

L.U.S.T. LINE



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

STREAMLINE: To Make SIMPLE OR MORE EFFICIENT

State UST Regulators Look for Ways to Break the Ties That Bind Them

JIM McCASLIN'S EXUBERANCE WAS EFFUSIVE. "TWO MONTHS AGO WE were really down and morale was low, but now I think our program is really moving. We've freed up more staff time, we've made some bold decisions, and we've had the backing of upper management to get some of our ideas implemented. It's been hard work, but we've gotten a good team together and, believe me, we're not through yet."

McCaslin is Acting Director of the Illinois Office of State Fire Marshal's Petroleum and Chemical Safety Division. His office handles UST registration, permitting, installation, abandonment, and removal inspections. As new Acting Director, MacCaslin found himself in an office bogged down and backlogged with unfulfilled tasks. After fruitless attempts to turn the situation around, McCaslin invited trained staff from EPA's Region 5 UST program to use their diagnostic skills and introduce the concepts of Total Quality Management (TQM), or "streamlining"—a process of recognizing where you are, deciding where you want to be, then working toward that end to achieve continuous improvement in quality, productivity, and efficiency.

With the help of the Region 5 TQM team, McCaslin and his staff took a hard look at their day-to-day practices. They were quickly able to identify the more obvious obstacles to getting tasks done. The big item was the 8- to 9-week turnaround time to get a permit out of their office.





"We realized we had three engineers on the phone 80-90% of the time answering questions—often giving out information that was right in our rule book," says McCaslin.

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"there's just got to be a faster cheaper more efficient way to get this job done!"

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"We recognized that we could take some immediate and obvious steps. For one thing, we needed to get our staff off the phone to free them up to get other work done. We got upper management to agree that the technical staff would only take calls between 4 and 5 o'clock. In about 2 1/2 weeks we had that 9-week turn around time cut to about 2 1/2 weeks.

"The funny part is, we've gotten very few complaints. The phone calls haven't even come pouring in between 4 and 5 o'clock. Some days we get very few calls. Now, during most of the day the secretaries handle incoming calls. They can refer to our list of some of the more commonly asked questions and answers. More important, they can refer people to our regulations or to the appropriate staff person. Before, it was easier for a consultant or tank owner to pick up the phone and call us than to look up the answer in the code book."

Illinois' UST program problems are not unique. Nationwide, over 100,000 UST-related releases have been reported and the backlog is growing. Overwhelming workloads, limited staff, burgeoning numbers of leaking UST sites, and backlogs of unprocessed permits, files, and workplans are a common cry among UST/LUST regulators.

"Everyday we are thrown into a situation where we have to hurry up and do something to meet some deadline," says Larry Coen, Supervisor of

the Missouri Department of Natural Resources (MDNR) LUST Unit. "We never had time to sit down to plan and prepare to meet the challenge. The challenge was always on top of us. It made a difference when we were able to evaluate our program and as a first step, make the decision to hire contractors to handle the routine calls and paperwork. The telephone is a powerful tool, but when it begins to rule your every waking moment, it is more like a curse."

"The workload absolutely blindsided us," recalls Dave Richfield, Supervisor of the Minnesota Pollution Control Agency's (MPCA) cleanup program. "Back in 1989 we thought we had a very good program, but it was one that would only work for a few hundred sites total work load. In that year we had 1,208 new sites. As people pulled their tanks, 2/3 to 3/4 of the sites had problems. We couldn't possibly have anticipated this.

"It was obvious to all of us that our system for managing these sites was failing. We kind of pushed the panic button." After struggling with a few other management techniques, MPCA turned to TQM.

Better, Faster, Cheaper Cleanups

Because of the mounting number of UST leaks and the billions of dollars required to perform corrective action, one of the EPA Office of Underground Storage Tanks' (OUST) highest priorities is to achieve more cleanups—better, faster, and cheaper—by streamlining the corrective action process. Is this the impossible dream? OUST says "no"! Based on its own experience in using TQM, OUST has recognized that corrective actions—like many other work processes—contain waste, unnecessary delays, unnecessary steps, and opportunities for improvement.

The Agency's objective is to equip its staff with the analytical, interpersonal, and administrative skills necessary to help states identify and eliminate waste, cut red tape, reduce delays, and introduce new technologies into their cleanup and oversight processes in particular and to UST programs in general. Along the way, state staff will learn by doing so that they can continue to make improvements on their own.

The key to the whole shebang is the process. The job of Regional staff or consultants is to help states define

their own work process—a kind of work process psychoanalysis. By looking at the existing process mirrored in charts and graphs, the staffer can identify problem areas and opportunities for improvement which often begin to become self-evident.

Of course, improvements often mean change—breaking with that old friend (and sometimes worst enemy), tradition. As Mark Twain wrote in *Tom Sawyer*, "Often, the less there is to justify a traditional custom the harder it is to get rid of it." Also, change often lends itself to the perception that toes might be stepped on, which can evoke fear and resistance. Un-entrenching a bureaucratic tradition in the name of improving the process is a challenge that demands support and approval from upper management and input from frontline staff—without fear of censure.

"It doesn't happen over night," explains Gerry Phillips, EPA Region 5 UST Coordinator. "You do have to sell the concept. We have conducted orientation training where we worked with all the supervisors in a division. We explain everything and usually they will say, 'That's a good idea. Let's try it on a small basis.'

"When they begin to look internally, they are surprised to find that often they are a big part of the problem—'Oh my god, do we really do that?' Typically, they have not taken the time to sit down and evaluate their process in enough detail to be able to ask the question, Why? Often after reviewing the pitfalls in the existing process they will say, 'Let's just not do it that way anymore.'

"We're finding that some of the process changes allow responsible parties to start corrective action sooner and reduce their preliminary site assessment costs through expediting the approval process within the state. In addition to saving money, we are also reducing the time that the released product is in the environment, and that's a very important factor."

Phillips cautions, however, that process changes do not always work. "But failure is not bad. Failure just means that you haven't yet found the solution."

Minnesota Attacks the Backlog

Getting back to 1989 in Minnesota: One of the basic tenets of TQM is to rely on the people who are in the best position to know what the problems are, and that is generally the frontline staff.

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LUSTLine

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Prepared by the NEIWPCC with a grant (#CT-901661) from the U.S.

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LUSTLine is issued as a communication service for the Subtitle I RCRA

Hazardous & Solid Waste Amendments rule promulgation process.

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Please give credit to the NEIWPCC. 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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MINNESOTA

STREAMLINING THE TECHNICAL PROCESS AT LUST SITES

by Jim Lundy

The number of leaking underground storage tank (LUST) sites needing cleanup nationwide has doubled yearly since 1989. Four hundred thousand LUST sites are expected by the late 1990s. Meanwhile, according to EPA, the typical LUST cleanup takes over three years to complete—in fact, there are relatively few completed cleanups. As regulators and consultants brace for the inevitable crunch, many are grappling with how to effect more rapid and efficient cleanups at these sites.

INDEED, MANY LUST CLEANUP PROGRAMS have yet to see their way clear to efficiently handling the technical demands of such a heavy caseload. The technical process typically consists of site discovery, notification, Phase I work plan, Phase I work plan review, investigation, investigation reporting, investigation review, more investigation (if needed), more investigation review, corrective action design proposal, corrective action design review, corrective action implementation, monitoring progress reports, and closure.

The Minnesota LUST cleanup program has found that many of these steps are unnecessary and that others can be refined or combined to enhance the overall efficiency of the cleanup process. To promote technical decisions that hasten and improve the cleanup process, the Minnesota LUST cleanup program has incorporated the following important precepts:

- Provide clear guidance documents and consultant training so that everyone knows what is expected from investigations and corrective action proposals;
- Encourage rapid investigation with simultaneous remediation; and
- Encourage the use of innovative investigation and corrective action techniques, if appropriate.

Before we go any further, I want to make clear my use of the term "cleanup"—it's a bit of a red herring. Environmental regulators will probably forever debate the "how clean is clean" question. No cleanup can return a site to pristine conditions; many don't even come close, because of technical limitations. Philosophically, a better term for cleanup would be "corrective action." I use the two terms interchangeably.

Guidance and Training

Cleanups are more efficient when consultants, responsible parties, and government officials know what to expect. State programs should prepare specific guidance documents for use in the field during investigations and provide consultant training to make sure the guidance is clear. Except for remaining available for consultation as a cleanup investigation proceeds, regulatory personnel should then step back and allow consultants to do their jobs.

Guidance documents also provide a baseline for consistent government review of reports. Any report falling short can be returned with fresh copies of appropriate guidance documents. The use of guidance documents helps render unnecessary much of the tedious government review of work plans, incomplete remedial investigation reports, or reports recommending further investigation. Instead, having supplied adequate guidance, regulatory agencies should be able to expect that their first site report review will be a *complete* remedial investigation report, including a corrective action design proposal.

Those "Real-Time" Decisions

Make sure the remedial investigation defines the extent and magnitude of soil and groundwater contamination. This can be accomplished in part by using field techniques that provide accurate, reliable, "real-time" data—soil gas surveys, driven probes (GeoProbe, BAT, cone penetrometer, HydroPunch), some form of polyethylene bag sample analysis ("lab in a bag"), or field gas chromatography.

