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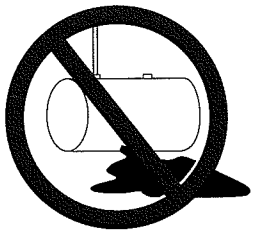
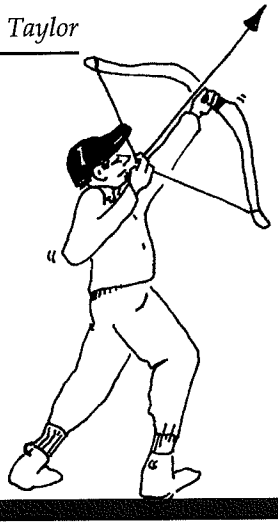


A Report on Federal & State Programs To Control Leaking Underground Storage Tanks

Taking Aim at Site Cleanup

Accurate Site Characterizations Will Get You Where You Need to Be Fast, Reliably, and Cost-Effectively

by Michael Taylor



THE CALL COMES IN AT 9:30 MONDAY MORNING. IT'S DAVE. He never calls unless he wants something...or there's a problem. There's been an inventory loss. "How much?" Bob asks. As Dave begins to describe his calculations, Bob's mind flashes back to the last time one of his station managers called with this problem; two years and $375,000 later, the problem is still not resolved

THE PROBLEM OF LEAKING UNDERGROUND STORAGE tank (LUST) sites that have been opened to environmental investigation but not closed, is an on-going thorn in the side of regulatory agencies, consultants, and tank owners alike. According to Lisa Lund, Deputy Director of EPA's Office of Underground Storage Tanks (OUST), there is an ever widening gap between newly discovered petroleum release sites and sites where cleanup work has been completed. The latest national figures are startling: about 1,000 new releases are reported each week, approximately 200,000 confirmed releases have been reported nationwide, only about 55,000 release sites have been closed.

Regulators, owners, and consultants have begun to recognize that the site characterization process, which provides the basis for a remediation strategy, may be part of the problem. The timing and accuracy of site characterizations, often not optimized by conventional methods, are key to determining effective cleanup strategies.

Conventional site assessment procedures entail installing a limited number of groundwater monitoring wells (usually four), sampling the wells, sending the samples to laboratories, waiting for results, re-sampling, and so on—a procedure often carried out over a 6-month to 2-year period. As a result, determining the fate of the

■ *continued on page 2*

Inside

site becomes a protracted decision-making process involving several phases. Hence, opportunities to avoid lengthy and expensive cleanups are often missed as released substances migrate from the soil to the groundwater.

In addition, conventional site characterization practices have been known to contribute to inaccurate decisions regarding cleanup strategies; these practices include, but are not limited to, focusing on the edge of the contaminant plume rather than the source and putting much of the investigative effort into installing and sampling monitoring wells. Needless to say, if your cleanup target is inaccurate or if your data are inadequate, you may well be initiating a remediation strategy that is doomed to miss its mark and result in a corrective action goal that is more and more difficult to reach.

Michael Marley, a remediation specialist with Vapex Environmental Technologies in Massachusetts, says current site assessment practices have posed obstacles in the way of planning remediation strategies. Many of the sites that Vapex is asked to remediate have already gone through an assessment. However, the data from these assessments are often insufficient to design an effective remediation, which means that additional assessment is usually required.

LUSTLine

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The New England Interstate Water Pollution Control Commission was established by an Act of Congress in 1947 and remains the oldest agency in the Northeast United States concerned with coordination of the multimedia environmental activities of the States of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island and Vermont.

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> ***"Groundwater conditions are dynamic, by the time you've gotten to phase ump-teen, the data you've collected in phase I is clearly in doubt."***
> Gary Robbins

"What we need is better continuity of objectives so that we can spend our client's money optimally to achieve the end goal," says Marley. "Many times, there's basically a duplication of efforts. We have been working with our clients to integrate the data obtained in phase I with phase II so we can cut down on the overall cost and time frame involved in getting this job done."

The good news is that an expanding array of available field-screening and sampling technologies is paving the way to improved site assessment procedures. A wide variety of such procedures are currently being used. Some field-screening procedures are used as quick indicators of contamination, others are used to quantify the magnitude of contamination. While the inexact nature of subsurface site assessment is likely to always have its frustrating aspects, site assessments using new expedited assessment techniques are proving to be fast, reliable, and accurate.

All in Good Time

"Groundwater conditions are dynamic," explains Dr. Gary Robbins of the University of Connecticut, "by the time you've gotten to phase ump-teen, the data you've collected in phase I is clearly in doubt. Field-screening methods provide real-time data, in contrast to the traditional method of arbitrarily planting four wells and waiting 2 months for a report." Robbins has long advocated the use of field-screening tools as a real-time, reliable, and accurate means of improving the site characterization process and has studied the problem in conjunction with EPA's Environmental Monitoring Systems Laboratory in Las Vegas.

In an effort to shorten the site assessment process, state and federal UST regulators and some state LUST cleanup contractors in EPA's Region 4 (southeastern states) spent last summer receiving training in field-screening techniques. In Region 4, UST program managers are concentrating their resources on improving the site characterization process in their states.

"All of the players have to feel comfortable with the approach in order to enjoy widespread use of the technology," says John Mason, Region 4's UST Program Manager. "We have provided training to the states and continue to work with them to explore the use of field measurements in the site characterization process. Our principle objective is to accelerate the process so that site remediation and cleanup can begin sooner. The potential cost savings of using field-screening techniques includes the reduced cost of lab analyses and the savings in eliminating sampling remobilization costs (e.g., moving drill rigs back onto sites to install more monitoring wells).

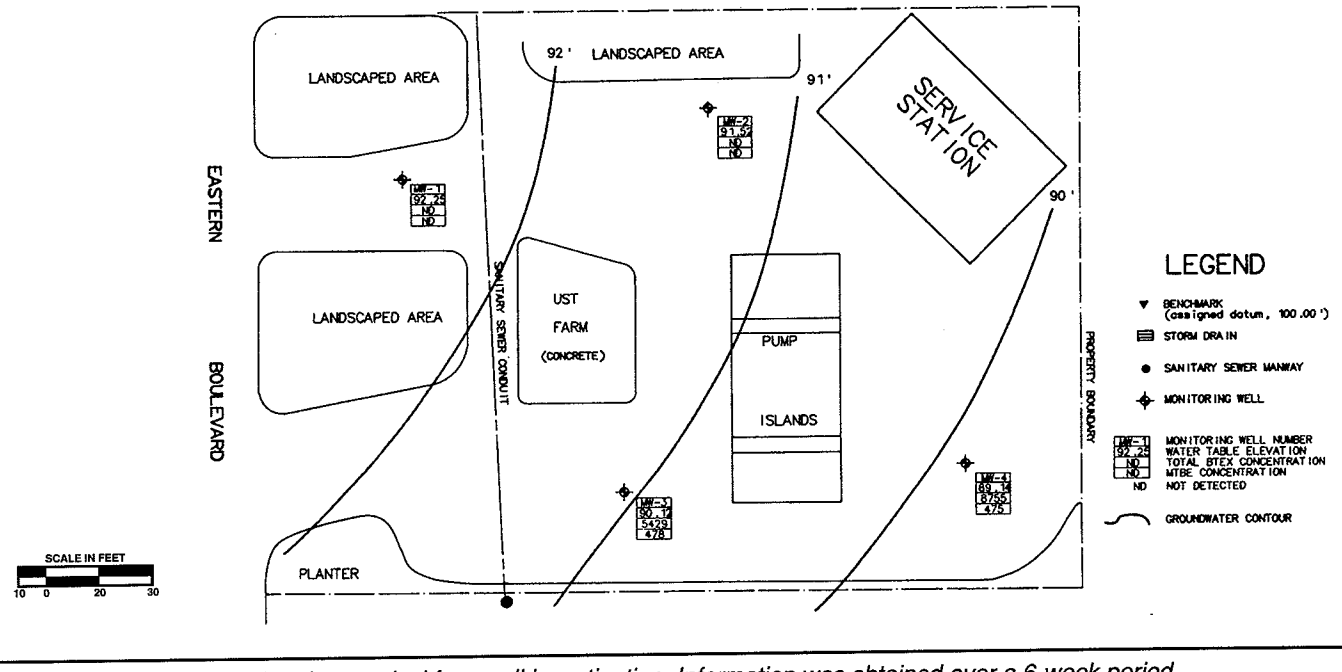
Mobil Oil Corporation began a project last year with Land Tech Remedial, a consulting firm working to reduce time frames typically associated with the site characterization process. Since beginning implementation of the program, complete assessments have been conducted in as little as 3 days.

Instead of relying on fixed laboratory analysis of monitoring well samples, the expedited approach combines data collected from various field-screening devices taken from samples acquired through narrow-point sampling systems. (Various drive-point systems using narrow diameter steel sampling rods can be used to collect soil, water, and vapor samples. In this case, a hand-held hammer drill system was used to advance 3/4-inch diameter steel sampling rods. Water was collected through 1/2-inch PVC piezometers.)

"A major advantage in compressing the time frames for site characterization to a month or less is you know what your dealing with," says Jeff Erikson, an environmental engineer at Mobil Oil. "You know what your risk is, and you can evaluate what action is appropriate."

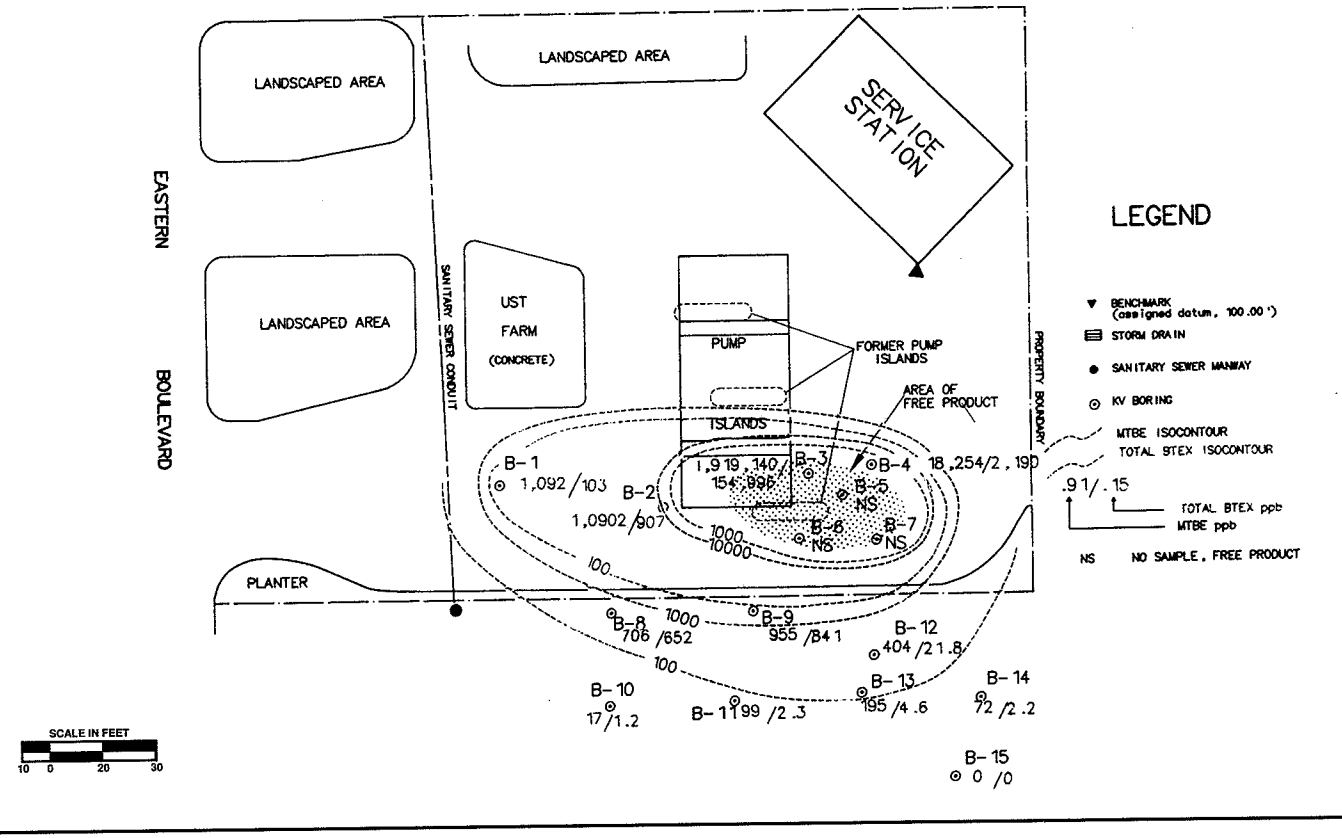
■ *continued on page 4*

CONVENTIONAL APPROACH



Results of data from typical four-well investigation. Information was obtained over a 6-week period.

EXPEDITED APPROACH



Results of data collected using expedited site assessment techniques.

Note: *the source mass is clearly delineated on the site. Also, investigators were able to determine that risk from off-site contaminant migration was limited. Using this expedited format, information was obtained in three days.*

These expedited site assessments conducted by Land Tech took place in New York State's Region 3. Responding to the first 3-day site assessment in Peekskill, New York State Department of Environmental Conservation (NYSDEC) Environmental Engineer Karl Weed, in a letter to Mobil Oil, referred to the data collection time frame as "impressive," deemed the strategy employed to define the aerial extent of the plume "excellent," and went on to approve the development of a remedial action plan based on the data provided.

