utah Executive Committee on Hazardous Waste adopted by reference the federal 40 CFR Part 280 UST regulations. A corrective action cleanup policy was also established.

In Utah, tank fees for implementation of the UST program can be set anywhere from \$25/tank to \$4,100/tank with legislative approval. The fee will probably be \$60/tank in 1989. Some of the money from these tank fees are expected be used to help fund the local health departments for their role in UST program implementation.

Legislation is being proposed in the 1989 session which would create a State financial assurance program. Tank owners who can show they are not in violation of the technical regulations would be able to use the fund to meet financial responsibility requirements.

Colorado

The Colorado UST program is implemented jointly by the Department of Health (DOH) and the State Inspector of Oils within the Department of Labor and Employment. Although the State lacks complete UST enabling legislation, the DOH UST Coordinator and the Inspector of Oils negotiated a Memorandum of Understanding which enables the State to fund and implement an effective program based on existing authorities. Under this agreement the State Inspector of Oils has primary responsibility for notification, upgrading, new installations, release detection, first response to leaks and closure activities. The DOH will deal primarily with corrective action, LUST Trust

(Continued on Page 12)

Flying Manholes Linked to Tank Draining

...The Old Fashioned Way

It had all the elements of a classic sight gag-something out of Monty Python or Buster Keaton flick. You see a guy pumping gas. He gazes down the street and catches sight of manholes, one after another, shooting 20 and 30 feet up into the air. The scene cuts away to a woman having coffee on her patio. Her lawn blows up. A manhole she never knew existed blasts right out of the grass.

The trouble is this site gag really happened, this August, in Gloucester, Massachusetts. Twenty to thirty manholes from a combination storm and sanitary sewer successively took flight for about a 1.5 mile stretch. Miraculously, no one in this bustling seaport town was hurt rattled?, yes!...cerebrally reverber-

ated?, yes!

How did this happen? A fuel oil dealer decided to save money and pump the "water" from his out-of-service and soon-to-be-removed gasoline UST himself, the old fashioned way... directly into the storm drain. He apparently didn't realize the tank had gasoline in it nor that there were prescribed procedures for draining the tank and disposing of it's contents.

Gloucester Fire Inspector Larry Colby had already met the tank in question back in 1976, when he spotted the apparently unearthed vessel in transport. He followed it en route from it's previous location to a new location - an activity requiring a removal permit, even then. He saw to it that proper procedure was followed and the tank was duly installed into it's new home.

This summer, Larry noticed that the tank was out-of-service and he informed the tank owner that it must be either tested or removed. The removal permit had been obtained earlier on the day of the accident. The removal was to be done by a local contractor who knew what was required. But the tank owner, a man in his 80's, had apparently decided that he could save a few bucks by emptying the tank himself. Historically, storm drains have been convenient disposal points for years. Many people still think nothing of using this disposal route,

In this case, the owner assumed that his tank held water (how did that

water get there?). He had drained the gasoline a few years ago. So, a hose was dropped to the bottom of the tank and pumping began. At first, employees were getting what appeared to be "water", but at some point they noticed they were pumping gasoline. At that point they used 55 gallon drums to hold the rest of the gasoline. When the tank was finally drained, they closed up the manhole and considered the job done.

The rest, as they say, is history. Someone may have dropped a cigarette butt into a storm drain at just the right moment, so that the vapors in the sewer line propagated a series of explosions and fires. The source of vapors was traced

to the fuel oil dealer's operation.

Steve Robertson of the State Department of Environmental Quality Engineering said the exhumed tank appeared to be in good shape - the water had gotten in through loose connections at the fill pipe. But they did find a lot of contamination that smelled like fuel oil in the soil. This was probably the result of 40 or 50 years of surface spills - the site houses 7 above ground tanks.

There are many tank owners who were in business long before anyone ever thought about "groundwater contamination", who are still doing business the old fashioned way. The new tank ethic has many new rules that will require guidance. The regulated community must now do a significant portion of its tank management business a new fashioned way, and the availability of easily understood guidance can help smooth the way.

No tank owner should assume that his former gasoline tank has water in it. Unless a tank has been thoroughly cleaned - even sandblasted - it should be considered potentially explosive. NEIWPCC's new video and companion booklet, Tank Closure Without Tears: An Inspector's Safety Guide discusses the hazards of handling USTs.

Copies of the video and booklet can be obtained for \$25.00 from NEIWPCC, 85 Merrimac St., Boston, MA 02114.