Far from making traditional investigative techniques obsolete, these real-time field methods make soil borings and monitoring wells more effective by guiding their placement more accurately and they reduce the need for costly multiple rounds of investigation. Real-time field methods are un-

likely to totally supplant traditional laboratory analyses, although we can expect the number of laboratory analyses per site to decrease.

These real-time field methods save on time as well cost. Historically, many LUST investigations have been multi-phased over a period of months or years, only to select a corrective action that could have been foreseen at the outset. Meanwhile, the contaminant plume has migrated onward, increasing the likelihood of off-site impacts, more complicated corrective actions, and higher costs. This is why we subscribe to these two rules of thumb: 1) consider cleanup strategy from the beginning of the remedial investigation, and 2) remediate as you investigate.

Sure, the first point sounds obvious, but in practice the cleanup strategy is often considered only after the investigation is complete. The remedial investigation becomes an end in itself. In this process, when a corrective action is finally proposed, it may already be obsolete because the original problem has likely transformed into one that is more complex.

Instead, why not instruct consultants to make site observations with corrective action in mind from the moment they walk onto a site? The deliberation should flow from the outset. "Is there limited access? Soil cleanup by excavation may be impossible...an *in-situ* method like soil venting may be indicated. Are there clay soils present? Forget pump and treat. Heterogeneous soils? Vacuum-enhanced free product recovery may fill the bill. Sandy soils? Pump and treat may wind up as part of the corrective action brew...but along with what?"

Experience has shown that groundwater cleanup goals can be determined early in the investigation process, provided certain key data are available. The consultant field geologist is usually in frequent contact with

the home office, so he/she can relay pertinent observations to the engineering staff, enabling corrective action design to begin almost immediately. Thus, the remedial investigation results and the corrective action design proposal can then be submitted simultaneously.

Much of what we have learned boils down to common sense. When we do an investigation to determine how to cleanup a contamination problem and we find the source (e.g., free product), then let's remove the material while we know where it is, including tanks, piping, contaminated backfill, and dirty soil. Excavate contaminated soil prior to other investigative attempts, beginning at the source area and working outward. This activity should be considered both an investigation and corrective action. No work plan or agency review is necessary until later. If appropriate, consider converting soil borings to monitoring wells, vent points, or air sparging points immediately, rather than relying on a future drilling round.

Choosing Your Medicine

In the early years of LUST cleanups, the choice of cleanup approaches was limited to excavating contaminated soil and pumping and treating contaminated groundwater or free product. Now there are many new cleanup choices, and the challenge is to carefully match corrective actions to specific site conditions to maximize our efforts. In addition, we are not limited to one cleanup approach; a combination of corrective actions can be very effective. Some of the more promising alternatives to pump and treat include the following:

- **Soil venting** can remove contaminant vapors from the subsurface. Because many petroleum contaminants in soil and groundwater tend to migrate into the vapor phase (volatilization), this method is effective at sites where air can move freely in the subsurface (e.g., sandy soils), especially near the interface between the saturated and unsaturated soil zones.
- **Air sparging** injects clean air beneath the water table. This action enhances contaminant volatilization and encourages natural micro-organisms to consume contaminants.
- **Enhanced bioremediation** encourages naturally occurring micro-organisms to consume petroleum contaminants in soil and

groundwater. Although this process is at work in any cleanup situation, it can be enhanced by adding nutrients, recirculating pumped contaminated water through a bioreactor, and other means.

- **Vacuum-enhanced free-product recovery** combines pump and treat with soil venting to avoid some of the problems inherent in pump and treat. It reduces the necessary drawdown of the water table by increasing the horizontal movement of contaminants, thus minimizing the volume of soils contaminated by the cleanup effort itself. It is most effective in heterogeneous soils and where available drawdown is small.
- **Hydrophobic membrane free-product recovery** is accomplished by using a hydrophobic/oleophilic filter to recover free product from borings and monitoring wells. Effective wherever free product is present at thicknesses greater than a film. Because free product is essentially a contaminant source, immediate free-product recovery significantly reduces migration of the plume and contamination of large volumes of groundwater.
- **Aboveground soil remediation** includes technologies that remove contaminated soil and treat it aboveground. States are having success with such techniques as land farming, aboveground soil venting, and bioremediation.
- **No action** is the case where data indicate that cost would exceed a marginal environmental benefit. At some sites we must accept the no action alternative as the most reasonable approach.

Those of us in the Minnesota LUST cleanup program are fortunate to have a management team that supports providing clear guidance documents, encourages simultaneous investigation and remediation, and stimulates the use of innovative investigation and corrective action techniques. Our success can also be attributed to proper staff training and the willingness of staff and management to approve untried new technologies.

Of course, this approach demands a respectful attitude among regulators, consultants, and responsible parties. When all three groups cooperate to design, review, and approve cleanup plans in an atmosphere of respect

(though probably not one lacking in disagreement or skepticism!), we have the best chance to accomplish rapid effective LUST cleanups. ■

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

TANK BIT

EPA Adds Alternative to Tank Overfill Requirements

IN RESPONSE TO A 1988 AMERICAN Petroleum Institute (API) petition, EPA has amended the federal UST overfill prevention requirements to allow alternative uses of overfill prevention equipment to be used that could be located closer to the tops of larger tanks as long as specified minimum levels of performance are achieved. Existing overfill rule [§ 280.20(c)(1)(ii)] requires that tank owners and operators prevent overfills by installing equipment designed to either: (1) alert the transfer operator when the tank is up to no more than 90% full by restricting the flow into the tank or triggering an alarm, or (2) automatically shut off flow into the tank when the tank is up to 95% full.

The amendment, which went into effect September 12, 1991, adds the alternative that the equipment must be able to: (3) "restrict flow 30 minutes prior to overfilling, alert the operator with a high level alarm one minute before overfilling, or automatically shut off flow into the tank so that none of the fittings located on top of the tank are exposed to product due to overfilling."

Overfilling UST systems is a common source of petroleum releases onto the ground surface. EPA studies have found that without overfill prevention equipment, petroleum or hazardous substances can be inadvertently forced into the environment through tank bung holes, vent lines, or fill ports when the volume of liquid delivered exceeds the tank's storage capacity. With the new amendment, EPA allows overfill equipment to be used closer to the top of the larger bulk storage tanks (those USTs frequently located at retail gasoline stations) and acknowledges that sufficient volumes would still be available to receive excess petroleum or waste. ■



MISSOURI

BEYOND HUNCHES...

L.U.S.T. FIELD INVESTIGATION TECHNIQUES FOR REGULATORY AGENCIES

by Ron Sheeley

AT THE MISSOURI DEPARTMENT OF Natural Resources (MDNR) LUST Unit, we are learning that the key to implementing a more efficient program is the organization of our data gathering and investigative procedures. By incorporating the details of routine investigation techniques with innovative technology, we have reduced our errors and oversights—catching details we never knew we'd missed in past investigations.

Most of the early LUST investigations produced good background information through interviews and observations, but verification of the nature and extent of a LUST situation was often hit or miss. The most sophisticated instruments used at that time were shovels, backhoes, and shallow soil augers. Decisions were based more on hunches and speculation than on scientific data. The complex nature of the sites sometimes led to inefficient use of manpower, money, and misapplication of regulatory authority.

While hunches and deductive reasoning continue to be a mainstay for field investigators, when it comes to confirming a hunch or suspicion that will cost someone from hundreds to thousands of dollars in professional consulting fees, it is prudent to have more to go on.

The Background Search

We begin the field investigation process with a thorough search for background on the site. We use the files of regulatory agencies. Often departments within the same division have useful information that is normally not intercommunicated. We access records in city halls through city assessors, health officers, conservation officers, city engineers, city utilities departments, fire departments, etc. We also obtain background information from U.S. Soil Conservation Service soil survey maps and state geologic services.

Next, we drive by the site to get a feel for it. It is usually not possible to accurately correlate file data to actual field conditions without a preliminary site visit. We note such features as drainage gradients, underground util-

ity locations, surface drainage systems, and exposed soil horizons (e.g., from construction activity) to get a feeling for soil permeability and contamination conduits. We are on the lookout for other potential responsible parties so that we can talk with them at the outset, not later on at possibly greater expense. We take panoramic photographs and videos during this preliminary visit and follow them up with more detailed photos as the investigation goes along.

We talk to people. Nosy neighbors are often a great source of information. Competing businesses can be good sources as can city utility foremen, firemen, and policemen. Of course we interview potential responsible parties, and in these situations it is not uncommon to hear, "My inventory records are good. It can't possibly be me! It must be them." Professional tact and style are important. Interviews should be friendly and nonthreatening.

Once background data are gathered and a rough idea of the scenario has been developed, we verify the hypothesis or let the field data develop another one. Because of the multitude of events going on at the same time, we involve at least two staff people during the course of the field investigation. One person concentrates on the mechanical details, and one keeps careful records of all aspects of the investigation.

Investigative Tools

The primary scientific investigative tool of the MDNR LUST Unit is the soil gas survey, which is a method of detecting and delineating hydrocarbon vapor levels underground. The technique basically consists of driving a rod into the soil to create a vapor well, then analyzing the vapors it intercepts with an analytical instrument (e.g., PID, FID, colorimetric tube, portable gas chromatograph).