Two months after the 3-day investigation, remediation of the concentrated mass of free product in the soil was completed. A monitoring program was initiated. BTEX and MTBE levels steadily decreased because the source of the contamination held in the soil was removed and bioremediation caused the attenuation of the remaining dissolved phase. Application for closure with the NYSDEC is expected in May 1993, one year after commencement of the remediation.

EPA OUST's Lisa Lund suggests that shortening the time frames associated with site assessments is very compatible with Agency efforts to streamline the regulatory oversight process. In an effort to deal with a growing number of cases, EPA is encouraging the elimination of steps along the road to cleanup closure. One certain way to decrease the regulatory backlog is to decrease the number of site assessment phases that must be conducted, documented, and reviewed.

Improving the Type and Accuracy of Data

Beyond improving the speed of assessments, the question of improving the type of data collected and the accuracy of the site characterization process has received significant scrutiny. With the era of pump-and-treat as the preferred remediation method almost behind us, many owners are now facing the dispiriting task of re-evaluating remediations that have been on the books for 5 to 10 years.

Many consultants and researchers point to inaccurate site characterization as one cause of these cleanup marathons. Research and case studies point to numerous flaws in the current process. For example, although monitoring wells have been standard in the industry for some time, their use as a primary assessment tool is now being questioned—Are the data derived from these monitoring wells leading to inaccurate remedial action decisions?

> ***"If one can accurately characterize a subsurface problem, the likelihood of developing and implementing a cost-effective corrective action strategy increases significantly."***
>
> Jeff Brown

"A major problem in remediating many sites is the lack of three-dimensional data," says Gary Robbins. "Based on empirical and experimental studies that both we and others have done, we find that unless you go out and characterize the three-dimensional properties and contaminant distribution at a site, your cleanup will be ineffective." Three-dimensional data are obtained by sampling soil or groundwater at discrete depths to profile contaminant distribution vertically across the site.

The lack of three-dimensional data was the apparent cause of a recent case reviewed by Land Tech Remedial. A pump-and-treat and vapor extraction system had been operated on the site for 3 years until the dissolved-phase hydrocarbon concentrations seemed to diminish. The system was turned off and a monitoring program was set in motion. After some months of monitoring, the dissolved-phase concentrations in the monitoring wells near the property boundary resurged.

Seeking new solutions, the owner sent out an RFP (request for proposal) and received four new proposals for remediation, all different. Rather than enter into another remediation immediately, this owner chose to do some vertical sampling in the source areas. Although several monitoring wells had been constructed and sampled previously, they had not revealed the mass of free product adsorbed in soils below the water table. This new information came from using vertical sampling techniques and provided the key to choosing an effective remediation design.

"There is something fundamentally wrong with our approach," says Robbins. "Typical monitoring wells provide averaged information. When you average contaminant distribution, the samples retrieved from the wells are essentially biased samples. Depending on such factors as how the well is purged, water levels achieved, the geology around the well, well construction, and the vertical distribution of contaminants being measured, contaminant levels may be misleading." (See related article, *What's Your Sampling Interval?*, on page 5.)

While employed as an engineer at EPA's OUST, Tom Schruben, now with Reliance Reinsurance Corp., tracked site data at pump-and-treat operations across the country in an effort to determine correlations between the sites and the effectiveness of these remediation strategies. "What we found," says Schruben, "is that the numbers were all over the place. They would go up and down at sites without apparent reason.

"Finally, we recognized that the numbers were correlating with seasonal fluctuations in the water table. The more the screened length of the monitoring well was in the water table, the lower the number would be. As water levels subsided in the summer, the numbers would rise.

"Besides recognizing that pump-and-treat was largely ineffective as a remediation strategy," explains Schruben, "we recognized that the data retrieved from monitoring wells were significantly affected by this seasonal water table fluctuation." Revelations of this nature have prompted many state agencies, owners, and consultants to rely more on overlapping sets of field-screening data than individual quantitative numbers from monitoring wells.

Targeting the Critical Mass

Another difficulty that seems to correspond with the all-purpose reliance on monitoring wells is a propensity on the part of regulators

and consultants to focus more on the edge of the contaminant plume than on the source of contamination—generally product held in the soil mass and released by the infiltration of rainwater. Because attention has been directed at groundwater and the spread of the dissolved-phase plume, investigations often entail several rounds of tracking and delineating the edge of the plume. This plume tracking and the never-ending outlay of resources in the process has perpetuated groundwater contamination problems that may never be resolved.

Jeff Erikson has overseen a shift of emphasis in his region. "Traditionally, the focus of a four-well assessment is the groundwater," says Erikson. "However, we are finding that many times the problem resides in the soil. By using an expedited approach that includes narrow diameter sampling points, we're getting a lot more information about where the product is in the soil."

The use of both driven probes to take soil, water, and air samples at discrete depths and field-screening tools to guide the assessment has aided in the data collection process. This approach not only provides three-dimensional data, it also provides many more samples for analysis, and in shorter order, than sampling of monitoring wells.

Rather than concentrating on defining the dissolved phase at the edge of the plume, locating and quantifying the contaminant mass will ultimately prove more effective in determining a remediation strategy. "Delineating the contaminant mass and maximizing mass recovery are the keys to remediating some of these sites," says Jeff Brown, Senior Associate at Land Tech Remedial.

"With better assessment techniques to define the mass," concurs Jeff Erikson, "I can make a much more informed decision on the proper course of action. If source removal by excavation is an option, by knowing the amount of impacted soil within 10 to 20 percent, I can make a decision much more quickly and with greater confidence."

"If one can accurately characterize a subsurface problem," says Jeff Brown, "the likelihood of developing and implementing a cost-effective corrective action strategy increases significantly."

The remediation of petroleum contamination in soil and groundwater is a relatively new science, and it will continue to evolve as we learn more from research and field experience. One important thing we have learned is that there are better and faster ways to get the job done. As EPA Region 4's John Mason says, it's a matter of getting all the players comfortable with the approach to enjoy widespread use of the technology. ■

Michael Taylor is Director of Corporate Development at Land Tech Remedial, an east coast-based environmental consulting firm headquartered in Monroe, Connecticut. The company has worked with regulators, researchers, and clients to advocate streamlined, risk-based approaches to obtaining faster, cheaper, better site cleanups.

LUST Investigation & Remediation

What's Your Sampling Interval?

The Intricacies of Sampling and Evaluating Groundwater Contamination Levels

by Jim Lundy

A GROUNDWATER HYDROLOGIST I KNOW WAS STOPPED FOR SPEEDING. "I CLOCKED YOU AT 76 MILES PER HOUR in a 35 mile per hour zone," said the officer to the hydrologist. Backpedaling, the hydrologist didn't miss a beat, he laughed and said, "Officer, if you include the time I was stopped at the red light, you will see that my average speed was only 35 miles per hour. You're just using the wrong sampling interval."

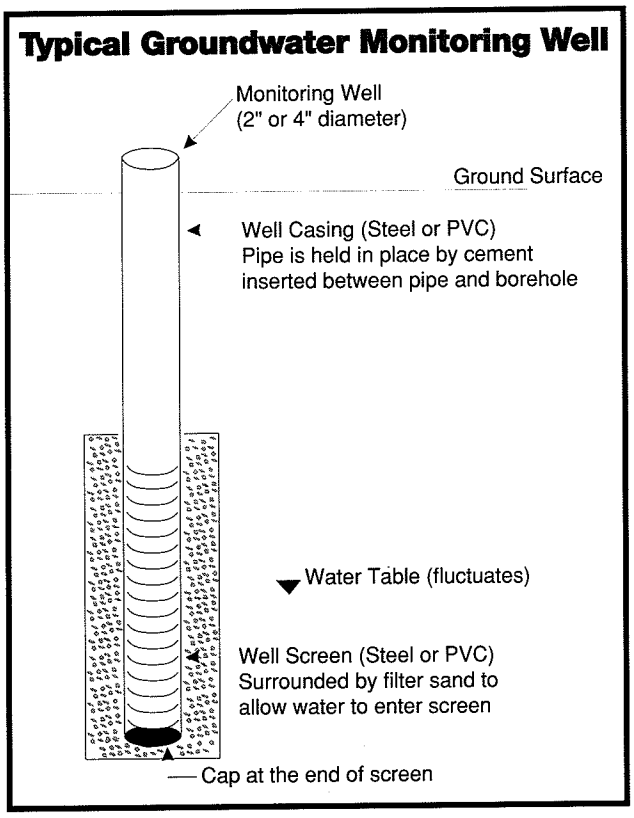
Assessment of soil and groundwater contamination at leaking underground storage tank (LUST) release sites depends upon properly collected samples. Because soil samples are retrieved from a fixed point beneath the ground surface, we can be reasonably certain that the sample represents soil conditions at the location sampled. But, because groundwater flows, groundwater sampling can be problematic—the investigator is often uncertain whether the groundwater sample represents the contaminated water near the well.

Because of this, and because many petroleum constituents are less dense than water, selecting a vertical sampling interval that is appropriate to the objective of the investigation is crucial. Groundwater investigators are sometimes like my hydrologist friend, driving at a certain speed but selecting an inappropriate sampling interval.

Proper groundwater sample collection at LUST sites is critical, because the analytical results are typically central to the design of a corrective action that may cost several hundreds of thousands of dollars. In view of these high stakes, investigators should ensure meaningful results by carefully considering their objectives in groundwater sampling and selecting a sampling method consistent with those objectives. Several groundwater sampling methods are now available. I'd like to describe some of these methods briefly and then mull over some of the implications of what we know and don't know about groundwater sampling.

Groundwater Sampling From Monitoring Wells

Currently, most groundwater investigations are conducted by means of sampling monitoring wells. Monitoring wells are 2- or 4-inch diameter steel or PVC pipes cemented vertically into the ground.



The wellscreen comprises the bottom portion of the well. (The wellscreen is a 3- to 10-feet long cylindrical attachment which is designed to allow groundwater, and not soil particles, to enter the well.) The length of the well screen allows for seasonal fluctuations in groundwater levels. Most investigations at LUST sites are concerned with groundwater quality near the water table. Thus, most monitoring wells are constructed so that half of the length of the wellscreen is placed above and the other half below the water table.

Some groundwater investigators blindly assume that sampling results from monitoring wells faithfully represent contaminant concentrations present in the groundwater. But this assumption neglects physical processes at work during the sampling procedure that control a sample's integrity.

For instance, in a typical monitoring well, the expectation is that because petroleum contaminants float, they will be sampled and detected. However, when water is removed from the well it causes water from below the water table where petroleum concentrations are likely to be much smaller to enter the well from the bottom of the screen. Thus, what may have been relatively clean water from below the water table dilutes the contaminated water in the well and becomes the sample. The very act of sampling groundwater affects the contaminant concentrations of the sample.

We can see that results of groundwater analyses from even the most carefully collected monitoring well samples will be some average of the contaminant concentration values over the saturated length of the screen. Alas, this means that the analytical result we use to make important public health decisions is a minimum groundwater concentration—just as my hydrologist friend's special sampling interval minimized his apparent speed.

Groundwater sample results from monitoring wells are also greatly affected by the volume of water purged prior to sampling. Purging refers to the removal of "stale" water from the monitoring well. In standard practice, the volume to be purged is determined by repeated measurement of parameters such as pH, temperature (T), and electrical conductivity (EC) until these values stabilize (usually within 10%). However, several researchers (Pionke and Urban, 1987; Gibs and Imbrigiotta, 1990) have shown that pH, T, and EC are poor indicators of adequate purging for petroleum compounds.

Research by Gary Robbins and James Martin-Hayden at the University of Connecticut also suggests that sample analytical results are highly sensitive to often neglected factors such as the original water level in the well and the ratio of bailer volume to well casing volume.

So, we have a situation in which the analytical results we get for groundwater samples collected from monitoring wells can be very sensitive to a variety of generally ignored factors, including saturated screen length at the time of sampling, purge volume, original water level in the well, and the ratio of bailer volume to casing volume. In fact, the analytical results may be more sensitive to these factors than to the actual concentration changes in the aquifer that the investigation seeks to measure. This confounding sensitivity on the part of our groundwater samples can lead to serious problems in interpretation of results.

Alternative Groundwater Sampling Methods

There are at least two alternative methods for collecting groundwater samples. The first method involves the use of narrow-diameter driven probes (non-permanent groundwater sampling points), and the second involves the use of multi-level samplers (permanently installed sampling points).

In the first method, the investigator drives (either by hand or by hydraulic force) a narrow (about 1") diameter pipe with a drive point into the ground. When the lower end of the pipe reaches the zone to be sampled, it is withdrawn a short distance, disengaging the drive point and enabling sampling. Either groundwater or vapor can be extracted from this sampling point. (Some units provide for soil sample collection as well.) The small void space at the bottom of the pipe, created by withdrawing the probe, ensures that the investigator collects the sample from a very small sampling interval (several inches). Groundwater samples can be analyzed either by a laboratory or by a portable gas chromatograph (GC). The investigator can plot a vertical profile of groundwater contaminant concentrations by advancing the sampling pipe farther and re-sampling, until sufficient data are measured. Of course, it is up to the investigator to decide what vertical sampling interval is appropriate for his or her objective, and this is sometimes difficult to determine.

In the second method, the investigator installs multi-level samplers using several lengths of flexible tubing within a single borehole. Each length of tubing ends with its own nylon mesh wellscreen which is only a couple of inches long. The wellscreens are installed at discrete depths in the borehole so that water samples can be drawn from several small, distinct sampling intervals. Again, these samples can be analyzed either by a lab or a portable

gas chromatograph.