Closely Watched Tanks

Long Island Study Sheds Light on Tank Corrosion

wo years and over 500 USTs later, $oldsymbol{\mathsf{L}}$ the Suffolk County, New York Department of Health Services has recently published the Final Report of its Tank Corrosion Study funded by EPA's Office of Underground Storage Tanks. The study was conceived as a means of gathering information about old buried steel tanks and the corrosion that plagues them, by closely observing the tanks when they are removed from the ground. Suffolk County was chosen for the study because of the large number of tanks being removed in a relatively short period of time in response to a local fank replacement ordinance.

The tanks studied varied in capacity from 175 gallons to 50,000 gallons and in age from 2 to 70 years. All but 18 tanks contained some type of petroleum product, and all 500 tanks included in the statistical analysis were made of plain welded steel. Each tank was scrutinized for perforations number, type, location, and size; for general interior and exterior condition; soil, backfill and groundwater conditions; the presence of leaked product; and for such tank statistics as volume, plate thickness, product, age,

etc.

Now that all of these data have been statistically sorted, compared and contrasted here are some of the conclusions that were reported:

- Unprotected steel tanks are risky. Of the 500 tanks inspected 143 or 28.6% had perforations. Fifty eight percent of these tanks showed evidence of leakage. None of these tanks were cathodically protected.
- In general, small tanks are much more likely to perforate than large tanks due to the thinner gauge steel used in smaller tanks. Most tanks less than 5000 gallons seem to be made of a thinner gauge steel than the 1/4" or thicker steel plate used in larger tanks. While the Steel Tank Institute has mandated the use of thicker steel on small volume STI tanks, other codes such as UL standard #58 have not changed these thickness specifications. The age of perforated tanks ranged from 8 to 70 years, but the volume of perforated tanks was almost always less than 5,000 gallons.

The study authors, Jim Pim and John Searing, caution that these statistics should not be used to claim there is no need to address tanks greater than 5,000 gallons, because few tanks greater than 5,000 gallons were included in this study. Many higher volume tanks which had once been

buried in the County were removed before the study began. The authors suggest that had these tanks been part of the study, a significant number of leaks would have shown up.

- Internal corrosion is less significant than external corrosion. This is, of course, relative, because once external corrosion is controlled through the use of cathodic protection, internal corrosion becomes the major threat to steel tank failure. Of the 143 perforated tanks, 75.5% of the perforations were caused by external corrosion, 6.3% by internal corrosion, 14,7% by combination internal/external corrosion, 2.8% by weld failure, and .7% by external mechanical damage. Internal corrosion will continue to be an important consideration and can be kept in check through the use of striker plates and periodic inspections.
- Fuel oil tanks are as susceptible to perforation as gasoline tanks of the same size. If the two groups are compared as a whole, fuel oil tanks are even more susceptible than gasoline tanks since they are generally of much smaller size.
- Tanks do not always leak immediately upon perforation. Why is this? The tank examiners frequently observed that corrosion products had formed a firm, but expanded "plug" on the outside of the tank. These plugs had to be forcibly knocked off before the holes were revealed. In these instances, product had not yet succeeded in seeping through the corrosion plug. It is not clear how or when these little plugs become unplugged.

Thus, existing tanks appear to be in worse shape than is demonstrated by precision testing. Testing, even if totally successful and accurate, can only locate tanks that are actively leaking product. The study proved that tanks can rust through completely long before they begin to leak product. In fact, the number of tanks found to have holes was nearly twice the number that showed evidence of having

leaked

• The study throws some doubt on the reliability of tank testing. Twentynine of the 143 perforated tanks had passed tightness tests within two years prior to removal; of these, 11 had leaked into the soil. Possibly some of the tanks began to leak after they were tested or, perhaps, there was seepage that was too slow to be detected by testing. Be that as it may, it has become more and more evident that periodic tightness testing is not a guarantee of tank integrity.

• The findings of this study are conservative and have application throughout the country. Because Suffolk County soils are generally low in corrosivity and many of the worst tanks had been removed before the study began, it is not unreasonable to assume that the prevalence of tank corrosion would be similar in other locations. Furthermore, the authors add, the autopsy only recorded perforations that were large enough to be easily observed. "There were undoubtedly other, smaller perforations that went undetected that could only have been found by careful air testing and soaping of the tanks."

For more information about the study, contact James Pim at 516/451-4634 or John Searing at 516/451-4627.