The equipment can be as simple as a set of slide hammers and colorimetric tubes or as complex as commercially available soil gas well tubes, which are driven into the ground with a hammer drill or by hydraulic pressure. The former can be purchased for a few hundred dollars but is useful only for shallow leak detection. The latter can cost several thousands of dollars with its

auxiliary equipment but can yield data from depths of 20 feet.

Equipment that is useful and often necessary to the data gathering potential of the soil gas survey system includes: a portable generator and extension cord, a large hammer drill and masonry bits, concrete patch, bucket soil augers, a magnetometer, transit and rod, teflon tubing or disposable tygon tubing, acetone or hexane and methanol, a PID, with data logger, an interface probe, sampling jars, bottle brushes, alkaline cleaner (e.g., Alconox), camera, field logbook, and waterproof field notebook. Because not all of this equipment is used in every field investigation, we use a checklist to be sure the proper equipment is available for each particular site and to fend off Murphy's Law wherever possible.

The Field Investigation

We use two general methods to gather field data—biased sampling and grid sampling. *Biased sampling* consists of selecting vapor sampling points to confirm obvious or suspected points of hydrocarbon discharge developed by the background search and field observations. This approach, which should be used first to confirm or deny the most apparent contamination scenario(s), usually consists of sampling points down gradient of the tank pit as well as lines and points that intercept underground conduits.

Even low to moderate hydrocarbon readings obtained in places where there should be none can implicate a responsible party. If other potential responsible parties exist, they too must be sampled in a similar manner to eliminate or implicate them as co-responsible. If this biased sampling technique does not generate a responsible party, then we turn to the grid sampling method.

Grid sampling consists of a series of wells installed in a grid pattern. We use the readings to draw a plume map, which usually zeroes-in on a point source. This method is not as time or cost effective as biased sampling, but it is thorough.

When we take soil vapor readings, we note the initial highest reading, allow some time for recharge of the vapor space, then take a second con-

firming reading. If the two readings do not closely concur, we may have either intercepted a vapor pocket and not an actual vein of the contaminant plume or we may be working with a malfunctioning data gathering instrument. When we use a PID or an FID, we check to be sure that it has a data logger so we can record the event numbers for later hard copy files. This is useful for future litigation and accurate report preparation.

The MDNR has found the combined use of established investigative

procedures and field instruments to be necessary to successfully conduct preliminary investigations and to establish responsible parties. It is also imperative that the user be familiar with the instruments and their limitations. Perhaps most important, the data must ultimately be correlated with the investigator's common sense and observations.

Ron Sheeley is an Environmental Specialist with the Missouri Department of Natural Resources.

THE ABBREVIATED CASE OF THE SULLIED SEEP

In April 1990, volatile petroleum compounds appeared in a natural seep near a spring located down gradient of a closed service station known to have had leaking USTs. Little detailed information was available in the Missouri DNR site files.

A preliminary drive-by revealed a well graded slope toward the affected seep. Storm and sanitary sewers and surface ditches were present. Soil profile information was found in the middle of an open field at a pit that had been excavated for future construction. Extensive beds of fractured rock ran approximately 6 feet under the surface in a matrix of tight clay. Furthermore, not just one, but six service stations (active and closed) were found to be located up gradient of the seep.

Interviews were conducted with station managers and neighbors. A local tank tester provided history on some of the tanks from the service station sites. The local MDNR agent talked with city officials and gathered more background history and contacts.

Because of the size of the area, the number of potential responsible parties, and time limitations, the biased sampling method was selected. Sampling points were located on the down-gradient side of the tanks and fuel lines and within the edge of the tank pits. Of the six UST locations examined, data indicated that five of the sites had hydrocarbon releases. Of these five, three showed vapor levels beyond what was normal.

The tanks had already been removed from one of the other two sites and backfilled with "clean" soil. At this site, no readings were found at the 6-foot depth, but at 10 feet, within the clean fill, excessive vapor levels were detected. Because readings at this site were highly variable, it is likely only a vapor pocket had been intercepted and that the source of vapors was deeper. The fifth site had contaminated monitoring wells, one with free product floating in it.

It is important to note that the soil gas survey is a valuable tool, but it is not a panacea. There are certain mechanical problems, such as the equipment's inability to penetrate rock layers, as encountered in this investigation.

Another problem many investigators encounter is the misconception that soil gas survey cannot be useful in tightly packed clay soil. Although its application must be modified, it can still be a useful tool. Common sense says if product is leaving the site then a conduit is present somewhere. So, begin by placing the sampling points near the area of known contamination (e.g., the tank pit), then track its path with more sampling points. If vapors are detected in native clay outside the tank pit - at even a foot - this may indicate a release of such size and duration that even dense clay was permeated. Generally, more sampling points are necessary in clay to enhance the chances of intercepting product conduits.

The layers of fractured rock in the tight clay soils in the region of this particular study limited penetration by the soil gas survey equipment to approximately 6 feet in most undisturbed soil. For this reason it was necessary to locate sampling points in native soil near the tank pits and lines. If significant releases had occurred and were directed to unknown conduits even the clay in this zone would be affected.

Although this field technique cannot produce qualitative data, in the hands of experienced operators it can provide relative quantitative that indicates a hydrocarbon release. Although the disposition of this case is not final, the regulatory agency has now located five potential responsible parties who must take corrective action and who may be required to do more thorough geologic investigations.

These initial corrective actions may solve the problem and/or generate new pertinent data. If these data indicate the need for further enforcement action, such action can be taken immediately. ■

TANK BIT



EPA Region 10 Compiles List of 3rd Party Certified Leak Detection Manufacturers

EPA REGIONAL OFFICES HAVE RECEIVED numerous and urgent requests from tank owners and operators for lists of eligible leak detection manufacturers and methodologies. Region 10 of EPA has taken on the task of compiling a national list of leak detection methodologies that have been certified by independent laboratories as having met EPA leak detection protocols. EPA previously estimated that as many as 280 different applications of available leak detection methods exist nationwide; which of these make the federal grade is not easily decipherable. Current indications are, however, that this number is now reduced to 100 or so.

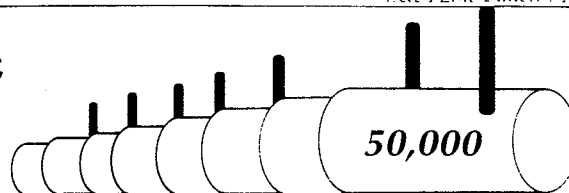
Under the federal UST rule, 40 CFR 280, leak detection methods installed after December 22, 1991 must be able to detect leak rates with a 95% probability of detection and a 5% probability of false alarm. EPA requires that manufacturers have their methods tested by independent third parties to determine whether the method can meet the required probabilities. The Agency has also developed protocols for testing the various types of leak detection methods.

Each of the testing protocols contains a certification form titled "Results of U.S.EPA Standard Evaluation," which is to be completed by the laboratory or third party issuing the finding. To be included on the national list, the manufacturer should submit completed copies of the certification form (where applicable), the "description" section of the protocol, and any additional documentation they wish to provide for each variation of their method which has passed the protocol.

While inclusion on the EPA list is strictly voluntary on the part of manufacturers, their participation has value, not only to tank owners and regulators, but to the manufacturers and marketers themselves, who stand to gain some marketing exposure. Region 10 expects to distribute the list, which will be updated continuously, by late September 1991. The list will be

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FOR LARGE USTs, TEMPERATURE COMPENSATION IS THE KEY



EPA Study Prescribes Procedures for Volumetric Leak Detection in Large Tanks

EXPERIMENTS CONDUCTED ON TWO PARTIALLY FILLED 50,000-gallon underground storage tanks (USTs) at Griffiss Air Force Base in upstate New York show that the performance of volumetric leak detection systems in large tanks depends primarily on the accuracy of the temperature compensation. The study, funded by EPA's Risk Reduction Engineering Lab in Edison, New Jersey, under contract with Vista Research, Inc. in Mountain View California, picks up where previous studies on tanks up to 10,000 gallons left off. Because EPA performance standards are based on experiments conducted on smaller tanks, it has been unclear whether volumetric tests that meet these standards on smaller tanks can achieve the same level of performance when used to test larger tanks.

The experiments show that errors in temperature compensation which are negligible in small tank tests become important in large tanks. Results of the experiments suggest that volumetric systems now capable of meeting regulatory standards when used to test 8,000- to 10,000-gallon tanks may also meet these standards when used to test 50,000-gallon tanks if the following five key features are included in the testing protocol:

- The duration of the test is increased from 1 or 2 hours to 4 hours to reduce the ambient and instrumentation noise;
- The number of temperature sensors is increased from 5 to 10 or more so that the accuracy of estimating the average thermally induced volume change in the layer of product surrounding each sensor increases;
- The waiting period after any addition or removal of product is increased from 6 hours to 24 hours or longer so that the horizontal and vertical temperature gradients dissipate;
- The average rate of change of temperature in any one layer or in the tank as a whole is small enough to allow accurate temperature compensation; and
- An accurate experimental estimate is made of the constants necessary for converting level

and temperature changes to volume.