The mechanics of sampling groundwater from driven points or multi-level samplers are no different from the mechanics of sampling a monitoring well, but the scale is smaller. Instead of results that reflect an average contaminant concentration over a given length of wellscreen, the investigator winds up with an average concentration over several inches. In addition, he or she is able to measure the way groundwater concentrations change with depth at the same location. One advantage to having this kind of information is that the investigator may learn more about flow patterns of specific contaminants.

COURTESY OF GEOPROBE SYSTEMS

Investigator deploying percussion probing unit for driving small diameter sampling tools.

Philosophical Queries

This smaller scale sampling scenario begs several questions, however. For example, with several small sampling intervals measured over what with a monitoring well would have been one large sampling interval, it stands to reason that the results will define a range of concentration values. These are the values that would have contributed to the average (minimum) value produced from a monitoring well sample. Some of the small sampling interval values will be very low, but some will be very high.

What is the meaning of the high values? They represent contaminant concentrations over a small vertical sampling interval, perhaps too small to realistically target for corrective action. Yet consultants and responsible parties who generate these data wonder (and rightly so) whether regulators will require corrective action that would not have been required had groundwater samples been collected from monitoring wells. Is there a need for method-based action levels?

Is it helpful to measure contaminant concentrations across such small vertical intervals? When a drinking water supply has been affected, contaminant concentrations are critical. But, in general, the real question the investigation is trying to answer is "what is the distribution of contaminant mass?" In as much as concentration data are always going to be an average over a sampling interval (as we have seen), the data are inherently limited. That being the case, what is an appropriate sampling interval? Surprise! It all comes down to the groundwater sampling objective—which can change during the course of the investigation!

Be a Mindful Investigator

To sum up my discourse, procedures for collecting groundwater samples have tended to yield analytical results that are minimum values for the contaminants we hope to detect. With experience, many of us have acquired a qualitative sense of what groundwater analytical results mean; factors described above show that we need to use this experience to tweak our internal calibrations in an effort to account for the bare minimum values we are getting.

Also, when monitoring wells are installed at a release site, we need to be mindful of construction and screen placement. Because we are at best obtaining an average over a vertical span, does it make sense to have a large amount of submerged screen? We also need to assess carefully sampling procedures and equipment, accounting for all factors that may influence the result. We need to be mindful of the risk implications as well.

The use of multi-level samplers and narrow-diameter driven probes is promising, but there may be drawbacks. Investigators must weigh the advantages of using innovative versus standard methods, of non-permanent versus permanent sampling, and of potentially generating a much wider range of groundwater contaminant concentration data. Investigators must decide what sampling interval is relevant to the problem they are trying to solve.

Selecting an appropriate sampling method or interval is not always easy to do. But, investigators report that, used appropriately, monitoring wells are valuable permanent groundwater sampling points that provide data that are becoming more and more widely accepted by regulators and responsible parties as standard. They also report that monitoring wells may serve their most useful purpose in the final stages of investigation or in long-term corrective action monitoring, as an effective means to track contaminant concentrations over time near the fringe of the plume.

Investigators also report that groundwater sampling methods that use narrow-diameter driven probes or multi-level samplers are cost-effective methods for reconnaissance plume mapping, free-product plume mapping, and providing a "snapshot" in time of the dissolved phase plume. Such information is generated rapidly and inexpensively and is useful for determining locations for eventual soil borings and monitoring wells.

Actually, my hydrologist friend has a good understanding of sampling intervals, but he still got a speeding ticket. ■

Jim Lundy is a Hydrologist with the Minnesota Pollution Control Agency.

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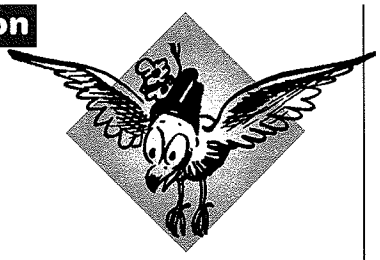
LUST Investigation & Remediation

Up In The Air

LUST Cleanups & Air Pollution



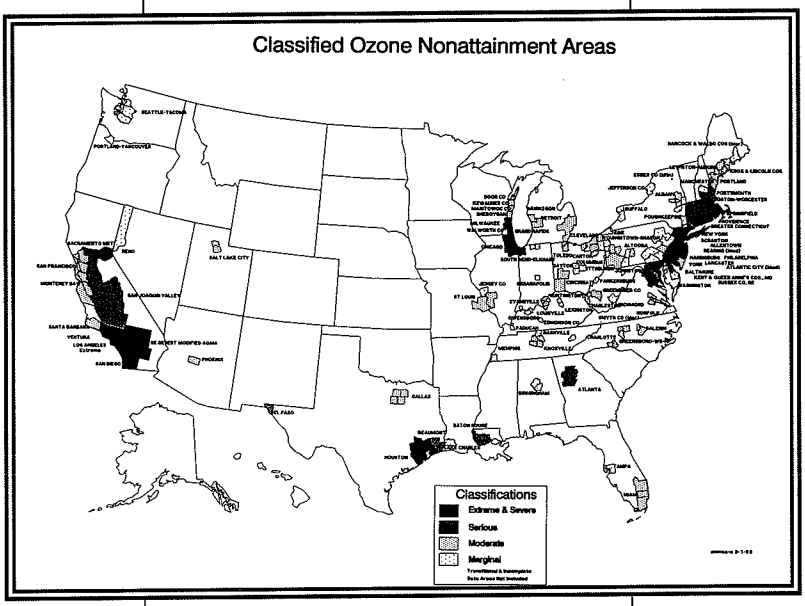
by June Taylor

IN ITS QUEST FOR BETTER, FASTER cleanups of petroleum releases at LUST sites, the U.S. EPA is extolling the virtues of such cleanup technologies as soil vapor extraction (sucking up petroleum vapors) and air sparging (bubbling air under the water table and pulling off the vapors). Both of these techniques, in many cases, can offer improvements over conventional pump and treat systems, but they also transfer volatile contaminants from the soil and water to the air—and once vented above ground, this "soil gas" is more aptly labelled "air pollution." Make that "potential air pollution" because there are technologies available to capture or destroy these airborne contaminants. (See sidebar on page 9.)

Because gasoline vapor emissions contain benzene (a known carcinogen) many air quality regulators are concerned that these emissions may pose risks to local populations. Overall air quality is of particular concern in those parts of the country that are in violation of air quality standards for ozone—basically the whole northeast coast, most of California, and a few hot spots in between. (See the "Ozone Non-Attainment" map on this page.) Although these ozone non-attainment areas (areas where air quality standards for ozone have not been met) cover a small portion of the United States, they include a huge universe of tanks.

But how much of a threat do vapors from a soil venting operation pose anyway? In a world that must cope with problems from industrial and automobile emissions, what are the additional risks of using soil venting technologies on a widespread basis? The answer depends on location, location, location! How close is the release site to people? What is the ambient air quality in the area? What are the air quality requirements in that part of the country?...in that place?

"Soil vapor extraction generally removes a large mass of VOCs [volatile organic compounds] in a relatively short period of time," notes Henry Lord, a consultant and hydrogeologist who has worked on numerous cleanups in the New England area. "At the onset of a corrective action you have a potential discharge of greater than 300-pounds per day. However, during the course of a typical project these emissions are likely to drop off rapidly and level off considerably under 100-pounds per day."



Whether a typical soil venting project is, or is not, a significant source of air pollution, as an emission source, this kind of project is a potential health and environmental threat and must be addressed by environmental regulators. The good news is that we have the technolgy to deal with these potential emissions from both an environmental and a public health point of view. The bad news is that in some parts of the country the permitting processes associated with controlling these emissions have become obstacles to timely site remediations.

Pruning the Permitting Thicket

Because the regulatory authorities who deal with leaking underground storage tank (LUST) cleanups are not the same as those who deal with air pollution, getting permits to run vapor extraction systems has become a stumbling block to better, faster cleanups. As if it weren't hard enough to get a cleanup underway, in some locations, this additional permitting requirement just adds another level of frustration.

Keith Winemiller, a consultant with Pacific Environmental Group which serves Washington, Oregon, and California says, "Everyone has his or her air permit horror stories." Winemiller had one such case in California which involved getting an air permit for an oil-water separator. How horrendous, you might ask, are the emissions from an oil-water separator to warrant a 2-year long permitting process? In this case, Winemiller's firm decided to get the cleanup underway without the permit, recognizing that it was wiser to stop the spread of subsurface contaminants than to delay and threaten groundwater—a rational decision from an environmental perspective. However, if the responsible party had needed reimbursement from the California LUST Trust Fund, he might have had a problem, because the state fund requires compliance with all rules.

Winemiller and other cleanup consultants are sympathetic to the cruel fact that budget constraints and heavy workloads in California's Air Pollution Control Districts (APCD's) contribute to the tedious nature of the problem, but they also feel that the permitting process is an area where, without question, streamlining is possible. The South Coast Air Quality Management District (AQMD), which covers the Los Angeles air basin, and is home to America's most polluted air, has recently taken steps to do just that—streamline their permit process.

"Basically, we're trying to provide better service to our

customers," says Rudy Eden, Senior Manager for the South Coast AQMD, "in this case, by certifying certain devices associated with soil treatment at LUST sites so that getting the permit to use them is almost automatic. To obtain certification, the manufacturer must present the piece of equipment to us for review and evaluation. We then develop permit conditions that are specific to that device, and are written to the most rigorous standard to meet risk assessment requirements. Of course, this type of application won't work for every site because each site is different."

The South Coast's program for LUST-related equipment is new; at this writing, it has certified only two types of equipment: a catalytic furnace and an internal combustion (IC) system, which runs on the recovered vapors and supplemental fuel. Eden notes that if an owner or operator uses certified equipment, he or she can obtain permits in a week or less, compared to months for non-certified systems. In addition, application fees for certified technologies are a fraction of regular applications—$150 versus $1,802. As with any system, the District requires that the operation be monitored to ensure that concentration limits are not exceeded.

Winemiller applauds what the South Coast District has done to streamline and believes there is more that air agencies could do to reduce costs and delays. "For example, something like 'roving permits' would make a lot of sense—a system that would allow contractors to move a particular piece of equipment that's already been permitted from one site to another without the requirement for a new application."

Pat Eklund, UST Program Manager for EPA Region 9 (southwestern states) is very interested in seeing other air districts adopt improved permit procedures. "I'm concerned about the cleanup delays caused by requirements for getting air permits in non-attainment air basins in particular," she says. Eklund hopes to do some trial Total Quality Management (TQM) work with one of the California Regional Water Quality Boards, a local AQMD, and a local city or county in California to see how procedures could be streamlined. Eklund is concerned that many permitting authorities simply aren't familiar with the new vapor control technologies, a problem she finds throughout her Region.

In parts of the country where the bane of smog is not an issue, many regulatory agencies are still concerned about air emissions from LUST cleanups. In these areas, where acute human health effects from toxics like benzene are likely to be the key issue, there are also examples of successes in simplifying air permitting procedures. Take Minnesota, for example, where the Pollution Control Agency's Air Quality Division set state standards for Significant Emission Rates (SERs) for various pollutants. In this case, the Air Quality Division gave the LUST program responsibility for seeing that standards are met.

Minnesota requires that air samples be taken on the day of corrective action start-up, on day 7, and on day 14. After day 14, the system is shut down until the lab results, which indicate whether or not the SERs have been exceeded for petroleum compounds, are available. If the emission levels are above the standard, appropriate emission controls are implemented, which can mean either treating the vapors or running the system at a lower flow rate, thereby reducing emission levels. Three samples are required because the initial operation typically generates the highest emissions, while the day 7 and day 14 points provide the best idea of the continuing levels of emissions.

Minnesota relies on the cleanup consultants and contractors to take the samples and "do the right thing." Jim Lundy, a hydrogeologist with Minnesota's LUST program, emphasizes, "There are numerous soil venting and air sparging projects throughout the state, and only so many of us, so we can't afford to

Systems That Trap or Treat Vented Vapors

Currently, a variety of systems are available to trap or treat vented vapors at LUST sites. These options can be categorized under one of three basic approaches that either capture, burn, or bio-degrade contaminants.

Capturing Emissions

Carbon adsorption has been used to capture air emissions for thousands of years, as far back as ancient China when charcoal was used to control odors emitted from the preparation of soy sauce. On remediation projects, however, costs can be high (e.g., $50,000 for a typical cleanup). Contaminated carbon must be disposed of as a hazardous waste. Some systems are designed to be "regenerated" using steam, for example, to clean the carbon for future re-use, then capturing the liquid condensate from the steam and separating the petroleum from the water. Recovering the product has the advantage of providing information on how much product is being recovered from below ground. With these systems, operating costs are low, but capital costs are greater.

Burning

Another vapor treatment approach is to burn the vapors. Running contaminated vapors through internal combustion (IC) engines is now fairly common. Some systems use a car engine equipped with a catalytic converter and modified to run on natural gas. The engine provides the power supply for the vacuum pumping system, and the contaminated air is used as part of the air intake.

The use of propane reduces the hydrocarbons (HC), carbon monoxide (CO), and nitrogen oxides (NOx)—typical products of combustion from gasoline-powered IC engines. The net pollution is theoretically less than driving a car around town, but as one consultant notes, "the system has to be tweaked to get the right burn on the air intake, so it takes some monitoring to do it right."

Vapors can also be incinerated. In this case, catalytic furnaces burn the contaminated vapors pulled from underground, producing less NOx than typical IC systems. The use of a catalyst reduces the temperature needed to achieve complete combustion from 1200-1400°F to about 700-800°F, resulting in big fuel savings.