(Continued from Page 11)

Regional Update

Fund, and financial responsibility activities.

The State has received approximately 300 reports of leaking USTs since January 1986, and 55 sites have been identified for potential LUST Trust Fund action. Colorado has been very active in outreach activities, having contracted for 15 public information and technical training seminars in in 1988, with more planned for 1989.

South Dakota

South Dakota's UST regulations, tailored after EPA's proposed rule, became effective in November 1987; the Department of Water and Natural Resources (DWNR) is the implementing agency. The State rules contain provisions that are more stringent than Interim Prohibition guidelines. South Dakota participated in EPA's state program approval pilot study last year and is already in preliminary program review based on the pilot study.

State legislation gives the DWNR cost recovery and environmental compliance authorities. Legislation also enables the State to establish petroleum release and emergency response funds, which can be used for the investigation and corrective action

of contaminated sites.

Currently, 2,760 facilities with 7,230 tanks are recorded in the Revelations database program. Inspections for installations of new tanks are given major emphasis and local fire departments and fire marshals have been enlisted to help perform inspections.

UST EXCHANGE



From the Editor: The meeting of state and federal UST regulatory personnel in Santa Fe, New Mexico this November presented an invaluable opportunity for participants to bandy about USTisms - experiences, frustrations, eternal questions, successes, jokes, anecdotes, and blah, blah, blahs. We now dare to offer LUSTLine as a modest vehicle for furthering this information exchange. Obviously, the more information exchanged, the more successful our effort. But clearly I can't make things up myself. This baby is all yours, except for my effort to discreetly weed out the fluff. If you have any lessons learned, success stories, differing opinions, or questions to throw out to your fellow UST-Kateers, call me at 617/861-8088 or write me, Ellen Frye, at NEIWPCC, 85 Merrimac St., Boston, MA 02114. Our first two stories come from

Possible and Reasonable Expectations of UST Cleanups by Michael Kanner, Chief of the Minnesota Pollution Control Agency's Tanks and Spills Section.

Wherever an underground tank has been buried, you can probably count on the fact that man has been busy doing something there for awhile and that the Garden of Eden has long since been tainted by pesticides, fertilizers, automobile droppings, acid rain, industrial waste, sewage and the like. That's why when it comes to cleanup we would be foolish to shoot for Garden of Eden standards. Since we cannot remove all contaminants and since we are dealing with hundreds of sites and limited personnel and resources, we have to focus on what is possible and reasonable and rely on good judgement.

We generally cleanup to parts per billion (ppb) ... as opposed to zero. The debate is whether to work toward 10 ppb or 50 ppb. The answer should factor in considerations of site, land use patterns, water supply, etc. There comes a point at every cleanup when you recognize it would cost twice as much and create major disruption to cleanup that extra 1%. Is it worth it? What is potentially at risk if you don't?

From the moment you begin working on a cleanup you are making decisions. To decide on how complete an investigation is warranted you need to focus on solutions and productivity so you can get the job done and move on to the next one. A full blown hydrology study may not always be necessary. Tailor your effort to the site, be flexible, and think in terms of what is reasonable for that site. What are you comfortable with based on what is at stake?

For example, North Minneapolis is an area tha has had heavy industry for decades. The drinking water source for this community is miles away. We can clean up a leak at a site like this and be pretty confident we have done an adequate job without spending a lot of time agonizing over how clean is clean. But for the situation that threatens immediate impact on human health and the environment - the site with actual or potential contamination of a regional aquifer, a sole source aquifer, or karst topography - you go the extra mile. You want to be as confident as possible that cleanup is "complete."

Although you are never absolutely sure you have made the right choices, as you get a feel for situations you find the choices usually make sense. With all the work we have to do out there, is it better to do 400 cleanups well, or 100 perfectly?

Minnesota and Rhode Island.

Keeping Tabs on Tank Testing by Sav Mancieri, UST Coordinator, Rhode Island Department of Environmental Management

Because Rhode Island UST regulations have specific requirements for tank testing - more frequent testing the older the tank - we have learned that some sort of approval procedure is necessary so that we can keep tabs on tank tests being done in the State. Otherwise, we could have a hundred different tests going on and no handle on consumer or environmental protection.