The experiments further suggest that a multiple-test strategy is required in order for such systems to meet the regulatory standard for tank tightness.

The Griffiss tanks were 77.5 feet long and 10.5 feet in diameter. A level sensor with a precision of 0.00025 inches and an array of 10 submerged thermistors each with a precision of 0.002°F were spaced at 12-inch intervals to collect the data. All experiments were conducted in partially filled tanks. Changes in product level were made by shunting product from one tank to another by means of a pump. The addition or removal of product produced changes in the temperature of the product that changed the volume by several liters per hour or more.

Also, as part of the experiments, calculations were made to estimate the minimum duration of a test conducted on a 48,000-gallon tank as a function of the precision of the instrumentation used to measure temperature and level changes. It was assumed in the calculations that the resolution of the sensors was two to three times smaller than the most extreme level change that occurred over the duration of the test. The calculations indicated that the test duration must be at least two hours in the case of a level sensor with a precision of 0.00025 inches and a temperature sensor with a precision of 0.002°F. When the instrumentation is less precise, the test duration must be proportionately longer.

The project yielded a recommended procedure for compensating for the thermal expansion or contraction of product in the tank. However, the Project Summary Report adds, "whether this procedure is sufficiently adequate for a volumetric leak detection system to meet EPA's regulatory standard for a tightness test (or a monthly monitoring test) will not be known until an actual performance evaluation is conducted on a system that incorporates some or all of these procedures."

Volumetric leak detection systems that will be used on large tanks should be experimentally evaluated according to the EPA's standard test procedure

for evaluating volumetric tightness tests. This includes the performance of the system in terms of probability of detection and probability of false alarm. Unfortunately, none of the existing facilities specializing in evaluations is equipped with 50,000-gallon tanks. Therefore, the report suggests that systems must be evaluated at large-volume storage facilities that are operational, and the EPA's standard test procedure should be modified to accommodate this type of evaluation. ■

The complete report, Volumetric Leak Detection in Large Underground Storage Tanks is being printed and will be available from: National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161; phone 703/487-4650. A copy of the Project Summary can also be obtained from the Technical Information Service.

To our Readers:

We welcome your comments and suggestions on any of our articles. Contact Ellen Frye at (617) 861-8088.

■ EPA REGION 10 LIST, continued from page 6

distributed to other EPA regional offices, state UST program offices, all those who have submitted certification information, and to the scores of others who have requested copies.

The list will include: the manufacturer's name and address; the test method and application; the date of third party certification and the name of certifier; and tank volume/size limitations. Region 10 also plans to evaluate the certification evaluations to be sure they make sense and are clear as to what the methods can and cannot do. ■

For more information, or to add your name to the list, contact: Joan Cabreza, Regional UST/LUST Program Manager, EPA Region 10, WD-139, 1200 6th Ave., Seattle, Washington 98101, phone 206/553-1643.

Tank-nically Speaking

by Marcel Moreau

Marcel Moreau is a nationally recognized petroleum storage specialist whose column, *Tank-nically Speaking*, is featured regularly in this publication to address questions, opinions, and technical interests of our readers.

RULERS LIE...AND OTHER LITTLE KNOWN FACTS ABOUT STATISTICS IN LEAK DETECTION

MANY SUMMERS AGO, WHEN I WAS IN high school, I worked as a carpenter's apprentice to a man whose uncompromising quality in house carpentry was legendary, at least in the small city of Westbrook, Maine. His name was Telesphore Rousseau; everyone called him Ted. A burnt-out cigar stub rested permanently in the corner of his mouth. He was in his seventies and going strong.

My first day on the job I arrived eager and ready to learn—with my hammer, nail apron, and tape measure. By the end of the summer the head of the hammer was polished to a silver sheen, the nail apron was dirty and tattered, and the tape measure, still like new, was at home on the bureau.

One of my first tasks as Ted's helper was to cut and install several dozen short pieces of 2x10 boards to fit between the floor joists of the house. I went along measuring the spaces with my tape, writing the measurements down on a board; carefully measuring pieces of wood; cutting them; and labeling them to be sure I knew where each would go. When I went to position the first piece there was an embarrassing gap between it and the joist. When I tried to set the next piece in place it took some determined hammering to make it fit into a space that seemed to have shrunk since I measured it. The next piece was, again, a little on the short side.

About this time, Ted walked by and the grin on his face clearly indicated that he knew exactly what was going on. "You know," he said, "the problem you're having is that you haven't learned that rulers lie."

Ted proceeded to show me that the way to make things fit is to put the piece you are going to cut in the place you want to put it, scribe a line right onto the piece, and use that as your

cutting guide. For big pieces he used long thin strips of wood that he marked and then transferred the mark to the piece to be cut. I worked the whole summer and never used a ruler again. In fact, I rarely use a ruler, even now.

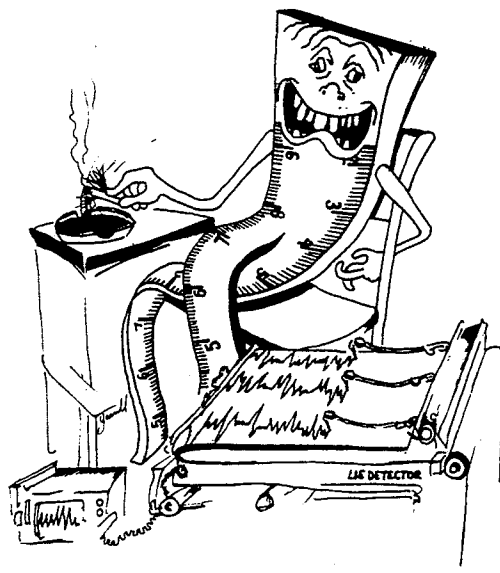
So what, my editor asks, does any of this have to do with USTs? Well, it's like this. One of the most prevalent ways of trying to tell whether a UST system is leaking is to measure various aspects of it:

- We *measure* the depth of liquid;
- We *calculate* a volume based on *measurements* of the length and diameter of the tank;
- We *measure* the volume of liquid dispensed;
- We *measure* the volume of liquid delivered; and
- During a tightness test, we *measure* the temperature of the product in the tank to see if temperature change can be producing a *measurable* volume change.

We reasoning humans commonly believe that when we make a measurement we know exactly the length, the weight, or the volume of the item in question. We make all these measurements with our sticks, gauges, and meters, and we expect that they are telling the absolute truth. But it is not until we do the exercise of having several people measure the same item that we realize Ted's truth: rulers lie.

So What About Statistical Inventory Analysis?

In my last article, I discussed some of the sources of error in making inventory control measurements with a gauge stick. I received a letter from a



reader who made the cogent point that if all the errors I talked about exist, how is it that there are people who claim to be able to take manual inventory data and through some hocus-pocus, detect leaks of the same magnitude as the best of tightness tests? "Doesn't the old garbage in/garbage out rule apply?" this reader asks. "How can the accuracy of the results be so much better than the accuracy of the measurements that we began with?"

The answer lies in statistics. Statisticians know—just like Ted—that rulers lie. But they say this in a more complicated way. What statistics say is, we cannot know anything with 100% confidence, but the situation is not hopeless. If we make enough measurements of the same item we can succeed in knowing *how well* we know something.

If I measure the level of liquid in a tank only once, I can't know how big a liar my gauge stick is on this particular day. Consequently (in the statistician's mind), I have a very poor idea of how much liquid is in the tank. However, if I make a dozen measurements of the level of liquid and they vary by no more than, say, 6 inches from one another, then the statistician can work his/her magic on these numbers and tell us that we can be 95% sure that the volume of liquid is 1,000 gallons, plus or minus 100 gallons...or some similar

calculation. If I make 1,000 measurements and most of them vary from one to another by fractions of an inch, with only a few measurements off by several inches, then a statistician might tell us that we can be 99% sure that the volume of liquid is 1,000 gallons, plus or minus 10 gallons.

Thus, using statistics we can get better and better estimates of what the "truth" is by making more and more measurements and observing how close or how far apart these measurements are to one another. This is one aspect of how we can take crude inventory measurements with a stick and closely approximate the truth about the volume of liquid in a storage system.

Another very important aspect of leak detection by way of inventory control is time. Take, for example, a tank with a capacity of 10,000 gallons that is 3/4 full of liquid. When we run an unfilled tightness test on this tank, we are trying to measure a volume change of 0.1 gallon per hour (a level change of 0.0015 inch) in a one-hour time frame. Given temperature fluctuations, tank deformation, changing vapor pressures in the vapor space, equipment variations, and the like, we find we need sophisticated equipment to make this measurement with any degree of confidence.

But, what if we get rid of this arbitrary one-hour time limit for finding the leak? Let's take the tank out of service for a year and monitor it to find this 0.1 gallon per hour (gph) leak. If we have a year to do the test, we will be trying to measure a volume change of 876 gallons (0.1 gph x 24 hrs x 365 days) or a level change of about 13 inches. Most anybody could detect this kind of a volume change, even with measurements made only to the nearest inch with a crooked stick.