Biodegradation

The third approach is biodegradation. Some natural degrading of contaminants occurs as the vapors move through the soil, but the amount of degradation varies greatly depending on the site conditions. Some consultants argue that slowing down the process by turning down the vacuum pressure can enhance degradation. One company takes the pumped vapors and bubbles them through a series of barrels of water "seeded" with soil bacteria from the contamination site. These bacteria eat or "biodegrade" the contaminants. Any remaining vapors are pulled through a single carbon cannister to prevent releases to the atmosphere. This approach is not the quickest, but using bugs is cheaper than treating or regenerating a large number of carbon canisters. ■

micro-manage. However, we do expect to make spot checks this field season to help make sure that the proper air sampling is being done."

Gary Gilbert, a consultant with Delta Environmental's St. Paul office, manages many air sparging and soil venting projects throughout the northern states. He gives Minnesota high marks for it's approach to dealing with air emissions at LUST cleanups. He feels the 2-week uncontrolled emissions test period is reasonable in as much as benzene breaks down into less harmful constituents in a matter of days. "Minnesota is knowledgeable and realistic to require testing for sustained high levels before requir-

■ *continued on page 20*

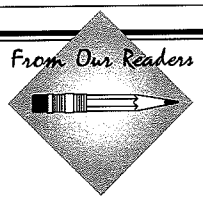
Gasoline Vapor Basics

Gasoline vapors are an air pollution concern for two reasons; because they are hydrocarbons, which are precursors to ozone formation, and because they contain benzene, a known human carcinogen. When released into the ground, gasoline, the liquid, partitions into other phases—dissolved (groundwater), adsorbed. (onto soil particles), and vapor.

Benzene, was the first toxic air pollutant regulated under the Clean Air Act. Although gasoline vapors contain other toxics (e.g., toluene, ethylbenzene, xylene), benzene is considered to be the most harmful. Air pollution agencies usually require monitoring of and limits on benzene emissions. Fortunately, when exposed to air and sunshine, benzene breaks down into less toxic constituents.

Ozone is a problem in many urban areas during the summer months when warm temperatures, sunlight, and certain substances (e.g., nitrogen oxides (NOx) and hydrocarbons) react photochemically to form a noxious smog. One of the curiosities of air chemistry is that ozone at ground level is a health hazard while ozone in the upper atmosphere is crucial to protecting plants and animals, including human beings, from harmful solar radiation.

In areas of the country that do not meet the national ozone standards ("non-attainment areas" in the Clean Air Act lexicon), air pollution control agencies regulate sources of hydrocarbons (ozone "precursors"), including emissions from LUST cleanups. It may seem that a LUST site would be too small to bother with, but in areas with acute smog problems, all controllable sources must be addressed. In parts of California, the need to control volatile organic compounds is so severe that you can no longer buy oil-based paints, and even barbecue lighter fluid is regulated. In such an atmosphere, LUST sites emitting petroleum vapors are seen as legitimate targets for enforcement. ■



Consultants Trying to Solve Tough Environmental Problems—and Taking it on the Chin Too.

Having read your October *L.U.S.T.Line*, and the article, "When Necessity is the Mother of Invention" in particular, I am concerned about the bad press the consulting industry continues to get. We agree that there may be numerous cleanup projects in existence where long-term "pump and treat" activities have been costly and ineffective, but if you take a moment to revisit the conditions under which many of these systems were installed it may help to put things a little more in perspective.

The UST regulations were promulgated with very little guidance as to how to perform cleanups, and technology did not exist at the time to adequately address groundwater contamination problems. The few consultants that were available were mostly environmental engineers and hydrogeologists who employed the best available technology at the time. It is unfair to criticize these earlier attempts and label them as abusive, since they were employed with the genuine hope of solving the problem. Unfortunately, we are still a long way from having all the solutions to clean up all sites.

Environmental engineers and geologists working in the soil and groundwater remediation field are the first generation of professionals to deal with these kinds of problems. As your article stated, a lot of trial and error is necessary to develop workable remediation solutions. To compound the difficulties of research and development, the consulting industry is subject to some very difficult financial constraints created by the various state cleanup funds. It is always frustrating when government tells free enterprise what it can do and what it can charge, while in the same breath criticizing that same industry for failing to employ state-of-the-art technologies.

Rather than regulate how we do business and what we charge, it would be more appropriate to require that the people performing remediation work be bound by existing legislatively established state boards of registration, such as the Board of Professional Engineers or the Board of Professional Geologists. Registration in these professions requires statutory accountability to a state board for responsible and correct analysis and design, as well as responsibility to the public for maintaining high ethical standards.

In addition, if the trust fund administrators would require that the people doing the work were licensed by state agencies and appropriately insured or bonded for the work they were doing, many of the so-called consultants that may abuse the market would be eliminated. It is inappropriate for government to tell free enterprise how to run their business, however, it is very appropriate for government to require a high level of professional qualification and accountability for the people accessing cleanup funds.

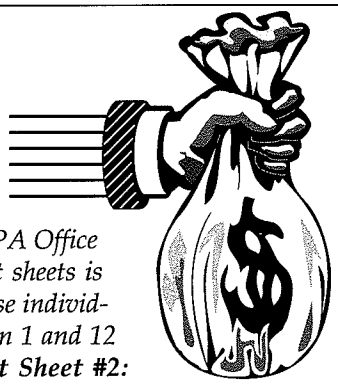
It is unfortunate that the industry developing the technology and know-how to begin solving the long-term contamination problems of this planet have become the villains. If we are looking for a villain perhaps we should point a finger at the pollution itself, or the lack of technology available to deal with the problem, or the lack of cleanup money available in a soft economy, or the compressed time frame created by regulations, or the lack of professional constraint on the people doing the work, or the creation of state cleanup funds that do not readily fit into any kind of free economy model. It has been a long time since I have read a trust fund-related article that had anything negative to say about the polluters, but I have read a lot lately that tends to blame everything on the consulting industry.

We are attempting to regulate ourselves and to deal with the problems that we know we have. If environmental consultants are "brought to their knees", then who is going to do the cleanup? Who is going to develop the technology? Who is going to solve the tough environmental problems ahead? ■

Richard G. Catlin, P.E., P.G., President of the Association of Professional Environmental Consultants, Wilmington, North Carolina.

LUST Investigation & Remediation

Controlling UST Cleanup Costs



In the previous issue of ***LUSTLine*** *we began the first of a series of fact sheets prepared by the EPA Office of Underground Storage Tanks on controlling UST cleanup costs The audience for these fact sheets is owners and operators who have little or no experience with remediating sites. In many cases these individuals are in Group 4 of the federal financial responsibility requirements—those who own between 1 and 12 USTs. Fact Sheet #1 was about* ***Hiring a Contractor****. The following articles are from* ***Fact Sheet #2: Negotiating the Contract*** *and* ***Fact Sheet #3: Interpreting the Bill.***

Negotiating the Contract

Build Trust

As a business person, you know that in business agreements there is almost always room for bargaining. Like other contracts you've worked out, site assessment and cleanup contract negotiations involve questions. Remember, contractors want to work with you, and answering your questions is part of getting the job.

The contract serves as a blueprint for the site assessment and cleanup, and it shows both you and the contractor where you've agreed to spend your money. Keep in mind, you can use the same or different contractors for the site assessment and cleanup jobs. Understanding and evaluating the bids from all contractors is your responsibility.

Get it in Writing

Most contractors will lay out a scope of work, which should include four kinds of basic information:

- Details of the tasks to be performed (e.g., the number of wells to be drilled)
- Specifics on qualifications of personnel who will perform those tasks
- Schedule of when the tasks are to be performed
- Costs of each of the tasks to be performed

Make sure you understand all of these components.

Control the Project

- **Know Regulations:** Before you hire a contractor, learn your state's underground storage tank program regulations. Most states have a fund to help UST owners pay for leaking underground storage system cleanups. The fund is generally managed by a state fund administrator. Check with your state fund administrator to see if you are eligible to receive assistance and to learn about other requirements (e.g., invoicing) you need to understand before you hire a contractor. Make sure the contractor follows these requirements.
- **Take Charge:** Manage the contractor; don't allow the contractor to manage you. Make certain that the contractor answers to you and keeps you informed of progress and problems. Remember, the state holds you responsible for the cleanup of your spill.

Types of Contracts

Generally, three types of contract options are used for site assessment and cleanup management: time and materials, fixed-price, and unit-price.

Time and Materials Contract - Charged hourly: This contract buys you hours of service, not a completed cleanup. Though not as common as the fixed-price contract, this type of deal is negotiated if you're uncertain of the type of work needed. Time and materials contracts involve loaded rates, which typically include the contractor's salary, fringe benefits, and overhead. *[Editor's note: To be sure time and materials costs don't get out of control, it is a good idea to be specific about what work will be done and to include a "not to exceed" cost figure in the contract.]*

Fixed-Price Contract - One price: In a fixed-price contract, one price covers the whole site assessment or cleanup from beginning to end [unless you are dividing the jobs up between different phases of work or different contractors]. This includes person hours, equipment hours, and all fees and services. You control costs by letting the contractor know that you will not pay for work beyond the scope of work unless you specifically agree to it in writing. You need to be careful that contractors don't take short cuts in completing work.

Unit-Price Contract - Charged by specific task: In a unit-price contract, a project is divided into specific tasks called work units, and a price is attributed to each. Examples of work units are:

- Taking soil borings (per foot or other unit)
- Sampling and analyzing groundwater from a monitoring well
- Excavating contaminated soil (per cubic yard or other unit)

The unit price includes labor (salary, fringe benefits, and overhead) and materials necessary to properly complete the task. Profit is included in the unit price. An advantage to the unit-price contract is that you are not required to pay for uncompleted tasks or inefficiencies on the part of the contractor. As with fixed-price contracts, you need to be careful that contractors don't take short cuts in completing work.

Cost-Cutting Tips—Getting What You Pay For

- **Scrutinize Bargains:** Don't let the lowest bidder fool you. The lowest bid may appear cheapest, but you might end up paying for expensive mistakes or redoing work that wasn't done right the first time. Select an experienced contractor who provides high quality work.
- **Hire Experience:** Contact your state UST program about their experience with contractors. You're better off with a contractor with a lot of state experience and good reviews on cost-effec-

tiveness and timeliness. Make sure the contractor has insurance and access to the proper equipment.

- **Monitor Budget:** Show cost limits for specific tasks in the contract. Require the contractor to tell you when he/she has reached certain points (e.g., 25% of tasks and costs, 50%, 75%). Make sure your contractor sticks to a schedule and informs you when he/she cannot.
- **Condition Payments:** Connect payment for services to the satisfactory completion of necessary work. Stipulate a policy on payment for idle time. (For example, delays in obtaining equipment caused by the contractor's poor planning should not be charged to you.)
- **Keep Tabs:** Negotiate a price ceiling into the contract and monitor charges and performance. Any changes in the scope of work should be authorized by you in writing—no authorization, no payment. Be sure you are paying for completed work, not projected work. Require the contractor to get approval from you for all overtime.
- **Encourage On-site Treatment of Soils:** On-site treatment is often cheaper than hauling the soil to a landfill or treating it at an off-site facility. Check with your state UST program to see if this is an acceptable practice.
- **Promote Quality:** Make it clear that you will not pay for substandard work.

The sooner a spill is cleaned up, the better. The longer you wait, the more the problem will spread and the more the cleanup will cost.

Interpreting the Bill

Figuring the Figures

Competition among gasoline stations may keep the prices at your pump about the same as the prices at the station down the street or across town. These prices may vary a few cents from week to week, but not by much. In contrast, site assessment and cleanup costs can vary tremendously.

In your day-to-day operations, you've probably noticed that there are almost as many ways to be charged for vendor services as there are vendors. In the cleanup business, charges for similar services or items may be worlds apart. That's because of the different rates contractors can charge you. And the ways that they bill you.

Match the Items

Understanding your bill—what the charges are and how they are determined— is essential to keeping down the cost of the cleanup. Your bill needs to match the contract scope of work and provide top-to-bottom detail, which means you need to carefully examine your first bill. Then sit down with your contractor and ask questions about charges you think are too high. Verify that charges are legitimate, correct, and timely.

Establish a billing schedule. Tell your contractor you need bills at regular intervals and that each invoice should specify the time-period of work performed. Examine each one carefully.

Know State Limits

Most states have a fund to help UST owners pay for cleaning up tank leaks. The fund is generally administered by a state fund administrator. State funds are set up in different ways. Check with your state fund administrator to see if you're eligible to receive these funds and to learn about other requirements (e.g., invoicing).

Remember, as a business owner, careful cost management is one of your strengths. Though you may be eligible for state assistance for certain tasks or services, don't depend on the state fund to pay for your cleanup. Review each of your costs carefully to be sure you weren't charged unfairly. Cost management is your responsibility.

Straight Rates and Loaded Rates

Contractors may list labor, overhead costs, other business expenses, and profits as separate cost elements (straight rates) or group them into fewer charges (loaded rates). The method of billing depends on the agreement in the contract. Whatever the agreement, be sure it is followed in the field and in billing. For your own financial well being, you need a clear understanding of every step of the process. For example, one contractor's labor rate for a senior engineer may be $50 per hour while another may charge $100 per hour. You should check to see whether the second contractor is quoting a loaded rate (i.e., a rate that includes salary, fringe benefits, and overhead).