A few years back we had approved only two precision tests and that was by reputation only. We thought we could wait to see the results of EPA's Edison study, but eventually we couldn't wait any longer; the testers were banging on the door and we had to do something. We had to develop our own protocol. Testers had to meet certain requirements, which at the time included NFPA guidelines for precision tests. We now rely on EPA Edison findings.

But we learned a lot from the whole experience. We have been requiring all testers to submit the engineering

data for each test to the DEM for review to see that numbers and conclusions make sense. We check for how they address vapor pockets, tank end deflection, thermal expansion...the whole works.

These checks have been quite useful. There have been times when a tester professes that such and such a thing must be done as a part of their test method, but in our review process we find that individual testers have been cutting corners. For example, even though test protocol stated the test was invalid without a groundwater determination, companies were performing tests without determining groundwater. In one instance we noticed that the groundwater number on the data sheet was always the same.

We now require testers to install a groundwater observation well to determine external water pressure according to their own test protocol. The well must be placed down to the bottom of the deepest tank, not to the groundwater. This has helped solve the problem of people cutting corners, where groundwater is concerned.

Once we approve the testing method, the individual tester becomes the big variable. So, we require the individual tester be certified by the testing company. The companies must have an on-going training program with periodic testing for recertification. But, this has not worked out quite the way we had hoped. Ideally, the tester should go back to school, take a course to be updated, take some kind of exam, and be recertified. In practice, some companies just let you come in and take the test and walk out with a certificate - no classroom information, no update.

Tank testing companies really need to make it their business to keep field testers updated on improvements in testing methods. One major tester in our State has recently changed protocol in response to Edison recommendations, which include making the tests longer. They

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Behind Your Nose

not as important as how conscientiously you use, maintain, and under-

stand that tool.

Each instrument has drawbacks which must be considered. "Your field instrument is only as good as the person sampling and the common sense used in sampling," notes Peter Sullivan of Rhode Island's Department of Environmental Management.

Many states that rely on field instruments try to standardize the use of the instrument from site to site. In Vermont, inspectors calibrate the HNU to benzene as a means of checking the instrument for reliability. The reading is a number indicating the relative degree of contamination in the soil. Then they decide what is the most appropriate means to address the contamination. Florida uses the OVA calibrated to benzene as a standard.

When taking soil vapor readings, inspectors should avoid entering excavations. It is safest to ask the backhoe operator to bring up a new bucket of soil. However, if two or three tanks have been removed at one time the excavation is more like a crater and some inspectors feel it is safe to enter

to take soil borings.

In sampling, you want to know you are taking soil from the base of the excavation and into the native soil. Because many soils erode back into the hole as the tank is being removed, Tom Bergamini says his inspectors set an index mark with a stake to locate the base of the excavation. Soil borings or readings should also be taken within the area of the piping and dis-

pensers.

Where to sample and how many readings and/or samples to take depends on what the inspector sees or doesn't see. If no staining is apparent it still helps to get a vapor sniff from the base of the excavation and into the native soil. Many states have developed protocol for this, but a good inspection must must often look beyond the protocol. If there is no obvious visual evidence of a leak, what do you do? As you increase the number of field readings, you decrease the likelihood of missing something.

Soils to the Lab

Lab analysis is expensive and also has drawbacks. Lab samples at closure are required by different states for different reasons - to verify field information, to identify and quantify contaminants for disposal, to use as a basis for cleanup, or to get "real" numbers before making any decisions.

But lab analysis has its problems too. Improper field sampling procedure can effectively waste the value of lab analysis if substantial portions of the volatiles are lost before a sample ever gets to the lab. Standardized sampling procedures can help here.

The where and how many of field sampling should be done judiciously. Your senses, hunches, and field data can factor into the sampling plan. Some states require at least two samples. But those two sampling locations should reflect what was learned from visual inspection of the tank and the pit. A sample taken from either end of the excavation is not much use if the leak was in the middle.

In many states soil samples must go to labs certified to test for particular

"Closure inspection is a very recent practice. In the past, people tended to walk away without assessing the condition of a site. We now know we don't want to bury these problems. 99

parameters in question, e.g.,total petroleum hydrocarbons (TPH). California relies heavily on lab analysis of soils samples and has developed a Leaking Underground Fuel Tank (LUFT)
Manual which spells out sampling and lab procedure in detail. Because the "real" numbers generated by labs can vary between labs for the same sample, standardization and consistency are a concern to many states.

Whether or not to take lab samples is a decision with trade-offs, "Tom Bergamini explains. "You need to be aware of the ramifications. For example, if you choose not to sample soil you might miss something a lab would

have picked up.