For the typical storage tank owner, time is money. Ergo, because of the owner's requirement for a test of short duration, the challenge for tightness testing is to accurately measure and properly interpret very small changes in tank volume. In contrast, statistical inventory analysis uses data from 30 days to find a leak. Statistical analysts are looking for leaks on the order of 72 gallons (0.1 gph x 24 hrs x 30 days), and these are relatively easy to detect with a wooden gauge stick that is used properly and consistently.

Statisticians have also gotten good

at sorting out different sources of error in data records, so that the effects of tilted tanks and miscalibrated meters can be removed to yield a better picture of the true measurement. For example, let's assume a dispensing meter is out

Thus, using statistics we can get better and better estimates of what the "truth" is by making more and more measurements and observing how close or how far apart these measurements are to one another. This is one aspect of how we can take crude inventory measurements with a stick and closely approximate the truth about the volume of liquid in a storage system.

of calibration and is delivering less fuel than is indicated. The amount of error introduced into the inventory record is going to vary from day to day, depending on the amount of fuel that is pumped through that meter on that day. The more fuel pumped, the greater the error. An analysis of the data can detect this relationship and correct for it, so that this particular "lie" can be removed from the inventory records and the remaining numbers are even closer to the truth.

So, although many people do not want to believe it (and this is a sad testimony to the state of science education in this country), properly applied statistics in conjunction with crude but numerous measurements with a wooden gauge stick over a long enough period of time can detect leaks of the same order of magnitude as a tightness test method that uses tens of thousands of dollars of equipment to measure volume and temperature to three or four decimal places.

A Word About "EPA Approvals"

Does the EPA approve leak detection methods? The folks in Washington would answer with a resounding "No!". Many vendors, however, claim to have "EPA approval." The *Federal Register* scrupulously avoids the word "approve," except to say that implementing agencies may "approve" alternative leak detection methods. This is all just semantics, but it gets to be an issue where the rubber hits the road (i.e., when the tank owner meets the leak detection vendor.

There are eight methods of tank leak detection that are carefully defined in the federal regulations. By defining these methods in detail, it seems to me that they are de facto "approved" leak detection methods.

However, leak detection devices, be they simple wooden gauge sticks or fancy electronic gizmos that do everything but brew coffee, are not approved.

A vendor can legitimately claim that the leak detection method that he is promoting is "approved" (i.e., consistent with the standards set in the regulations), but he would be a liar if he said that the particular device or service he was selling was "an approved EPA device." The correct statement relative to the specific device would be that a third party has followed an

EPA protocol and certified that the device meets the performance standards set in the regulations.

Clever vendors capitalize on the confusion by merely stamping "EPA approved" on their sales literature without specifying whether they mean the method or the device. As one salesman told me, "We catch fish any way we can."

So, be careful of which hooks you nibble on, and don't believe every measurement you meet.

See you next issue. ■

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FROM TANKER TRUCK TO TANK:

WHAT COULD POSSIBLY GO WRONG?

by June Taylor

NEVADA - A fuel delivery driver tries to deposit 3,000 gallons of diesel fuel into a customer's underground storage tank. Unfortunately, he has hooked up to the waste oil tank by mistake. The result is a big overfill and a big batch of "contaminated fuel" in need of cleanup and disposal.

PENNSYLVANIA - 3,000 gallons of heating oil are delivered to a monitoring well instead of a UST. Oops! Another costly cleanup.

OHIO - A fuel delivery is in process at a downtown station when a customer pulls in. Not seeing the hoses, she drives right over them snagging one, which is then disconnected causing gasoline to be spewed over the pavement. Somehow the gasoline is ignited. Quick action by the station operator, tanker driver, and local fire crew prevent a conflagration.

WITH OVER 13,000 FUEL DELIVERIES PER day into underground storage tanks throughout the U. S., what could possibly go wrong? Plenty!...to put it succinctly. The cases mentioned above are just the tip of an iceberg of industry horror stories. Everyone's got their favorite. Mine is a recent case in Ohio where gasoline was delivered into a groundwater monitoring well. The monitoring well had been *locked*, no less! The tanker driver pursued the delivery by asking the station operator for a key to the lock. The young, inexperienced cash register attendant didn't know which key was which, so he handed over the facility's ring of keys to the driver. After several tries, the driver found the key to the well. The rest, as they say, is history. The owner of the station is one of several such cases that has been referred to an EPA regional office for prosecution.

Yes, the owner. In cases like this, owners feel they are unfairly held responsible for a problem created by the delivery driver. But, under federal UST rules, EPA (like most states) has no jurisdiction over the delivery drivers. Hence, the responsibility is placed with the owner/operator to ensure a safe delivery.

Indeed, owners can take some very simple steps to guard against delivery errors. For one thing, they should *label all fill pipes*! It's so simple, but many owner/operators haven't taken the time to do it. Most major oil companies do it because they know it cuts down on costly delivery errors. (The American Petroleum Institute (API) has a color code that is used widely in the industry for marking fill pipe access covers.) One labeling tip is to extend the painted area several inches beyond the metal cover onto the paved area. Covers can get mixed up, and the large painted areas can ensure that code colors are properly matched.

An extra measure of insurance is to attach another tag to the fill pipe.

In the Nevada diesel delivery case noted above, the driver had three products to deliver: premium, regular unleaded, and diesel. He found three fill pipes all in a row. The first two were color labeled for premium and unleaded gasoline. But, it was late at night and no one was around to ask, so the driver just *assumed* the third was the diesel. Little did he know, the diesel tank had been added later and was located "out back," where one usually finds the waste oil tank. "Sticking" the tank beforehand, a standard industry practice, would have given him a clue that the tank wasn't for diesel and wouldn't hold 3,000 gallons. Ah, hindsight...

"Sticking the tank is the simplest and surest form of overfill protection," says George Eisler, Training Director for Transport South, a large independent petroleum carrier serving the southeast U.S. To reduce costs from problem deliveries, Eisler's firm developed a safety training program for its drivers, including a video showing pre-trip procedures and a "drip-less delivery." (For anyone interested in seeing the right way to handle product from the bulk terminal to the UST facility, this video offers an excellent overview.)

While Mr. Eisler is big on tank sticking, he notes that sticking without an accurate tank chart is useless. "You'd be surprised how many owners do not have their tank charts... such a basic necessity for their business. How are they deciding how much product to order without sticking the tanks themselves and calculating how much more their tank will hold?"

Transport does not subscribe to the "poke and hope" product delivery technique. Company policy is to not deliver to a facility at which the owner doesn't have tank charts. "But," Eisler

notes, "that only means the customer gets mad at me and calls someone else."

Stage 1 Vapor Recovery Puts Drivers in the Responsibility Seat

But there is a set of environmental rules that specifically holds drivers and trucking companies liable if things aren't done properly—Stage 1 Vapor Recovery. Under the Clean Air Act, areas with severe air quality problems are required to install vapor recovery systems for tank fueling. In normal tank filling operations, vapors are vented through tall vent pipes. In Stage 1 the vapors are directed back into the tanker and returned to the bulk facility where they are recycled or burned off.

Stage 1 is considered one of the most cost-effective air pollution controls on the books. But to be effective, it relies heavily on tanker drivers. Owners must provide the proper hookups and maintain them, but the drivers are legally responsible for making proper connections, and they are personally subject to fines for failure to connect. (Many companies will fire drivers if they fail to make Stage 1 hookups.)

What do Stage 1 rules have to do with USTs spills and overfills? Plenty. Not all tanker drivers feel as warmly toward Stage 1 as the air regulators do. In fact, many believe it slows them down, costs them money, and puts them in a dangerous situation on their return trip.

Indeed, driving fuel tanker trucks is a risky business that requires a lot of defensive driving and other safety skills. "It's like driving a bomb." is a common complaint. EPA's position is that driving back with "over-rich" vapors is less dangerous than driving with the explosive mix of residual vapors and air.

Thus, despite the possibility of fines or firing, some drivers don't con-

LESSONS FROM A FLEXIBLE PIPING FAILURE

by Keith Osborne

THERE HAS BEEN A GREAT DEAL OF DISCUSSION about the importance of quality control and adherence to installation instruction in the manufacture and installation of UST system components. There is nothing like a failure to point out the compounding effect of what might seem like oversight, omissions, and errors in both of these areas that can contribute to a release.

Recently, the "Bufflex" flexible piping system at a one-year old convenience store location suddenly failed, releasing as much as 4,000 gallons of diesel fuel. Preliminary results indicate a principal cause to be a quality control problem on the part of the primary piping manufacturer. It appears that materials incompatible with the particular grade of diesel fuel were used in the fabrication of the product carrier pipe. Unaware of any specification change by the manufacturer, we at Buffalo Environmental Products, Inc., the product vendor, installed the incorrect material.

