New England Interstate Water Pollution Control Commission

255 Ballardvale Street Wilmington Massachusetts 01887

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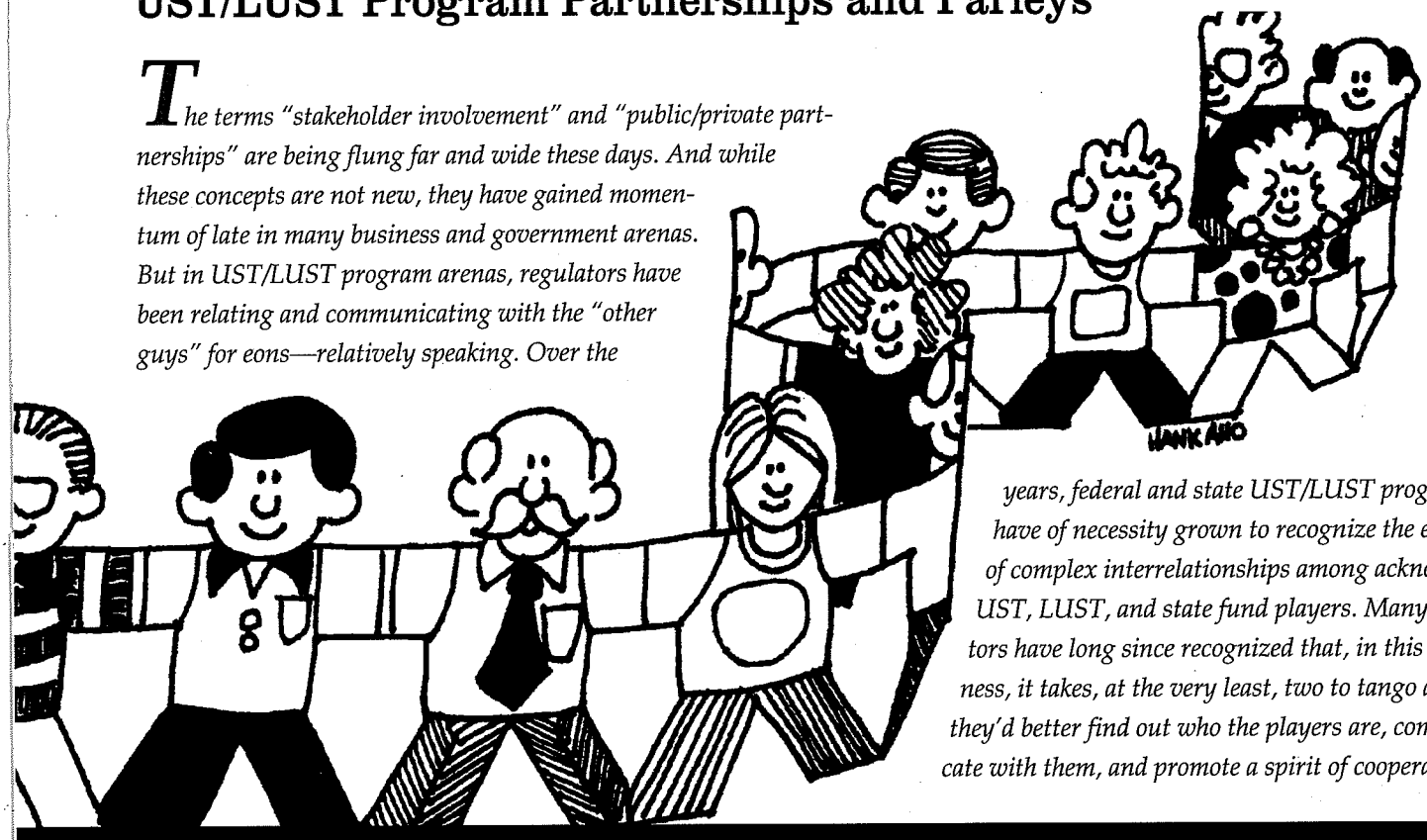
L.U.S.T.LINE

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

ASSEMBLING THE PLAYERS

UST/LUST Program Partnerships and Parleys

The terms "stakeholder involvement" and "public/private partnerships" are being flung far and wide these days. And while these concepts are not new, they have gained momentum of late in many business and government arenas. But in UST/LUST program arenas, regulators have been relating and communicating with the "other guys" for eons—relatively speaking. Over the years, federal and state UST/LUST programs have of necessity grown to recognize the existence of complex interrelationships among acknowledged UST, LUST, and state fund players. Many regulators have long since recognized that, in this business, it takes, at the very least, two to tango and that they'd better find out who the players are, communicate with them, and promote a spirit of cooperation.