'Say you have permeable soils and an old leak. Near surface conditions may not have concentrations in volatile organics that would register on a field instrument. The lab sample might reflect the older leak by catching the heavier hydrocarbons that adhere to the soil. But, there are problems with lab sample too. Our decisions often get down to cost versus environmental benefit."

A Reasonable Effort

EPA has not prescribed how much effort should go into determining, at closure, whether a UST system has caused any environmental damage. Since site assessment involves judgement, there will always be some element of uncertainty. Some calls are difficult to make. Even experienced field people can leave a job feeling

uncertain and uneasy, knowing full well they may have missed something that could eventually cause someone down the road a significant problem.

Every state environmental agency is struggling with such questions as: How far should we go? What is the trade-off between the cost of further investigation and the knowledge to be gained; between the cost involved in looking for what may or may not be there against the potential for missing a significant environmental problem? Certainly, as state UST programs progress, evaluative methods will improve and field experience will provide better answers to some of these questions.

Putting The Pieces Together

At closure, the inspector's response to the discovery of contamination is going to depend on the site. A small leak in a sole source aquifer may be more significant than a larger leak in a remote area where groundwater is 100 feet down or in an industrialized area with an unaffected public water supply and years of accumulated environmental abuse.

The inspector checks out such sensitive contamination receptors as adjacent dwellings, drinking water wells, surface water, sewer lines, and other utility conduits. The data are entered, sorted, assessed, weighed and

tossed about in the mind.

If the inspector is with the state environmental agency, instructions for minor cleanup, such as contaminated soil around the fill pipe area, are often issued right then and there. A fire inspector is more likely to perform limited field observations and call the state environmental agency to pursue indications of leakage. However, in many cases, fire inspectors are not familiar with sampling and analysis techniques.

It is important to keep in mind that the thousands of UST removals going on right now mean that thousands of potential sources of contamination are being removed as well. Closure inspection is a very recent practice. In the past, people tended to walk away without assessing the condition of a site. We now know we don't want to bury these problems. Thus, since we have already improved on what was, and will likely improve much more upon what is, a reasonable effort to screen these sites should prove its worth in environmental benefit.

NEIWPCC is now preparing a video and companion booklet on site assessment at closure. We expect to complete this project this summer.

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UST Exchange

sent notices of this change to some of their testers, but not to those who don't pay annual membership dues. In this situation the testers who didn't receive notices may well continue to do the test the old shorter way, which is less reliable, but which might appeal more to the tank owner who thinks he is benefitting from a shorter down time. So, to make sure there are no excuses, we are in the proces of sending out letters to all our testers with a copy of the update.

We maintain a list of all our approved testing companies, which is available to tank owner/operators upon request. However, we caution them that the cheapest is not necessarily the best. If a tester is sloppy and does not detect an existing leak, it could cost lot more when all is said

and done.

It also helps if somebody in the state is trained in approved testing methods. From a legal point of view there will have to be some enforcement if testing is allowed as a means of determining tank integrity. Sooner or later the state will be need some enforcement of testers. Sooner or later, when it comes down to testifying in court, and you have been out there watching someone doing something wrong, some lawyer will get you on the stand and say, "How did you know it was wrong?" At least have the basic knowledge of the test.

Thus, we also require our approved testing companies to come and give people in our office a short training course before they can test in the State. (Massachusetts requires a video training tape.—Ed.) We know what has to be done on a particular test...we may not know how to do it ourselves, but we are able to evaluate it. We feel that our approach to keeping tabs on testers has been useful in weeding out the cut-rate-corner-cutters, leaving room for those testers who take their re-

sponsibility seriously.

To order copies of LUSTLine, Bulletin 10, call Hotline (800) 424-9346. To add your name to the LUSTLine Mailing List, call (617) 367-8522

Questions and Answers

The EPA Office of Underground Storage Tanks has received numerous questions relating to the new UST rules. Many of these questions have been requests for clarification of specific portions of the rule. Here are a few of those questions and EPA's answers.



Q. If an equipment distributor is installing piping he must cathodically protect the piping. The regulation states that field installed cathodic protection used for piping must be designed by a corrosion expert. Does EPA realize that this excludes Petroleum Equipment Institute (PEI) distributors and requires us to use a person who does not exist in our state? What are we to do?