Sort Out Cost Elements

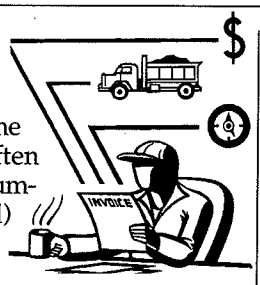
To understand the differences in billing procedures, you need to know what and how the contractor charges you. Most contractors calculate costs with the following charges in mind:

- **Direct Labor:** Employee salaries, not including benefits.
- **Fringe (Employee) Benefits:** Vacation, sick, and holiday time and sometimes insurance and retirement benefits. This cost is calculated as a percentage of direct labor.
- **Other Direct Costs (ODCs):** Equipment, supplies, travel, soil disposal, and other costs associated directly with the site assessment or cleanup. Refer to the contract to see if these expenses are included.
- **Overhead:** Rent, utilities, and phone bills associated with the operation of the facility where the contractor works. This cost is calculated as a percentage or a multiple of direct labor.
- **General Administrative (G&A) Costs:** Expenses associated with tasks necessary to run a business that are not billable directly to customers. For example, paying bills, preparing internal reports, and holding meetings. Sometimes these costs are included in overhead. G&A costs are often calculated as a percentage of direct labor, overhead, or other direct costs.
- **Subcontractor Costs** (When Appropriate): Costs for contractors who provide specific ser-

vices under the direction of the main (prime) contractor. They include the subcontractor's general and administrative costs and profit percentage.

Using subcontractors always means added expense because the prime contractor increases his/her rates to cover the expense of hiring and managing a subcontractor. For example, the general contractor you hire to clean up a spill at your station, hires another group to remove the tank and haul the soil from the site. Your bill from the general contractor for those services will include charges for finding and managing a subcontractor.

- **Fee/Profit:** Earnings from the contract to help the contractor recover the costs of investing in equipment. Typically figured as a percentage of all contractor costs, this charge may be negotiated to your advantage when working out the contract. For example, a contractor may be willing to reduce the fee for a big job or for one that requires only equipment they already have.
- **Reported Costs:** The total expenses incurred by the contractor, often reported as summary (loaded) costs. The extent of detail of the reported costs depends on how much detail you want the contractor to include. To help the state fund administrator understand and pay your claim, make sure your reported costs are as detailed as your state fund requires.



- **Loaded Rates:** The number calculated by adding together costs, such as salary, fringe benefits, and overhead. One contractor's loaded rates may include all three of these; another's may include these plus fees.

And Remember...

The sooner a spill is cleaned up, the better. The longer you wait, the more the problem will spread and the more the cleanup will cost. ■

Tank Bits

NY DEC's Chemical Storage Manual

A manual of *Recommended Practices for Storing and Handling Hazardous Substances* was recently completed by the New York State Department of Environmental Conservation and O'Brien and Gere Engineers. The 155-page manual, a guide for engineers, operators, and managers who have responsibility for hazardous chemicals, covers a variety of subjects including: transfers and overfill prevention, recommended equipment inspection practices, risk and hazard assessment, warehousing of drums, secondary containment, and spill response planning. Copies may be obtained at a cost of $15.00 from: The Health Education Services, P.O. Box 7126, Albany, NY 12224. Phone: 518/439-7286. ■

The Case of the Deteriorated Spill Containment Seals

Have You Inspected Your UST System Lately?

It was a routine maintenance inspection of an underground storage tank fueling system. The maintenance person for the Tennessee-based Golden Gallon convenience store chain was checking the spill containment device at one of the company's Georgia locations when he noticed what looked like bits of rubber in the bottom of the spill bucket. Upon closer inspection he discovered that the seal, where the bottom of the bucket attaches to the fill pipe, had deteriorated.

The spill containment device at this location was the Universal Valve Company's Model 60-CD Spill Containment Manhole. Golden Gallon had installed these devices in many of their Georgia locations in 1986 and 1987. With the discovery of the deteriorated gasket, the company proceeded to check the spill containment device gaskets at all of these locations. They found consistent gasket deterioration in all such devices exposed to gasoline—seals exposed to diesel and kerosene fuels showed only minor deterioration—which suggests a gasoline compatibility problem. The company promptly replaced all the gaskets.

Golden Gallon alerted the Georgia Department of Natural Resources (DNR) to the possible contamination risks associated with the deterioration of the seals (spilled product drains into the surrounding backfill). DNR recently issued a press release urging UST owners to inspect containment device seals to ensure that they are operating properly and to replace them when necessary.

"We don't see the seal problem as a major environmental problem, but it is a potential problem," says Randy Williams, manager of the DNR Environmental Protection Division's UST Management Program. "Because these seals are rarely checked, we don't know how widespread the problem is. Our concern is that discharges into the soil resulting from seal deterioration could become more pronounced as time goes on."

Many spill containment manholes in new storage systems do not have rubber seals at the bottom of the containment bucket, but many retrofitted systems do. The bottom line is that this equipment should hold liquid—that's the whole point of the spill bucket. If the device does not hold liquid, it is in violation of federal and state UST requirements and an owner or operator could face enforcement action or, in some states, denial of state trust fund coverage in the event of a severe leak. If you have heard of UST installations with similar problems, let us know. ■

Leak Prevention

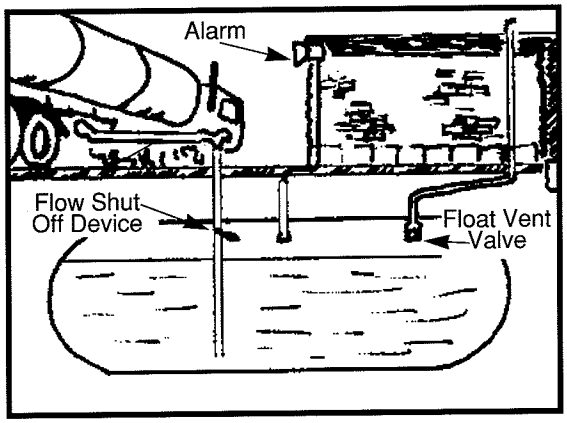
Tank-nically Speaking

by Marcel Moreau

*Marcel Moreau is a nationally recognized petroleum storage specialist whose column, **Tank-nically Speaking**, is a regular feature of **LUSTLine**. As always, we welcome your questions, opinions, and technical interests.*

OVERFILL PREVENTION: Are We There Yet?

ANYONE WHO IS INVOLVED with the removal of USTs knows that soil contamination around fill pipes is an all too familiar sight. The federal rules specify two different requirements that are designed to avoid this problem in the future. The focus of the first requirement, which I will refer to as spill containment, is on catching any drips that may drop when delivery hoses are disconnected. This requirement is typically met by installing some form of a liquid-tight "bucket" around the tank fill pipe. The focus of the second requirement, which I will refer to as overfill prevention, is to stop a delivery before a tank is completely full so that the contents of the delivery hose can be drained into the tank. This requirement can be met by alarms, devices installed in the fill pipe, or devices installed on the tank vent line. In this article, I'd like to expose some of what I think are major weaknesses with the vent line overfill prevention device commonly known as the "float vent valve" or "ball float valve," probably the most common overfill prevention device in use today.



Three methods of overfill protection are allowed by federal rules.

The Vagaries of the Float Vent Valve

The float vent valve is installed inside the underground tank at the vent opening. The unit consists of a short piece of pipe that typically protrudes down below the tank top about 6 inches and a wire cage that contains a hollow metal ball. The ball normally sits in the cage an inch or two below the opening of the pipe so that the tank can vent normally. When the fuel level in the tank reaches the ball, it floats upward until it blocks the pipe opening and closes off the tank vent. With the vent closed off, no more fuel should be able to enter the tank. Well, that's the theory anyway. Let's look a little more closely at some of the assumptions behind this theory.

Assuming Too Much?

The most far reaching assumption critical to the operation of the float vent valve is that the top of the tank is airtight. If there are other avenues for air to escape from the tank, then the function of the float vent valve will be compromised if not totally circumvented. Let's look at a few examples...

Although most deliveries from large tank vehicles are made using airtight hose connections to the tank fill pipe ("tight fill" connections as they are commonly known), this is not always true at smaller, especially rural "mom and pop" operations. At "mom and pop" operations, deliveries are made by attaching a length of pipe several feet long to a hose and inserting this pipe into the tank fill pipe ("loose fills" as they are commonly known). During a loose-fill delivery, vapors escape from the tank fill pipe even under normal circumstances, but with a float vent valve installed, product will come flooding out of the fill pipe when the float vent valve closes. Hence, float vent valves are useless when deliveries are made with loose-fill connections. (Loose fills are only legal for tanks of 1,000 gallons or less according to NFPA 30. In addition, loose fills can only be used on tanks where Stage I vapor recovery requirements are not in effect.)

There is another opening into the top of the tank that is crucial to the proper operation of a float vent valve: the drain valve in the spill containment manhole around the fill pipe. The spill containment manhole is intended to catch drips that may occur when the delivery hose is disconnected; the drain valve allows these drips of fuel to be drained into the tank. While these spill containment manhole drain valves typically seal tightly when they are installed, it doesn't take long before dirt, debris, and physical abuse cause these valves to leak or to be stuck open.

If the drain mechanism on the spill containment manhole is stuck open, and the float vent valve closes because of an overfill, the drain mechanism becomes the vent for the underground tank. This chain of events will result in the release of product vapors at grade at the fill pipe—a potentially explosive situation. If the truck driver does not notice this situation, the tank will continue to fill until liquid product spews out of the spill containment manhole, thereby causing a spill and producing an even greater potential for explosion...not a pretty sight.

Venting the underground tank through the spill containment manhole drain mechanism is not always accidental. Some drivers have learned that the drain mechanism on the spill containment manhole is a convenient way to override the operation of the float vent valve completely.

Why do this? When flow stops, all the driver has to do to continue the delivery is open the drain

mechanism on the spill containment manhole which enables him to continue the delivery—at a rapid rate. Although opening the drain mechanism releases vapors in the vicinity of the driver, in many cases he or she is more concerned with draining the truck and getting the next load than with thinking about the potential for an explosion or health hazard.

I would argue that a storage tank equipped with a float vent valve and a spill containment manhole that drains into the tank has not met the intent of the overfill prevention regulations. Float vent valves should only be used with spill containment manholes that do not have drain mechanisms that open into the underground tank.

Additional opportunities for the top of the tank to be less than airtight are presented by the fittings used to install automatic tank gauge probes, the tank/fill pipe and tank/submersible pump connections, the plugs used to seal unused tank top openings, and the float vent valve itself. How do we *know* that all of these fittings are, in fact, airtight?

Incompatibility With Fuel Delivery Systems

Float vent valves have other drawbacks as well. One of the most catastrophic drawbacks is that they are not compatible with pressurized deliveries into the tank. When a float vent valve closes during a gravity drop delivery, the pressure in the tank increases by a few pounds because of the weight of the product in the hose and the tanker. When a float vent valve closes during a pumped delivery, however, the pressure inside the tank increases until the pressure relief mechanism in the pump kicks in.

These pressure relief mechanisms are typically set at somewhat over 100 psi—more than 20 times the pressure that an underground tank is designed to withstand. Quite predictably, this over-pressurization can result in the rupture of the underground tank and in the loss of a tankful of product into the ground. I am aware of two instances on Long Island, New York, where tanks have been ruptured by over-pressurization caused by a combination of pumped deliveries and float vent valves. Float vent valves are no longer allowed in Long Island's Suffolk County.

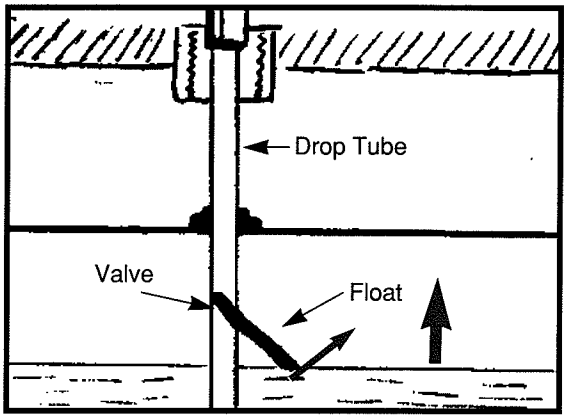
Float vent valves are also not compatible with suction pump retail motor fuel dispensing systems. The increase in pressure in the tank when the float vent valve closes pushes product through the suction piping and forces it out the air exhaust on the air eliminator at the pump, resulting in a spill at the pump island. Because the driver is often some distance away from the pump island, he or she may not notice that this spill is happening. Because some motorists insist on ignoring the "No Smoking" signs at pump islands, such a spill is potentially dangerous.

What Float Vent Valve?

Fuel delivery drivers have a few choice words to say about float vent valves. There is typically no way for a driver to tell that a float vent valve is installed on an underground tank. If a flow shut-off device is installed in a drop tube, you can see it by looking down the fill pipe. A flow shut-off device also causes the hose to jump when it closes, which alerts the delivery person that the tank is nearly full.

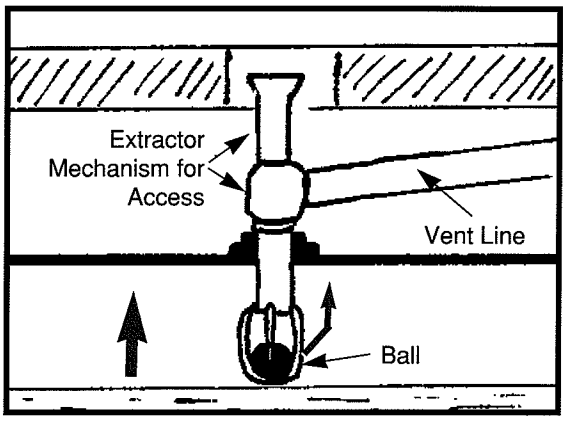
But the driver cannot see a float vent valve, so he or she may not know that one is present. When a float vent valves closes, it creates a pocket of air in the tank that compresses gradually and acts as a cushion so that there is no noticeable movement of the delivery hose. All the driver can tell by looking at the sight glass in his hose connector is that product has stopped flowing, which is what happens when a tank without any overfill protection device is overfilled.