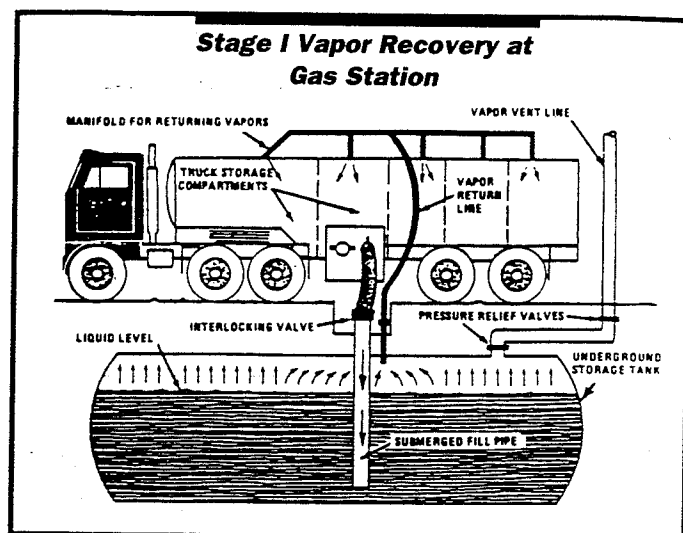
Compounding the primary piping failure were a number of other items that, if handled differently, would have lessened the impact of the release. For one thing, although piping sump monitors were installed, the alarm annunciator was placed in a back room of the store behind the main refrigeration unit, making it impossible to hear the alarm unless an employee was in that back room. Also, monitors were not connected to the relays that would have shut down the submersible pumps. Line leak detectors, which would have served as a mechanical back up, were also absent.

Inspection of the electrical system revealed that below grade junction boxes for the electronic monitoring, which were specified to be watertight, were not. One of the wirenut connections was fractured and the wire corroded.

The elimination of any of these factors would have prevented or minimized the release—the big *if only*...

- If the piping had been manufactured to the proper spec, the lines would have remained intact. A

■ continued on page 12



nect the vapor return line, jamming a stick in to open it instead. Unfortunately, bypassing vapor recovery in this way also knocks out overfill prevention devices. Instead of automatically stopping when the tank is 90% full, the fuel will pour out of the vapor opening. In addition, bypassing vapor recovery in this way can cause a dangerous accumulation of gasoline vapors at ground level. More than one driver has been seriously burned and a few killed when vapors ignited.

Clearly, tanker drivers and owners have a lot to contend with in ensuring safe deliveries. New spill and overfill devices are being installed and the number of groundwater and vapor monitoring wells is increasing across the country, so the number of botched deliveries could easily increase as well. While deliveries made directly into monitoring wells are probably the most egregious form of "mis-fueling" at UST installations, all mis-deliveries can present serious problems. As Stage 1 Vapor Recovery, once confined to major urban areas, becomes a standard feature across the country, more and more tank owners and fuel delivery drivers will be faced with new equipment requirements and new delivery procedures.

Trade Associations and EPA Join Forces

The fuel delivery dilemma is of concern to both EPA and industry-related trade associations. All parties agree that training and education on this subject can benefit both delivery drivers and tank owner/operators. The thinking is that education on safe deliveries and related environmental rules is in everyone's interest. UST programs can benefit from the regulatory clout that Stage 1 rules exert on trucking compa-

nies; air programs can benefit by having the synergy between new overfill devices and Stage 1 connections made clear; and collaboration with the industry can help get the training information into the hands of the people who need it.

To this end, EPA's Office of Underground Storage Tanks (OUST) and Office of Air have been working together in cooperation with a number of trade associations representing tank owners, trucking operations, and equipment manufacturers and distributors, to produce a training video that deals with the changing equipment required at UST installations and the procedures for ensuring safe deliveries. As a part of this effort, three of the trade associations—Petroleum Marketers Association of America (PMAA), American Petroleum Institute (API), and National Private Truck Council (NPTC)—conducted an informal survey of their trucking operations last spring, asking drivers some basic questions about safe deliveries. An alarming 27% did not know how to tell a monitoring well from a fill pipe if it wasn't labeled; 70% were unfamiliar with overfill protection devices; and almost 70% believe it is more "potentially dangerous" to drive a truck loaded with vapors for recovery. There is clearly an opportunity to improve awareness and, one hopes, performance through this training effort.

In addition to API, PMAA, and NPTC other invited industry participants include the Society of Independent Gasoline Marketers, National Association of Convenience Stores, National Tank Truck Carriers, and the Petroleum Equipment Institute. The Fiberglass Petroleum Tank and Piping Institute and Steel Tank Institute are also contributing to the project. The industry groups and EPA are splitting the cost; the project is scheduled for completion in spring 1992. ■

June Taylor is video consultant to EPA's Office of Underground Storage Tanks.

Note: People interested in Transport South's training video can call George Eisler at 1-800-877-7611.

■ PIPING FAILURE, continued from page 11

large number of these systems have been installed and are working as designed.

- If the relays to shut off the pumps had been connected, the pumps would have been inoperable and a simple look at the monitoring panel would have revealed the problem.
- If the annunciator had been audible, the employees could have shut down the pumps manually, minimizing the release.
- If the underground connections were encapsulated and installed in watertight enclosures, as specified, the alarm may have been detected, reducing the amount of product released.

It should be noted that the parallel gasoline system at the same location is and has been functioning normally.

Although the problem could not be identified by visual inspection, we are responsible for failing to ensure that the original equipment manufacturer's (OEM) quality control program was effective. The OEM is responsible for changing the manufacturing specification without consulting with the vendor and specifier. The installer, by incorrectly and incompletely installing the monitoring system, contributed to the problem, as did the owner of the store by having the panel placed in a relatively inaccessible location.

Prompt reaction by the owner upon discovery of the problem prevented a more serious release, and response by Buffalo Environmental Products, with field support by the installer, was quick and decisive. We are fully backed its product and are working with all parties involved. The site is well on its way to a complete cleanup, the manufacturing quality control procedures have been upgraded, and the recommended installation instructions enhanced.

This problem won't happen to us vendor again, but it could happen to others. In terms of the UST system, it points up the vital importance of every component and every operation during manufacture and installation in assuring that the system will perform as intended. ■

Keith Osborne is Vice President of Cevin Industries, owners of Buffalo Environmental Products.

Field Notes

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

Containment Sumps and Dispenser Pans are Environmentally Safe But Potentially Dangerous

It used to be that submersible pumping systems at service stations and other refueling sites were surrounded by backfill material. A leak at the submersible usually traveled through the backfill and ended up somewhere else. And it wasn't too long ago that any leakage that occurred at the dispenser, including careless filter cartridge changing and dispenser repair, found its way into the dirt at the bottom of the dispenser island.

While we now know that permitting gasoline to escape into the soil is not good for the environment, it did have one advantage: the areas around the submerged pumps and at the base of the dispensers where the fuel leaked were generally safe from explosion and fire. Nowadays however, our technically advanced and environmentally responsible UST installations include containment sumps that contain not only gasoline spills and leaks, but also high concentrations of hydrocarbon vapors. So now service station repairmen, weights and measures officials, and UST program inspectors sometimes find themselves working in and around a small area that may harbor a hydrocarbon-enriched atmosphere that can easily be ignited by the spark of a falling wrench, a static discharge, or an electrical spark.

I am not in a position to offer advice on how to work safely in these areas. That responsibility rests with the management of the company or agency for which you work. OSHA and other agencies probably have something to say on this matter as well. At a minimum, however, anyone working on and around the submerged pump should realize that he/she may be

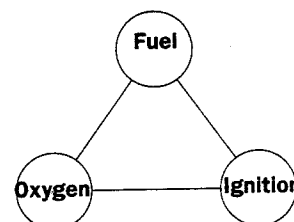
exposed to hazards which have not been present in the past. If the submersible's containment sump is not naturally ventilated and egress is restricted, consider following OSHA's confined space entry requirements. Use a meter to determine if the atmosphere inside the sump is safe. Monitor that atmosphere frequently. Use ventilation equipment and respirators. Consider having a backup man present both during entry and while work is in progress.

First-generation dispenser pans provide unique problems to those working around the island because they are located in areas heavily frequented by the general public. Extra care must be taken to ensure that motorists and onlookers are prohibited from entering the area around the dispenser pan while work is in progress.

The petroleum equipment industry has been alerted to this problem. Many manufacturers of containment sumps and dispenser pans are now in the process of making improvements to their equipment by adding such things as warning labels, remote drainage systems, explosive-condition detectors, automatic fire extinguishing systems, and non-conductive manway frames and covers. Service technicians are being instructed by their companies on how to work safely in these areas surrounding the dispenser and containment sump.