A. Chapter 9 and Appendix B of PEI RP-100 provides a design for sacrificial anode style cathodic protection of factory coated metal piping. This design guide was developed by corrosion experts for use by installers. The design is conservative and will result in reliable, long lasting protection of metallic piping. If the system is installed in accordance with with the design provided in this manual, EPA believes it meets the requirement that the field installed cathodic protection system be designed by a corrosion expert.

The PEI RP-100 design does not cover field coated piping, uncoated piping, tanks, or impressed current systems. These systems require more complex designs than sacrificial anode and factory coated pipe systems. EPA does not know of any design guide for these types of systems. Consequently, they would have to be designed individually by corrosion experts for the sites at which they were used.

- Q. An owner/operator has an STI-P3 tank with fiberglass piping and a steel pump. As currently designed, the pump is in contact with the backfill. Because of this contact, does the pump have to be cathodically protected?
- A. This owner/operator has three options: 1) isolate the pump from the backfill; 2) cathodically protect the pump; or 3) get a "corrosion expert" to certify that, given the individual circumstances, cathodic protection is not needed. The corrosion expert would document this certification in a letter sent to the owner/operator, who would then keep a copy in the office files.
- Q. The owner of an electric company has three petroleum facilities with a total of 11 tanks. The facilities fuel the company's trucks. However, the owner also sells gas to his employees (at cost) for their private vehicles. The company's net worth is over \$20 million. Would this owner be considered a "marketer" under the financial responsibility regulations? By what date will this person have to be in compliance with financial responsibility assurance provisions?
- A. This owner is considered a "non-marketer" since the product is not being sold to the "public at large." As a non-marketer, this owner must comply with financial assurance provisions by January 1989.
- Q. At present, LUST Trust Fund monies can only be used at sites where there are known or suspected releases. However, when dealing with abandoned tanks that have product in them, it may be more cost-effective to pump out product before they begin leaking. Has EPA considered a policy of allowing Trust Fund Monies to be used to remove product from abandoned tanks that are not yet leaking?
- A. As part of the RCRA reauthorization, EPA may consider expanding the criteria for allowable uses of Trust Fund Monies.

TANK TALK

The Steel Tank Institute (STI) has announced a free, corrosion-prevention monitoring program for all regulated, non-residential sti-P3 USTs shipped after October 1, 1988. STI will monitor and provide written reports on the status of the cathodic protection system (for tanks, not piping) over the 30-year warranteed life of the tank.

The new monitoring program follows the schedule specified in EPA's 40 CFR 280.31. Initial testing will be conducted within six months of installation, with follow-ups every three years thereafter. Methods used will be safe and non-disruptive, with no excavating and no interruptions in tank service. These corrosion system checks are consucted by monitoring tank-to-soil voltage readings at a builtin test station.

The Canadian Council of Resource and Environmental Ministers (CCREM) has published an Environmental Code of Practice for Underground Storage Tanks. The Code, which was developed by a National Task Force on Leaking Storage Tanks and coordinated by Environment Canada, comprises a model set of minimum technical requirements designed to protect the environment by preventing releases from USTs and piping. Major recommendations include:

• obligatory registration for all UST systems containing petroleum products (includes heating oil, gasoline and waste oil);

• the classification of sites and a corresponding level of protection, depending on the sensitivity of the sites (Class A is most sensitive; class B moderately sensitive; Class C, least sensitive);

• secondary containment systems with leak detection monitors for all new Class A sites;

the use of approved tank installers to guarantee the quality of installations;
no new steel tanks without cathodic corrosion protection;

• mandatory upgrading of old steel

tanks and piping;
• overfill and spill protection for Class A and B sites;

• removal of all out-of-service tanks. For more information, contact Kelly Karr, Environment Canada, 819/953-1125.

Thompson Publishing Company has begun publishing **The Underground Storage Tank Guide**, a looseleaf information service on how to comply with EPA's UST requirements. The Guide includes such information as: a full text of federal rules and summaries of state requirements; clear explanations of what is required and how to comply; checklists of deadlines for avaoiding costly penalties; outlines of industry standards and explanations of when they apply, and a directory of insurance companies.

Editor-in-chief is Jeffrey L. Leiter, a partner in the Washington, D.C. law firm Collier, Shannon, Rill and Scott, and recognized as one of the leading experts in UST regulation. The service

includes a 300-page binder, monthly newsletter, and monthly updates. To order the Guide, call toll-free 1-800-424-2959. A one-year charter rate is \$239. ■

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