The driver becomes dangerously aware that a float vent valve is present, however, when he disconnects the hose from the tank fill pipe. Because the



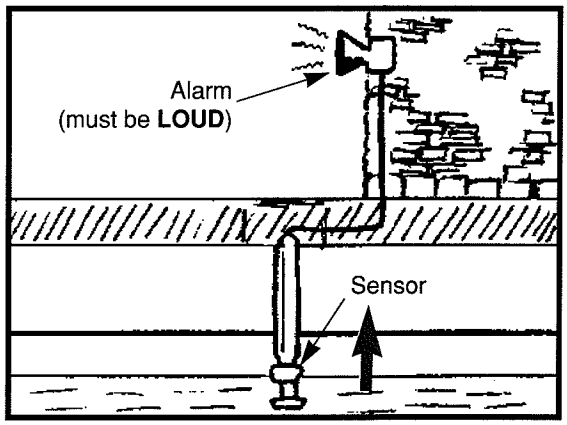
1 Flow Shut Off Device

Usually installed as part of the drop tube in the tank fill pipe. Rising liquid level raises float, closing valve and shutting off delivery.



2 Float Vent Valve

Installed inside the tank at the vent opening. Rising liquid level raises ball and blocks vent pipe, reducing delivery rate to about 15 gal/min or less.



3 Alarms

Rising liquid level is detected by a sensor that activates an external alarm.

air space at the top of the tank is pressurized by the weight of the product in the hose, when the hose is disconnected, product blows out, spraying the driver and resulting in a spill. The only safe way to avoid this situation is to wait a half hour or more for the pressure in the tank to be relieved by the 1/8" vent hole in the float vent valve. Clearly, a notice attached to the fill pipe that a float vent valve is present would be a great service to delivery truck drivers so that they would know to wait for the pressure to be relieved after the float vent valve has closed before disconnecting the delivery hose.

Isn't There a Better Way

As float vent valves are installed on more and more storage systems, we may find out that they are more a part of the problem than they are a part of the solution. In my opinion (feel free to send in yours), properly designed and installed overfill prevention devices installed in the drop tubes of fill pipes are a much sounder and safer way to achieve successful overfill prevention. Alarms would be my second choice, if they are installed correctly...but that's another story.

Will The Real Ullage Calculation Please Stand Up?

While we're talking about overfill prevention, let me mention a few other oversights that lead to overfill incidents. Most automatic tank gauges include the ullage volume of the tank as part of the information they provide to the storage system operator. Ullage is the remaining empty space in the tank. Many tank owners use this number to determine how much product to order.

For most existing automatic tank gauges, the ullage calculation does not take into account the reduction in working capacity of the tank resulting from the installation of an overfill prevention device. If, for example, an overfill prevention device is installed at 90 percent of the working capacity of a tank with an actual capacity of 10,058 gallons, the automatic tank gauge will overcalculate the amount of fuel that can be delivered by 1,000 gallons. It should come as no surprise then, that delivery personnel frequently try to deliver more product into the tank than it can hold.

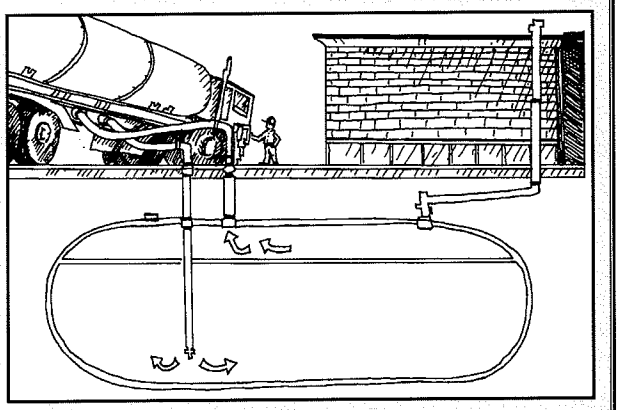
Recently installed automatic tank gauges take the ullage calculation error into account by reporting the "90% ullage" which is calculated by subtracting 10% of the actual capacity of the tank from the remaining ullage. My question is, how many UST owner/operators understand the meaning of "90% ullage"?

While operators of storage systems are busy ordering too much product because they have failed to take into account the reduction in the working volume of the tank because of overfill prevention equipment, delivery drivers get stuck with a hose full of product because no one bothers to tell them the working capacity of the tank. A delivery driver may know whether a tank is steel or fiberglass, and may even have the appropriate tank inch-to-gallon conversion chart; but by and large, the driver has no idea of what type of overfill prevention device, if any, is installed on the tank, and he or she never knows what level of product in the tank will trigger the overfill device.

The current federal rules specify that overfill prevention devices can be set off at anywhere from 90% of the tank capacity to just below the tank top, depending on how the device operates. In most cases in this country, there is no way for the delivery person to know where the cut-off point is, which means that the driver is operating blind. Hence, drivers sometimes "poke and hope," because all they can do is measure the current volume of product in the tank with a gauge stick and hope that the volume of product in the

New Video

Keeping It Clean: Making Safe and Spill-Free Motor Fuel Deliveries



Drivers of motor fuel delivery trucks are the most important factor in ensuring that fuel deliveries to underground storage tanks are pollution-free. Today's drivers deal with many types of equipment that are required to prevent air pollution and soil and groundwater contamination. *Keeping it Clean: Making Safe and Spill-Free Motor Fuel Deliveries* is a 25-minute video tape that illustrates both the key steps of a safe, clean delivery and the variety of equipment that drivers will find at various motor fuel facilities. The video specifically addresses Stage I vapor recovery, overfill prevention, and spill containment.

Keeping it Clean was produced by the Environmental Media Center (EMC) for the U.S. Environmental Protection Agency's Office of Underground Storage Tanks and Office of Air Quality in cooperation with the American Petroleum Equipment Institute (API), Petroleum Equipment Institute (PEI), Petroleum Marketers Association of America (PMAA), Fiberglass Petroleum Tank and Pipe Institute, and Steel Tank Institute.

Although it focuses on the needs of fuel tanker drivers, the program also has important information for tank owners and operators who must select, label, and maintain a variety of pollution control equipment.

EPA has provided copies of this training program to its Regional Offices as well as to state air pollution and underground storage tank programs. API, PEI, PMAA, and EMC are marketing and selling the video. The suggested price is $59.95 including postage and handling. For ordering information call EPA's RCRA/Superfund Hotline at 1-800/424-9346. For hearing impaired call TDD 1-800/553-7672. Government agencies receive a discount from EMC. Call 1-800/522/0362

truck can and will fit in the tank.

At the last Petroleum Equipment Institute (PEI) convention, I saw a new type of tank identification that consisted of a brass plate with a colored reflector to indicate product type and a space on the plate to engrave the working capacity of the tank. After reading this marker any driver would know how much liquid the tank could hold. Seems like a good idea to me.

A Little Knowledge Goes a Long Way

So, the point of this discussion is that installing overfill prevention devices (especially float vent valves) is not the solution to storage system overfilling. What is needed is a good deal more knowledge among people ordering fuel as to how much liquid their storage tanks actually hold and communication of critical information to delivery drivers on how overfill protection works, what overfill device is installed on a particular tank, and the working capacity of the tank. The EPA and a consortium of industry groups have just completed a video called *Keeping it Clean: Making Safe and Spill-Free Motor Fuel Deliveries* (see page 16) for fuel delivery truck drivers to explain how the various overfill prevention devices work. This effort is a good first step, but much remains to be done before the overfill problem is truly laid to rest. ■

O O O P S !

Missing words in ***LUSTLine*** *#17's "Tank-nically Speaking," page 15, column 3. Please note that right after "Methods that meet the monthly test standard," the text should say as underlined:*

- **Groundwater and vapor monitoring** - Either of these methods can be used to meet monthly monitoring requirements if the system is designed to detect leaks from any portion of the piping that routinely contains product and is checked at least monthly for indications of a leak. The system must meet all the conditions specified in the regulations for groundwater or vapor monitoring, including a site assessment (hopefully by a competent person) that determines whether all regulatory requirements have been met and that the method will, in fact, detect leaks.

Field Notes

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

Here Comes Stage II Vapor Recovery

On November 21, 1990, President Bush signed into law the Clean Air Act Amendments of 1990 (CAAA). To control smog-causing pollutants released during vehicle refueling, the CAAA mandates the use of special systems and devices that capture vapors at the vehicle fill pipe and return them to the facility storage tank. The control of emissions from vehicle fueling operations is commonly referred to as Stage II vapor recovery.

The CAAA requires facilities that dispense gasoline in the worst polluted areas and cities in the country [see map on page 8] to install Stage II equipment according to a 2-year phase-in schedule. The specific installation deadlines vary from state to state and depend primarily on when the gasoline outlets were constructed and how many gallons per month are dispensed. As a general rule, however, most vapor recovery upgrades are scheduled for installation in either 1993 or 1994.

Because the installation of Stage II systems requires that concrete be broken in order to to lay vapor-return lines from the dispenser back to the tank, underground storage tank regulators are finding that many tank owners are opting to combine their vapor recovery installation work with their tank upgrade plans. And while vapor-return lines are not regulated under the federal underground tank standards (40 CFR Part 280), UST owners and regulators have found that improperly installed Stage II systems can create problems with underground storage tanks and piping, with hydrocarbon vapor monitoring systems, and with the general operation of the dispensing facility.

Underground storage tank owners, contractors, and regulators agree that the single most important aspect of a successful Stage II program is to ensure that the systems are installed correctly. Recognizing the importance of proper installation and testing of Stage II equipment, a special committee of the Petroleum Equipment Institute (PEI) began preparing a recommended practice on the subject in 1991.

Early last fall, PEI requested comments on a draft of *Recommended Practices for Installation and Testing of Vapor Recovery Systems at Vehicle Fueling Sites.* We requested comments from equipment companies, environmental officials, petroleum marketing associations, and oil company engineers; we received over 175 comments. As a result of suggestions made by the public and private sectors, we revised and improved the draft.

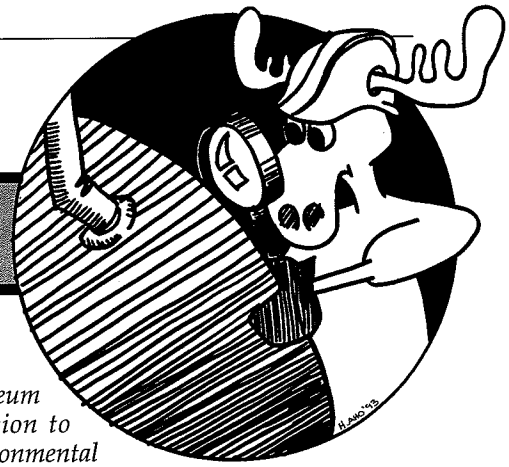
The final, approved version of the recommended practice (PEI/RP300-93) is now available to interested parties. RP300-93 includes information on different types of vapor recovery systems, installation methods, and vapor recovery piping. It also contains chapters covering testing during construction, pressure decay and dynamic backpressure testing, and blockage testing. The text includes 18 drawings, and a list of pertinent publications.

The practices recommended in RP300-93 are limited to those related to the installation and testing of motor fuel vapor recovery systems located at vehicle fueling facilities. The document does not cover practices for installing or testing vapor recovery systems associated with bulk loading at terminals, bulk plants, and on-board transports.

The importance of skilled and knowledgeable technicians in vapor recovery installation work cannot be overemphasized. The work is highly technical; opportunities for error, which could adversely affect not only vapor recovery system operation but also the upgraded UST system, are abundant. Installers should be properly trained, equipped, and supervised. The installers who wrote PEI's recommended practice on proper vapor recovery system installation hope the document will be useful to system installers, tank owners, and environmental regulators who depend on getting the job done properly.

Copies of PEI RP300-93 are available for $15 per copy from the Petroleum Equipment Institute, P.O. Box 2380, Tulsa, Oklahoma 74101. 918/494-9696. ■

Leak Prevention



Tanks Down East

by W. David McCaskill

Because many of our readers have enjoyed David McCaskill's insights on the world of petroleum storage tanks, we are introducing ***Tanks Down East*** *as a regularly featured addition to* ***LUSTLine****. David is a petroleum storage specialist with the Maine Department of Environmental Protection. We welcome your comments.*

Field Testing Secondary Containment Systems

SOME YEARS AGO AS A CONSULTANT I conducted a UST piping survey for EPA. When I asked a fellow from the midwest why he didn't install much double-walled piping, he replied, "If you put single-walled piping in right the first time, why do you need secondary containment?"

What could I say? Here in Maine, we can't take chances. Folks in these parts usually live in small communities; where everybody's groundwater supply comes from the same bedrock fracture.

The 1986 version of Maine's UST rules allowed secondary containment as a leak detection option; however, most UST owners chose the other allowed and less expensive option—single-walled systems with groundwater monitoring. But, based on the numbers of groundwater monitoring access covers that we were observing either covered with asphalt and concrete or rusted shut, it didn't take long for the Maine Department of Environmental Protection (DEP) to realize that a good percentage of owners were not monitoring these wells on a weekly or even monthly basis. As a result of this discovery, in 1991 our department used this information to help convince the state legislature that it was time to require secondary containment and continuous interstitial space monitoring for all new UST systems.

Lately, in my patrols throughout the state, I have inspected secondary containment systems at UST facilities and talked with installers, owners, and vendors about some of the problems they have encountered with these systems. So, here's my thumbnail report on secondary containment—tanks, piping, sumps, leak detection sensors, and other sundry gadgets (cursed or praised) —Down East.