Although manufacturers are constantly trying to improve equipment designs with safety in mind, the burden of caution still falls on the owner, operator, service technician, and inspector who must maintain and work around these potentially dangerous areas. So remember, when entering an enclosed space where fuels are present or working in areas where high levels of vapors are present, always be aware that potential danger exists. Know how to identify danger, know how to make an area safe prior to entry, and be sure to maintain a safe work area until you are ready to leave. ■

Fire Triangle



*Be aware of the basic fire triangle:
fuel, oxygen, ignition source.
All three elements are necessary
to support combustion.*

■ STREAMLINING, *continued from page 2*

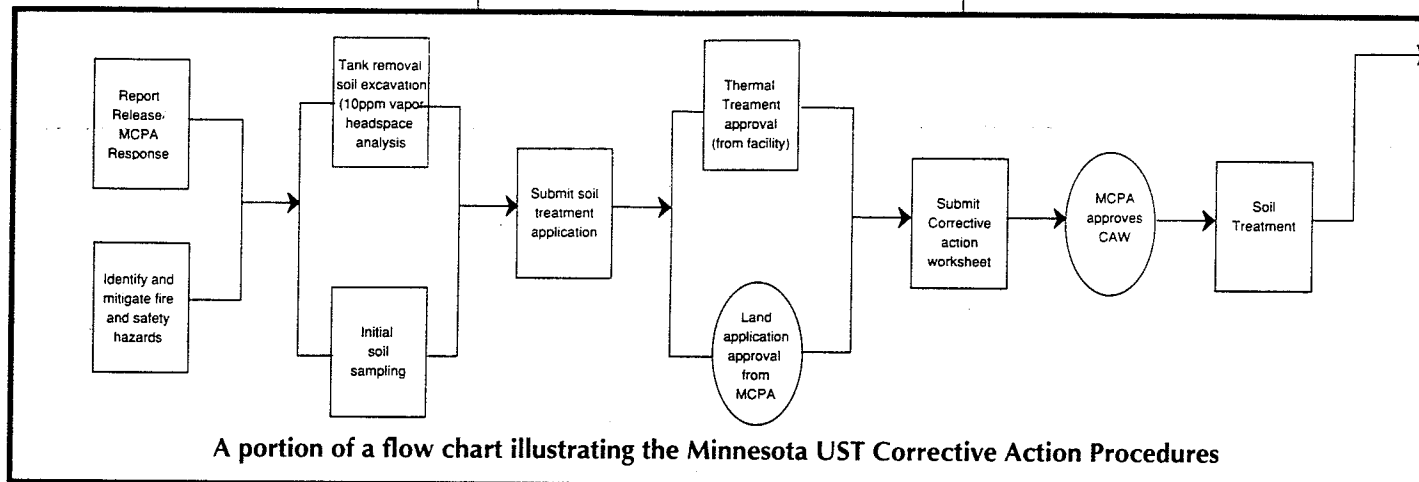
"Staff had been awfully frustrated at how poorly the system worked, and to some degree, they had lost a little faith in management," recalls Dave Richfield. MPCA's first important step in TQM was to bring staff and management together to form "quality teams."

- Cleanup goals and standards are communicated to the regulated community; and
- Staff and management focus on what is important by recognizing that one can't do everything at once.

"The result is that we can pretty much keep up with the workload now," says Richfield. "Since 1989 we

tutionally imposed roadblocks, and improving communication with consultants, tank owners, and responsible parties (RPs) so that everyone understands what is expected the first time.

"At our first streamlining meeting we drew a flow chart on how we saw our process going," says Larry Coen. "We discovered that a large percent of RPs submit incomplete documents.



As a team, staff and management did all kinds of pareto charts and flow charts to identify the problems and opportunities for improvement. The plan was to pick the top few problem areas that presented glaring opportunities for program improvement and work on them. "Some pretty obvious things jumped out at us," says Richfield. "So we had the staff go back and redesign the program, which did a lot to help the slumping morale as well as the program."

As a result, changes were made within MPCA with a good deal of success. Similar process roadblocks and areas needing improvement have also been identified by UST/LUST program personnel in other states and localities. MPCA's experience suggests that a LUST cleanup program can be more effective when:

- Good, sound, quick decisions are made by cleanup staff (see article on page 3);
- Frontline staff are empowered to make decisions;
- Frontline staff (the experts) are sought out for advice on policy;
- Micro-management of sites (through reviews of work plans) is eliminated;
- Consultants and the regulated community are informed and educated regarding specific agency requirements;
- A system for prioritizing jobs is established and followed;

have been continuously measuring program performance, and we have kept in touch with the consultants and contractors. We are interested in their opinions on what is working and what isn't. I would say also that we have a pretty good rapport with the regulated community, but it wasn't always that way.

"The most difficult part about doing what we did was making the decision to do it, especially when you already have more work than you can handle. It is a very brave decision to say the system doesn't work, and that we need to stop and make changes to make our workload manageable. But it was worth it. The number of sites we are able to process has increased dramatically, and our review times have dropped. For example, our time for approving a corrective action design has dropped from 546 days median in 1988 to 82 days in 1991, and we're doing a better job of it too."

Turning Around Turn Around Times

Lengthy turnaround times for such tasks as approving corrective action plans, processing permits, or paying out cleanup reimbursements has been a recurring lament among the states. But as Minnesota and a few other states have discovered, much of the delay can be eliminated through snipping away at some of the regulatory red tape, thinning out other insti-

When we receive this incomplete package, it requires that first we prepare a letter saying we need this or that information, then they submit the this and that, and then we go over the document again—doing rework maybe three or four times instead of getting it right the first or second time. (See article on page 5.)

"One of the important things we're working on with Midwest Research Institute [a contractor working with EPA and the states on streamlining projects] is our outreach guidance documents. We are upgrading our closure document and creating new site assessment and cleanup guidance documents. With these documents our hope is that the regulated community will get it right the first time. We're trying to make our documents comprehensive so that the contractors and consultants can look at them and know what we want. Each document will have a checklist page, which the preparer can check off as he goes along. We'll have to test the usability of this material in the field and make revisions as necessary."

More than 12 states have conducted Consultants/Contractor Days or Owner/Operators Days to improve communications by clearly explaining what they require in hopes of cutting down response times and phone calls. Consultants Days can also help pro-

■ *continued on page 14*

■ STREAMLINING, continued from page 13

vide a level playing field whereby everybody is working off the same information and they provide an opportunity for two-way communication.

Burrie Boshoff, Assistant Chief of the Pollution Control Branch at the North Carolina Department of Environment, Health, and Natural Resources (DEHNR), organized a 2-day Owners/Operators Day in November 1990 to explain to about 550 attendees how the program works and what they need to know. The Agency put together a notebook for attendees that served as a guideline on technical and administrative matters.

This summer the North Carolina DEHNR held "Mini Consultants Days" throughout the state to explain to consultants and owner/operators how to prepare a cleanup fund reimbursement package. "Our Regional offices were concerned about the time it took to review a reimbursement package," explains Boshoff. "Considering the accelerated rate the packages were coming in to our office, the situation would just get worse if we didn't do something about it.

"The problem was the way the packages were submitted. It was taking 2 days or even longer to review the packages when it shouldn't take longer than 3 hours. We decided we needed to be able to reduce our reimbursement turnaround time to 1 month from the time the reimbursement package is presented to the time a check is cut.

"During the workshops we explained how the reimbursement process should work and showed participants how to fill out the reimbursement forms. We told the consultants how to submit their packages, and we explained that any package not submitted properly would be returned with a request that the sender follow the guidelines."

Choosing Appropriate Cleanup Technologies

As with any process, technological paradigms can create roadblocks to the realization of more effective cleanup possibilities. Bob Brown, Environmental Specialist with the Alaska Department of Environmental Conservation, may have thought his was a voice crying in the wilderness; asking for EPA/MRI help to streamline the corrective action process and to prepare a technology transfer directory.

FINANCIAL RESPONSIBILITY U • P • D • A • T • E

EPA EXTENDS FINANCIAL RESPONSIBILITY COMPLIANCE DATE FOR SMALL BUSINESSES

Concerned about small business' ability to obtain financial assurance by an October 26, 1991 compliance date, EPA has proposed an extension of the compliance deadline to December 31, 1992. The proposed extension affects owners and operators in compliance Group 4; those with 12 or fewer tanks at more than one facility, fewer than 100 tanks at a single facility, and non-marketers with a net worth of less than \$20 million. A final decision concerning the extension will be made after considering public comment on the proposed rule.

Federal financial responsibility (FR) rules require that UST owners and operators show financial means to cover cleanup costs and third-party damages resulting from potential leaks. This FR requirement has been phased-in over several years. Petroleum marketers owning 1,000 or more USTs as well as non-marketers with more than \$20 million in tangible net worth (Group 1) were required to comply by January 1989. Marketers owning between 100 and 999 USTs (Group 2) were required to comply by October 1989. Marketers owning between 13 and 99 USTs (Group 3) were required to comply by April 1991.

Compliance Group 4 represents the owners and operators of the smallest gasoline and service stations who are generally in need of an effective financial responsibility mechanism. EPA collected information from the UST insurance industry, the regulated community, and the states which indicates that many owners and operators need more time to comply with financial responsibility requirements.

To date, 43 states have enacted legislation creating state assurance funds. Of these, 27 have received EPA approval to use these funds as financial responsibility compliance mechanisms. Upon submission of a fund for EPA review, owners and operators in that state are considered to be in compliance with federal FR requirements unless or until EPA disapproves the fund. Several states, however, need additional time to develop and submit their funds for EPA review.

EPA is working with Congress and the states to enable small businesses to remain economically viable while, at the same time, ensuring that mechanisms exist to pay for the cleanup of leaks. The proposed extension is part of a broader EPA effort to reduce the costs and impact of UST regulations on small businesses, while ensuring human health and the environment are protected. Because UST technical requirements remain in effect, the Agency believes an extension of the compliance date will not adversely affect human health and the environment.

As part of its effort to provide relief to small businesses, EPA has also sought comments on two possible regulatory options: creating a new category for rural petroleum marketers who provide essential community services, and extending the compliance deadline for specific facilities in states where certain federally determined criteria are met.