Going back ten years ago, EPA's fledgling Office of Underground Storage Tanks (OUST) set up the nation's new tank regulatory program as a state/federal partnership. Recognizing that many states already had a "leg up" on tank regulation and that the federal government's most useful role would be to provide a framework for consistency, Ron Brand, OUST Director at that time, introduced the notion of federal/state "franchising"—EPA would be the franchiser, supporting the state franchisees in ways that would allow them to perform better. On the whole, that partnership appears to have worked well.

Because of the extraordinary size of the regulated tank universe, OUST and the states also recognized early on that

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the traditional "command and control" regulatory approach was not really the best way to win friends and influence thousands of tank owners. While UST/LUST regulators still occasionally have good reason to employ "kick butt" tactics, most also recognize that antagonism can be counterproductive and that a kinder, more empathic approach can be more effective in day-to-day dealings with the regulated community—a cordial, but professional relationship.

OUST solicited stakeholder input way back when the UST regulations were being developed. Afterall, what did environmental regulators know about tank systems, why they leaked, or how they operated? The agency naturally turned to major industry trade associations such as the American Petroleum Institute (API), Petroleum Equipment Institute (PEI), Fiberglass Tank & Piping Institute, Steel Tank Institute (STI), National Association of Convenience Stores (NACS), Petroleum Marketers Association of America (PMAA), and the Society of Independent Gasoline Marketers of America (SIGMA). EPA also produced UST training videos in cooperation with many of these organizations, as well as with the New England Interstate Water Pollution Control Commission.

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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The Growing Circle of Players

If you look at RCRA Subtitle I in terms of its fundamental raison d'être—to make good tank management common business practice—there are a number of entities besides just tank owners and operators who factor into the equation. Good tank management means the prevention, detection, and timely, cost-effective remediation of releases. For this reason, the UST/LUST circle of players, or stakeholders, has necessarily widened over the years. Whereas OUST has had a rapport with representatives from petroleum marketers' associations, oil companies, and petroleum equipment manufacturers for a number of years, more recently it has stepped up dialogue with such interests as insurers, bankers, realtors, appraisers, and property managers.

Lenders and members of the real estate and insurance industries have come to realize that they, too, have an interest in the management of USTs on commercial properties. USTs, properly maintained, have been and should continue to be an asset to a property. There are safe and accepted ways to operate tanks so that they remain assets rather than become liabilities. The OUST view is that it will be mutually beneficial for EPA, states, and interested private industries to join forces in ensuring good tank management.

OUST has recently undertaken a Private Sector Initiative to work with lenders and members of the real estate and insurance industries to find ways to achieve this mutually-beneficial goal. OUST will produce tools and educational materials to assist these industries in addressing USTs during routine business transactions. By incorporating consideration of tank management practices into everyday business decisions and asking the right questions, OUST feels that these industries can create market incentives for tank owners and operators to properly manage their tanks—which would protect the interests of these industries, as well as the environment.

"OUST has always been big on talking with others about issues, real-life experiences, technical expertise, and just general implementation problems," says Lisa Lund, Acting Director for OUST. "We are simply expanding that sphere to include other affected stakeholders. We repeatedly see that solutions to complex problems, such as state fund solvency, small business compliance, or RBCA [risk-based corrective action] implementation, take considerable skill, expertise, political wherewithal, and plain tenacity that is best provided by a broad-based group.

"Our personal experience with partnerships this past year, both with PIRI and the Air Force [see articles on page 5] has led to a leveraging of both resources and technical expertise," says Lund. "This led to RBCA training and implementation support in 43 states and to the TANK RACER cost estimation software.

"We will encourage the states to establish standing committees to deal with tank issues as they arise," says Lund, "with representation that could include a variety of tank owners and operators and other private sector companies such as bankers, facility managers, appraisers, commercial brokers, insurers, tank equipment manufacturers and vendors, environmental groups, legislators, local governments, consultants, and contractors."

Stakeholders and Partners in the States

Most state UST/LUST programs routinely invite input and cooperation from a variety of in-state associations who represent an assortment of tank owning sectors. States also

deal one-on-one with owner/operators, distributors, consultants, and contractors. Covering all these bases takes a considerable degree of diligence.