The Various Vessels

Currently, you'll find two types of double-walled tanks (excavation liners have lost this battle) commonly installed in Maine, fiberglass reinforced plastic (FRP) and jacketed tanks.

FRP double-walled tanks are simply fiberglass tanks with another fiberglass shell wrapped around them. The two shells are separated by ribs or a mesh that forms an interstitial space that can be monitored. A hydrostatic leak detection system can be used with these tanks. With this system, the interstitial space is filled with a brine solution, the level of which is monitored to verify the integrity of the inner and outer walls of the tank. The brine solution is used on FRP tanks because of it's anti-freeze and non-toxic qualities, however it cannot be used in steel tanks because of it's corrosive properties. Here in Maine, we have observed that the use of FRP double-walled tanks with hydrostatic monitoring is limited to municipal, federal, or corporate projects, primarily, where an engineer is involved in specifying the system.

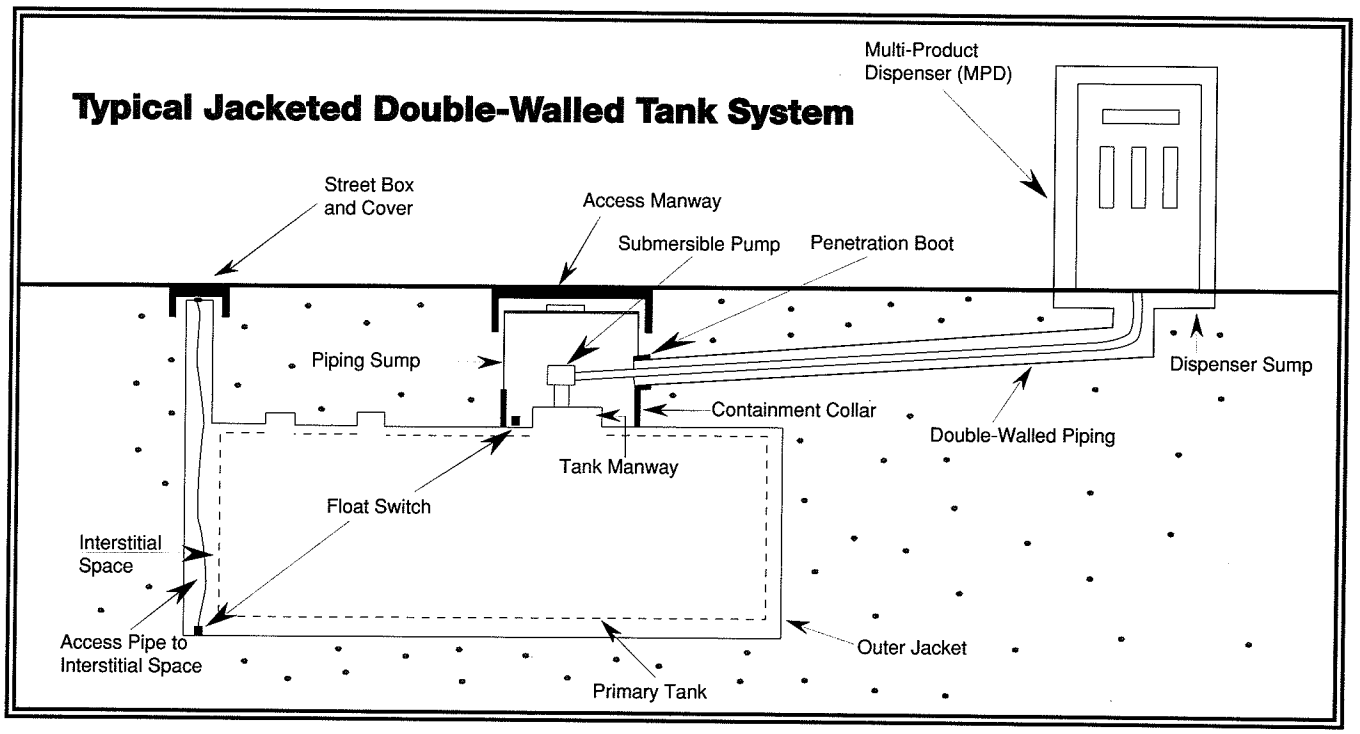
Jacketed tanks are steel single-walled inner tanks that are covered with either an FRP or a plastic (usually high density polyethylene-HDPE) outer jacket. The two walls are set apart by a plastic separation grid or metal foil that forms an interstitial space that can be monitored using standard leak detection probes that enter the space through an access tube (see diagram on page 19).

Jacketed tanks are hybrids between FRP clad steel tanks and true fiberglass tanks. The advantage of the jacketed system is that the steel provides structural integrity while the FRP or HDPE jacket provides corrosion protection and leak detection. In Maine, these tanks are installed at virtually all retail motor fuel facilities. I suspect their lower price has a lot to do with their popularity.

Containment Conduits

Here in Maine we still have a large number of small "mom and pop" stores that sell small volumes of product and use the not-too-expensive combination suction pump/dispenser which draws product out of the tank at lower flows. New FRP single-walled suction systems or the "European design" include a single check valve directly under the dispenser suction pump which holds product in the line under negative pressure (vacuum). In the case of a leak, this vacuum is released and the product flows back into the tank—assuming the piping is pitched properly. Installers have assured me that this phenomenon does indeed work. Once the system is operating (the lines are charged), if there is a leak, say from a loose fitting near the pump, installers say they can hear the "loud sucking sound" of the product heading back to the tank.

In Maine, double-walled piping is associated, as well as required, with pressurized piping systems, which incorporate a pump within the



tank, and those fancy futuristic-looking multi-product dispensers (MPDs), which provide the greater volumes needed for high throughput stations. The material most commonly used for double-walled piping is, again, the ubiquitous FRP. These systems consist of a 2-inch primary pipe and a 3-inch containment pipe.

The problem with FRP systems is that they take a bit of time to install. The primary pipe must be cut, the ends tapered (somewhat like sharpening a pencil) to fit properly into the fittings, and the whole works assembled and glued. During this process, the secondary pipe must also be cut to precise lengths, slid over the primary pipe, and joined by special two-part "clamshell" fittings that are glued and bolted together. All glued joints must be allowed to cure for about 12 hours at about 70°F or cured with electric heat packs for 20 minutes. Now, don't forget, both primary and secondary piping must be air tested at appropriate stages in the process. Holy Mackerel! Is there a quicker, better way?

Well, the new kids on the block are two continuous flexible piping system designs. The original flexible system consists of a plastic laminate primary hose that is cut to length and slid inside a corrugated HDPE outer containment pipe. There are no joints in the piping run, and the only connections are located inside the piping sump on the tank and at the dispenser sump under the fueling island.

A second flexible system design has gone a step further by attaching the containment pipe directly to the primary pipe. The inside surface of the secondary pipe has small channels which run the length of the pipe and form an interstitial space.

The obvious advantage of flexible systems is the elimination of joints which thereby reduces installation time as well as potential leak points. Currently, the only U.L. listed flexible piping system on the market is the brand that uses the two separate lines. There has been some question in the industry concerning the long-term durability/permeability of flexible piping versus the time-tested FRP pipe.

The only type of secondary containment other than double-walled piping that I have run across is an FRP piping trench liner system, which appears to be used by one particular major oil company. This system consists of a series of fiberglass open channels approximately 2-feet wide by 18-inches tall, and 20-feet long, glued together and terminating at the piping sumps and dispenser pans. Installers claim that installation of this product is cumbersome and difficult to make watertight, even though the trench liners have glued-on covers.

Sensitive Sumps

Piping sumps are plastic, FRP, or steel "buckets" of various sizes, and attached to the top of the tank where the double-walled piping can be terminated and monitored. Sumps are located in a covered access manway pit and are usually designed to contain a submersible pump. The sumps themselves also have covers which are designed to either shed water or be liquid tight in case of high groundwater. Some sumps are open-ended tubes that are glued to a factory-installed 4-inch high FRP containment collar which forms the bottom of the sump. Other sumps are attached to a tank fitting by way of an adapter, and others are attached to an existing tank manway with a combination of bolts and gaskets.

The double-walled piping system enters the sump by way of a penetration boot (a rubber collar attached to the sump) where the secondary pipe is terminated and the primary pipe continues to the pump. If a leak develops in the primary piping, the design is such that product runs through the secondary piping until it spills into the sump. There, a liquid sensor or float switch is supposed to detect the leak and activate an alarm or light at the control box inside the station.

Piping sumps are a wonderfully simple and effective technology, but sometimes we see some glitches. For example, water-tight sump covers have been known to fill with water after a heavy rainstorm and then dutifully signal an alarm. This prob-

lem usually occurs with sumps that are nestled inside access manways that are only slightly larger in diameter than the sump. The space in-between the concrete walls of the access manway and the sump, which is typically filled with backfill, is not large enough to allow timely drainage of the water seeping through the "water-tight" street cover box, so it ponds up around the sump bucket and, given enough time to accumulate, eventually seeps into the sump bucket itself. The deep frost we experience here in the north country also helps impede drainage.

One oil distributor in Maine employs a maintenance person who, among other things, routinely visits the company's facilities and pumps out water that has accumulated in the sumps because of water runoff. Solutions to this water seepage problem include either more expensive liquid-tight covers or improving drainage around the sump. One sump manufacturer now offers a field retrofit kit so that the company's standard sump can be made liquid-tight at existing installations. If high groundwater or tidal situations are typical conditions, then a liquid-tight sump should always be used.

Alarming Annunciators

There are a myriad of leak detection sensors on the market. Here in Maine, the primary technologies of choice are either a float switch or an air bell sensor for double-walled tank or piping sump leak detection. As indicated by their name, float switch sensors simply make electrical contact when the float is lifted into the "on" position by a liquid. An air bell is a hollow tube that is open at the bottom and connected to a pressure switch at the top. When liquid enters the tube, the air inside is pressurized, thereby throwing the switch and activating an alarm.

Both of these sensors tell you only that something wet is in the space that you are monitoring. These sensors are subject to false alarms in the sumps, because of groundwater and surface water seepage, and false alarms in the tanks because of condensation in the interstitial space. There are more sophisticated electronic sensors that rely on the different electrical resistances between product and water to discriminate between the two. But...a lot of times, the more sophisticated these gadgets get, the more they cost, and the more things go wrong.

Several installers I've talked to comment that, given the options, they like the FRP double-walled tanks with hydrostatic leak detection systems because these systems are easy to install and have a low incidence of "call backs" caused by false alarms triggered by condensation problems in interstitial spaces.

In my travels, I have also come across the phenomenon of the dangling leak detection probe. Manufacturer recommendations, not to mention common sense, instruct that the probes be located on or very near the bottom of the piping sump so that a leak can be identified quickly. I have seen sensors suspended 4 to 12 inches off the bottom of the sump. I doubt that they were installed that way on purpose. More likely they were placed at those levels as a compromise by some frazzled owner or maintenance person after experiencing one too many heavy rain-related false alarms. On one occasion, an ill-placed probe masked a union leak that was not detected until I came snooping around.

User Friendly and Functional

Spurred on by market forces and regulatory coaxing, secondary containment technology for underground storage systems continues to evolve. Manufacturers are striving to make their petroleum storage products more user friendly—easier to install and maintain—in what has become a very competitive business. It is up to installers, owners, and regulators to keep the pressure on the manufacturers of tank, piping, and leak detection equipment so that secondary containment becomes an easier pill to swallow for the prevention of groundwater contamination at UST sites. Meanwhile, here Down East, we'll continue in our thankless role as the cold weather testing ground for UST equipment. Keep you posted. ■

■ **Up in the Air** *continued from page 10*

ing a big investment in off-gas treatment," says Gilbert, adding that the need for air emissions controls is rare.

Throughout the country there is a mixed bag of regulatory approaches to this problem. Michael Sink of Pacific Environmental Services did a study for EPA on VOC controls (Soil Vapor Extraction VOC Control Technology Assessment, EPA0450/4-89-017) and notes: "A number of states have active and stringent air pollution programs, necessitating the use of VOC control equipment on soil vapor extraction emissions. Other states [are] less active, allowing some SVE emissions to vent directly to the atmosphere. Moreover, the VOC regulations themselves vary from state to state, with some states concentrating on BACT, on risk assessment, on maximum allowable emission rates, or on the control of specific compounds."

At EPA headquarters' doorstep is an example of this mix of approaches. Virginia, Maryland, and the District of Columbia share a common airshed which has a designated "serious" ozone problem. However, in terms of dealing with LUST vapors, these states have nothing in common. Virginia basically grants everyone a waiver, Maryland allows up to 20-pounds per day of total hydrocarbons to be emitted, and the District of Columbia allows 1 pound per day. The D.C. permit costs about $50 according to Donald Wambsgans of D.C.'s Air Office and "usually they can get it within an hour if the information is all there." In Maryland the fee is $500 per installation and it takes a couple of weeks to get a permit.

"The air discharge permitting issue is not unlike water discharge permitting issues that were, and still are in some cases, associated with pump-and treat operations at LUST sites," says Henry Lord. "For many projects we were required to go through the National Pollution Discharge Elimination System (NPDES) permit application process because we were treating and discharging water into regulated waters. This process could take 6 months to a year, or longer.