EPA is also putting the finishing touches on a local government FR rule package, per a June 1990 proposed rule, which will give local governments additional flexibility in complying with the financial responsibility requirements. The rule is expected to hit the *Federal Register* this December, and the expected date of compliance will be one year later, December 1992. ■

"It's a problem of relative degree," Brown says. "We're a little bit isolated from the other states. So even with major consulting firms in the state, there is sort of a lag in awareness of current applications of technologies. There is also a lack of applications in the state that give experience. It's also reflected in our low level of completed site cleanups." Hey Bob, you're not alone.

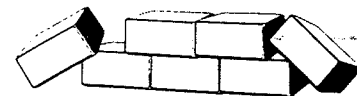
As Burrie Boshoff says, "the big question is how much can it cost to clean up some of these sites? How long will it take? We want to be able to say how effective this method of cleanup is in this situation. What alternatives are there that would be more cost-effective? Right now we ask any consultants who look at a site to consider the alternatives and not just go

■ continued on page 15



How ABOUT BRICKS?

A Constructive Bent for Contaminated Soils



THREE BRICK MANUFACTURING COMPANIES in North Carolina have developed processes for blending locally mined clay and shale with petroleum contaminated soil to beget a raw material that begets a high quality brick. The bricks are fired in tunnel kilns over a 3-day period with temperatures peaking at approximately 2,000°F. According to Rocky Springer, Sales Manager at Cherokee Sanford Group, Inc., one of the three brick manufacturing companies, "this recycling process yields a brick product of uncompromisable structural and aesthetic quality, which is completely free of contamination."

The process of handling and remediating petroleum contaminated soils does get complicated, however. Manufacturers must be concerned with soil evaluation; they must abide by state and federal air and water quality and hazardous waste requirements; they must obtain site-specific guidance and approval from the appropriate State Department of Environment, Health, and Natural Resources (DEHNR) regional office; and, of course, they need to maintain the quality of the brick product.

"We have been through 3 years of working with this [contaminated soil] material," says Springer. "The brick manufacturing process is a very effective means of remediating contaminated soil, but you really have to work hard to protect product quality."

In general, the brick-making process involves screening the contaminated soils for debris such as rocks, plastic, pipe, concrete, asphalt, etc. Virgin locally mined clay and shale materials are then blended with the contaminated soils. Depending on the type of brick being manufactured,

varying percentages of contaminated soil may be used in the blend mix.

This raw material is stockpiled, completely encased within required compacted impermeable clay non-discharge pads to prevent leaching or run-off of contaminants. One facility, Cunningham Brick Company, stores the soil inside a containment building complete with concrete reinforced floors, reinforced concrete block walls, lighting, and ridge roof ventilation. Another facility, Soil Reclaiming Inc., maintains eight monitoring wells in the area of the non-discharge pad.

The stockpiled material is eventually transferred to a grinding plant where the raw material is reduced to a particle size necessary to form the brick. Brick forming occurs in a pug mill process where water is added to increase the plasticity of the material. The pug mill extrudes a continuous ribbon of clay which is cut to form the brick.

The bricks are stacked on a rail kiln car and taken to the kiln for firing. During this process, brick are exposed to kiln temperatures that exceed 600°F for two days and reach peak tempera-

tures of 2,000°F for a period of approximately 12 hours. The lighter fraction hydrocarbons are volatilized while the heavier fractions are combusted as a fuel which helps fire the brick in the kiln's firing zone. Brick manufactured by this process are hydrocarbon free.

The brick manufacturing companies require a battery of analytical data to prove that the petro-

leum contaminated soil is non-hazardous under RCRA or CERCLA law and any additional regional DEHNR requirements. They also procure representative contaminated soil samples to determine if geologic characteristics are compatible with company manufacturing requirements.

Air quality concerns are handled through the DEHNR air permit process. The Agency is assuming no destruction of volatiles as far as stack emissions are concerned. The permittees/generators are required to have soils sampled and analyzed for volatiles to ensure that contaminant concentrations are no higher than those specified in the brick company's permit for operating at an air emissions source..

Charges for accepting contaminated soil can range between \$30 - \$55 per ton (transportation costs not included), depending on the quantity of soil, level of contamination, and suitability of the soil type for the brick making process. Each brick company has detailed manifesting procedures for transport and delivery of the contaminated material. ■

BRICK MANUFACTURING COMPANIES

The three North Carolina brick manufacturing companies involved in contaminated soil reuse are:

Cherokee Environmental Group

A Division of Cherokee Sanford Group, Inc.
Contact: Rocky Springer, 919/774-5330

Cunningham Brick Company, Inc.

Contact: Richard Cunningham, 919/472-6181

Soil Reclaiming, Inc.

Associates of Lee Brick and Tile Company, Inc.
Contact: Bill Wornom, 919/774-3077

■ STREAMLINING, *continued from page 14*

straight to pump-and-treat systems."

EPA is encouraging the use of new technologies and approaches to improve and expedite site assessment and cleanup. Although the list of cleanup alternatives and combinations of alternatives is expanding (and that's another story), many state agencies and consultants are understandably cautious about jumping in with both feet.

EPA has funded a variety of projects that are designed to promote the use of new, more effective cleanup technologies.

In Alaska, EPA consultants are preparing a manual, matrix, or table that assesses the cleanup levels attainable given the application of various corrective action or remediation technologies. "We're trying to get case history analyses or technology assessment documents out to our staff and to the consulting industry and owners

and operators so we can all pull each other up by the bootstraps and recommend and evaluate proposals that are efficient and cost-effective."

Many state UST/LUST program managers and staff are trying to pull themselves up by the bootstraps. If they manage to get things to working better—more simple and efficient—they've probably done some streamlining. We'll hit on this some more in the next issue of LUSTLine—in the most simple and efficient way we can. ■



Searching For The Honest Tank...

NEIWPCC's New Video & Companion Booklet Deal With UST Facility Compliance Inspections

To shed some light on the subject of underground storage tank (UST) facility compliance inspections, the New England Interstate Water Pollution

Control Commission (NEIWPCC) has produced a new EPA OUST funded 33-minute video and accompanying 40-page booklet titled, *Searching For The Honest Tank: A Guide to UST Facility Compliance Inspections*.

The video stars five UST regulators from across the country and covers UST facility inspection priorities, protocol, equipment, documentation, recordkeeping review, compliance with technical standards, and enforcement and follow-up. The booklet follows the outline of the video in somewhat more detail. While state and local inspectors are the primary audience for this material, the information provides compliance insight for tank owners and operators as well.

Searching for the Honest Tank is the third in a series of video/booklets produced by NEIWPCC with a grant from EPA's OUST. The first 30-minute video and companion booklet, *Tank Closure Without Tears...An Inspector's Safety Guide*, deals with safety issues at tank closure. The second, *What Do We Have Here?...An Inspector's Guide to Site Assessment at Tank Closure*, is actually 3 videos on one tape, a 30-minute feature presentation on site assessment at tank closure, plus 2 short presentations, one on field testing instruments (14-minutes) and another on soil and water sampling (7-minutes).

Copies of the *Searching for the Honest Tank* video and companion booklet can be ordered at a prepaid cost of \$40.00 (shipping and handling included) from NEIETC, 2 Fort Rd., South Portland, Maine 04106. Make checks payable to NEIETC. The video and booklet can also be borrowed from NEIETC for \$10.00. ■

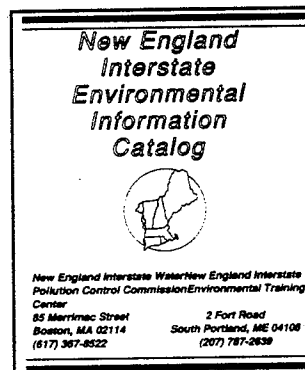
NATaT Training Video and Booklet for Small Town Governments

The National Association of Towns and Townships (NATaT) has released *Getting Out From Under*, a training module on UST alternatives consisting of a 17-minute video and a 79-page guidebook. The module is designed to aid small town local government officials in complying with federal UST regulations by providing "how to" information on all aspects of tank management—from site assessment to closure to replacement. In addition, local leaders are shown several approaches to reduce or remove liability for leaks and spills, such as tank consolidation, regional facilities, and purchasing municipal fuel from the private sector.

The video includes four case studies of economically and geographically diverse small towns and townships which use different approaches to deal successfully with UST issues. The manual acts as the instructional guide.

The video/manual module costs \$50.00 for NATaT members, \$80.00 for non-members. Rental fees are \$20.00 for members and \$40.00 for non-members. The guidebook alone is \$6.00 for members and \$11.00 for others. Copies can be obtained by sending a check or purchase order to: NATaT, 1522 K St., N.W., Suite 730, Washington, D.C. 20005. ■

NEIWPCC's New Catalog



The new NEIWPCC Environmental Information Catalog is now available. The free catalog will be of interest to anyone concerned with water-related environmental issues. It contains technical and non-technical documents, audio-visual materials for loan or sale, and many other NEIWPCC products. To obtain a copy, or to be

placed on the mailing list for updates, call NEIETC office in South Portland, ME at (207) 767-2539. ■

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