"Finally," continues Lord, "recognizing that the permit process was causing delays and that these sites were not permanent discharge sources, EPA came up with a policy whereby, for certain types of remediation or emergency response pro-

■ *continued on page 23*

Enforcement

Florida Invests in Leak Prevention with Aggressive Facility Compliance Verification Program

by Marshall T. Mott-Smith

SINCE 1987, THE FLORIDA DEPARTment of Environmental Regulation (DER) has actively pursued verification of compliance with underground and aboveground storage system rules by contracting with local governments to perform facility inspections and enforcement actions. Over 120,000 inspections have been performed to date; 40,000 inspections were completed in 1992 alone, including routine facility inspections, tank removals, installations, and re-inspections for enforcement. To date, county inspectors have inspected most of the state's 60,000 storage tank removals and 22,000 new installations.

Compliance rates for facilities have increased from 3% to an average of 60% statewide, and the violations that are currently discovered are usually paper violations, such as improper recordkeeping or inventory control, instead of major infractions. Counties uner contract with the DER have written over 35,000 non-compliance letters, over 14,000 warning letters, and taken 2,200 administrative enforcement actions.

Getting to the Compliance Verification Program

With passage of the Water Quality Assurance Act in 1983, the Florida Legislature gave DER the authority to establish and maintain a regulatory program for underground and aboveground storage tank systems. The DER's six district inspectors spent most of their time in the early years of the program involved in enforcement actions against facilities with petroleum contamination. These efforts were unsuccessful because small facility owners lacked the resources to clean up the sites, and the more affluent owners were able to delay the enforcement through legal maneuvers. In the meantime, the contamination remained in the ground.

In 1986, the legislature tried to resolve the problem by passing the SUPER Act (the State Underground Petroleum Environmental Response Act). Because Florida gets approximately 92% of its drinking water supplies from groundwater, the legislators decided that it was more important to clean up the large number of contaminated sites quickly than to continue in pursuit of protracted enforcement actions. As a result, a $50 million per year trust fund was established for an amnesty program (the Early Detection Incentive Program) to clean up contaminated sites that were reported to the Department. Under this program, no compliance was necessary. If a facility had a discharge, the state would pay for the on-site cleanup.

With the state spending millions of tax dollars cleaning up contaminated sites, the legislature looked toward prevention as a means of minimizing future cleanups.

When the enrollment period for the amnesty program ended in December of 1988 (9,500 facilities applied), a new program for financial responsibility began. The Florida Petroleum Liability Insurance and Restoration Program (PLIRP) still had the same cleanup benefits, but to be eligible, tank owners were required to be in compliance with DER rules. With the state spending millions of tax dollars cleaning up contaminated sites, the legislature looked toward prevention as a means of minimizing future cleanups.

The SUPER Act required the Department to contract with local governments "to the greatest extent possible" to administer its responsibilities under the Act. With the passage of PLIRP, it became even more important to verify compliance because program eligibility depended on it. Therefore, in 1987, the DER Storage Tank Regulation Section in Tallahassee began contracting its Compliance Verification Program with local county governments.

Contracting With Counties

The legislature budgeted $8 million per year for the Compliance Verification Program. The Department concentrated on contracting with the larger urban counties first. We sent letters to the county commissions explaining the program and asking if they would be willing to participate. Our intent was to contract with whomever the county commission wanted. The response was excellent. In the larger counties (such as Dade (Miami), Hillsborough (Tampa), and Duval (Jacksonville)), DER contracted with county environmental programs. In mid-size and smaller counties, the Department contracted with county environmental programs, county and district public health units, fire marshals' offices, and emergency management agencies.

DER developed a model contract that required local governments to complete at least five inspections per facility on new installations, to perform closure inspections, to review closure assessment report evaluations, and to perform annual compliance inspections of registered underground and aboveground storage tank systems. The contract also required that the county investigate discharge reports and unregistered facilities, respond to routine technical assistance requests, interpret rules, respond to complaints, and perform all enforcement actions as specified in the contract.

The funding for each 1-year contract is based on the number of routine compliance inspections for registered facilities, of projected inspections for new installations, of discharges, and of closures. Funding

is also provided for enforcement and technical assistance work based on the number of compliance inspections. DER pays salaries between base and 10% above base for personnel equivalent to Department environmental specialist, supervisor, and clerical positions. Funding for fringe and indirect rates, travel, equipment, supplies, and training costs are determined by previous year's data, DER policies, and county justifications for the expenses. A model worksheet was developed to standardize the funding calculations.

The intent of the model contract was to establish program consistency for the diverse county organizational units and geographical areas around the state. However, it is necessary for DER to negotiate each contract to incorporate specific conditions needed for individual county situations. During the first year of the program, we learned that contract management should be centralized. We initially tried to have our six district offices negotiate and route the contracts to our headquarters office in Tallahassee. This approach was unsuccessful, however, because it resulted in six different versions of the contracts and created a great deal of confusion and inconsistency.

Since then, the Storage Tank Regulation Section personnel in Tallahassee have been responsible for contract initiation and renewal processing, and DER District Office Tanks Program Supervisors serve as the project managers for contracted counties in their districts. The district personnel are responsible for contract management and evaluation functions and must approve and sign all county invoices for payment.

Contract negotiations are often difficult. We notice that when we are negotiating new contracts, the counties often do not provide enough information to make accurate projections of anticipated workloads, particularly for new facility installations and closures. Each county has its own management and budget constraints, position descriptions, contract attorneys, salaries, and administrative procedures that become roadblocks to reaching an agreement on services to be provided.

Contract renewal raises problems with salary increases, determinations of indirect costs, equipment procurement, and cutbacks in the number of facilities in the county resulting from tank closures. Disagreements have led to delays in signing the contracts, which have occasionally resulted in 1-month time lapses between renewal contracts.

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Once the contract is signed, the county has the responsibility to manage the daily compliance and enforcement activities. Some of the larger counties have established inspector "patrol areas" to provide better coverage of complaints, improve inspector familiarity with an area, and achieve more efficient use of resources. Most counties try to perform multiple inspections in the same area and to inspect all of the same convenience store facilities in one time period so that facility records can be checked more easily.

Many local governments have their compliance inspectors do enforcement; others assign these duties to different people. Counties have ready access to DER's central data base and are responsible for data entry for all inspections and discharge reports.

OSHA Health and Safety Training is provided by the EPA/OUST's recently produced interactive video training program. The computer system hardware is located in each district office so local government employees can obtain their 24-hour site visit certification and 8-hour refresher course at their convenience. [Florida was a pilot state in the development of the health and safety interactive video. This training material is not yet available nationwide. OUST is currently working out final details.]

Enforcement

Enforcement is ultimately the responsibility of the DER's district office. Nevertheless, the model contract specifies three different levels of enforcement that the county may request, based on it's qualifications and interest in undertaking enforcement responsibility. Level one enforcement is mandatory for all counties. It requires that counties write noncompliance letters and warning letters, perform enforcement site inspections and re-inspections, and assist the district office with administrative and judicial enforcement actions. The DER is the lead agency.

Level two is a mid-level enforcement effort in which the county is a partner in leading the enforcement. The county prepares case reports, penalty calculations, notices of violation, consent orders, as well as all level one tasks. At level three, the county has the enforcement lead and receives additional funding for this responsibility. The county may use its own enforcement procedures or take the lead using DER procedures. A county must have satisfactorily performed its duties at lower enforcement levels before being eligible for higher levels. The DER District Director must approve each county's enforcement level.

Getting to Consistency

The most significant problem with Florida's Compliance Verification Program is lack of consistency in rule interpretation, sampling, inspections, and enforcement. With over 150 inspectors in the counties, there is substantial variation in interpretation of the Department's rules. We receive at least one complaint a week from some group or owner about a particular county's misinterpretation of the rules or unprofessional behavior.

These complaints are treated the same way that we treat complaints about facilities. We investigate and listen to both sides of the story before we react. However, the tank owners' perceptions of the program are important, and we continually try to improve program consistency. Consistency is especially important in the area of enforcement, because penalties must be uniform statewide.

DER tries to improve program consistency by holding monthly teleconferences with all the inspectors and by holding supervisor's meetings twice a year. We also have an annual program meeting at which we bring together over 300 state and county UST, AST, LAST, and LUST

personnel and provide training in the form of speakers, trade shows, and group discussion/problem-solving sessions.

Other means of communication include the PMS (Program Management Subcommittee) made up of Headquarters, District, and Local Program representatives who are responsible for creating guidance memos on rule interpretations, developing forms, and updating the program manuals provided to each district and county. We are also establishing standard groundwater and vapor sampling protocols and producing training videos on how to perform inspections at different types of facilities and how to perform various activities (e.g., closure, installations, terminals).

At 4-month intervals, the district offices review the progress of each county's efforts to fulfill the terms of the contract. A standard program review form is used in this evaluation process. If a county is not making satisfactory progress, it must submit a plan to the district on how it intends to resolve the problem. The district will not sign invoices for counties that fail to comply with their plan or that perform less than 95% of their contracted inspections.

The Issue is Leak Prevention

The program is successful because of the overall quality of county employees and the state's commitment to pursue a prevention program. Facility owners know that they will be inspected at least once a year and that enforcement will occur if they do not comply. Without this kind of a prevention program, Florida would just continue to clean up contaminated facilities at public expense as long as the trust fund allowed. (The trust fund now generates $160 million/year.)

No other state relies as heavily on groundwater for its drinking water supplies as Florida, so prevention is crucial. We are accomplishing our goals of increased compliance rates and are now working to focus on prevention of discharges by making the Department's rules more stringent. For example, secondary containment is now required for all new and replacement storage tank systems. One half of the 80,000 active USTs and ASTs will have secondary containment by 1998, all the remaining USTs will have secondary containment by 2009. The counties will continue to inspect these facilities and enforce DER rules, and it is a sure bet that our compliance rates will continue to improve as a result of these efforts. ■

Marshall Mott-Smith is Administrator of the Storage Tank Regulation Section at the Florida Department of Environmental Regulation.

■ Up in the Air *continued from page 20*

jects, a temporary waiver was granted, provided the project was in compliance with certain performance standards. [Some state programs do not allow this waiver.] This policy has worked well in terms of getting projects underway and completed."

In our quest to improve cleanups it is clear that vapor extraction cleanup technologies offer great promise—a promise that can be met without threatening our air. The hassles caused by the overlapping authority of air and LUST agencies and the delays in getting permits show a clear need for information, education, and streamlining. Improved technologies should not go unused because agency staffs don't understand them or because cleanup contractors are left up in the air when applying for permits. Furthermore, "Time is pollution spreading and time is money," says Gary Gilbert. And, lest we forget, much of that money may be coming out of limited state LUST trust funds. ■

June Taylor is an environmental consultant who works with the EPA Office of Underground Storage Tanks.

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Proposed Rule to Exempt TC Testing for UST Petroleum-Contaminated Debris

In February, EPA proposed a rule that will exempt contaminated media and debris generated from petroleum LUST corrective actions that are subject to Subtitle I of RCRA from certain portions of the RCRA Toxicity Characteristics (TC) Rule. Without this exemption, which is limited to the 25 newly listed organic chemicals, the TC rule would subject petroleum-contaminated soil and debris to regulatory control under the hazardous waste provisions of Subtitle C of RCRA. The proposed rule maintains the same language as that in the current temporary deferral (40 CFR 261.4(b)(10)). The public comment period ended on April 13.

The findings of EPA's studies and public meetings indicate that removing the TC deferral would significantly affect UST cleanup procedures, delay remedial actions, and increase soil remediation costs. Furthermore, delays in site remediation caused by compliance with Subtitle C requirements could increase health and environmental risks. EPA believes that states are in the best position to oversee management of contaminated media and debris from the approximately 50,000 new LUST sites identified each year. For more information or for a copy of the Federal Register notice, call EPA's RCRA/Superfund Hotline, 1-800-424-9346. ■

Financial Responsibility Final Rule for Local Governments

In February, EPA promulgated additional assurance mechanisms for use by local government entities that own or operate petroleum USTs. This rule, which will help local governments comply with the UST financial responsibility requirements, includes a bond rating test, a worksheet test, a governmental guarantee, and a fund balance test. These new mechanisms address the unique financial characteristics of local governments and allow financially capable entities the opportunity to self-insure. For more information, call EPA's RCRA/Superfund Hotline, 1-800-424-9346. ■

EPA HQ UPDATE

Health and Safety Training for Underground Storage Tank Inspectors: Instructor and Student Guides are now available through the U.S. Government Printing Office. To order the *Instructor's Guide*, ask for stock number: 055-000-00421-8. Send $2.00 for handling and postage. To order the *Student's Guide*, ask for stock number 055-000-00420-0. Send $25.00, which includes postage and handling. Bulk orders of 100 copies or more receive a discount of 25-percent. Please address orders to: Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954. ■

HyperVentilate software is now available in IBM PC-compatible format using Microsoft Windows/Spinnaker PLUS. *HyperVentilate* is a software guidance system for vapor extraction applications. (For more information on this system, see LUSTLine Bulletin #17.) EPA's Office of Underground Storage Tanks has distributed copies to EPA Regional Program Managers and state UST and LUST Managers. To obtain copies of *HyperVentilate* (IBM PC-compatible), ask for document number S/N 055-000-00427-7, $22 each. Mail your order to: Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954. ■

Tank Bits

EDF Releases Report on Leaking Aboveground Storage Tanks (LASTs)

The Environmental Defense Fund (EDF) recently released a report titled, *LAST But Not Least: Leaking Aboveground Storage Tank Threats, Costs, and Answers*, which focuses on the environmental threat posed by the nation's 1-million aboveground storage tanks. The report says that while one-quarter of these ASTs are leaking, unlike LUSTs, LASTs are virtually unregulated. The report urges support of legislation that promotes release prevention and addresses cleanup of existing releases. Copies may be obtained at a cost of $10.00 from: The Environmental Defense Fund, 1875 Connecticut Ave., NW, Washington, D.C. 20009. Phone: 202/387-3500. ■

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