"Stakeholder involvement is not always easy," says Dennis Rounds, Executive Director of the South Dakota Petroleum Release Compensation Fund (PRCF), "but you get a better product in the end. It used to be that we would write the regulations and then go to public notice to battle it out with the people we were regulating. Now we're getting rid of the sense that the rules are owned by the regulators."

"Stakeholders often feel that government forces regulations on them, even when they are good regs," says Pat Rounds, Administrator of the Iowa UST Financial Responsibility Program. He says involving stakeholders early on helped dispel the perception that Iowa's risk-based corrective action (RBCA) process was developed solely by regulators and then inflicted on all other groups.

"When we get more buy-in from the regulated community up front, we have the potential for greater success with implementing the rule later on," reasons Chuck Schwer, Supervisor of the Vermont Department of Environmental Conservation's Site Management Section. "If the owner or operator has good ideas and we use them, they are more a part of the process. It gets us away from the 'we/they' thing."

Over the years, Vermont has held a number of workshops for consultants and owners and operators. The legislative committee set up to review the state's cleanup fund is, by statute, composed of a state senator, a state representative, the DEC Commissioner, a PMAA member, a distributor, a retailer, and the Vermont Department of Banking and Insurance.

The Leveraging Advantage

"We're much better attuned to the people in the industry than we were," says Lynn Woodard, Supervisor of the New Hampshire Department of Environmental Services (NHDES) Oil Compliance Section. "We've been giving presentations throughout the state this year that are a major effort to break down the barriers and develop a partnership for a win/win situation."

The state is developing partnerships with oil companies and small distributors to enlist their assistance, not only in distributing outreach materials to their customers but also to help their customers determine if they are in compliance or not. To do this, NHDES has developed a compliance "easy check," or self-audit. The agency is asking marketers to audit their own facilities, as well as their customers' facilities.

"We remind the distributors that it really will save them money and grief if their customers are in compliance," explains Woodard. "There are a host of economic advantages to keeping their customers up and running. The 'easy check' makes it easier for owners and operators to understand what they have to do. If they think they are out of compliance, they need to schedule correction."

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>
> *Chuck Schwer*

"Our whole thesis is that compliance is the key to release prevention. So we continuously ask ourselves what we can do to achieve more compliance. We even allow for amnesty situations, where the rules are waived for a certain period of time so that the owner or operator can get moving in the right direction. Of course, if they just ignore us, we won't be so lenient."

To leverage very limited staff resources, New Hampshire is considering entering into another type of partnership which involves privatizing UST inspections. This enforcement approach is much like that of Pennsylvania's, where private sector professionals conduct routine UST inspections and receive payment for this service from the owner/operator.

Iowa's Stakeholder Involvement

LUST remediation involves interaction among states (LUST programs and state funds), responsible parties, consultants, contractors, insurance companies, and so on. The remediation experience can get hairy if states have not set guidelines and explained how things work. In response to complaints raised by Iowa's owners and operators about ineffective cleanups, insufficient funds for necessary cleanups, and difficulty selling contaminated properties, the governor, legislature, and other interested parties began working together to find a sensible solution. In 1995, the legislature enacted a bill that made two significant improvements to the state's UST program: It required the Iowa Department of Natural Resources (IDNR) UST program to adopt a risk-based decision-making process, and it made funds available to pay cleanup costs.

The bill called for the establishment of an eight-member Technical Advisory Committee to help IDNR develop a RBCA rule. Members of the committee were from the state UST fund, Iowa Groundwater Association, Association of Business and Industry, Petroleum Marketers of Iowa, Iowa Environmental Council, Iowa Petroleum Council, Consulting Engineers of Iowa, and Iowa League of Cities. The committee also solicited input from other stakeholders, such as the Iowa Bankers Association.

"This was an open process," says Pat Rounds. "We asked for and received a great deal of input—and we used it. It takes more effort to get it done this way. But I believe not only will this process be better received by the regulated community for their being involved, but it will be a better process because of their involvement."

"IDNR is very pleased with the result," says Alan Stokes, Administrator of the IDNR Division of Environmental Protection. "The stakeholder participation yielded a technically superior product that

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stands a much better chance of being accepted by the people who will have to work with it."

Last December, the committee and IDNR held six public hearings on the proposed RBCA rules throughout the state. They took all the comments and spent the past 6 months rewriting the rules and developing new software and equations to create a RBCA process that is tailored to Iowa. The IDNR expects to adopt the rules in late June.

No State Fund is an Island

The creation of most state funds was driven as much in response to pressure from petroleum marketers as by the need to get sites cleaned up in the absence of financially responsible parties. In that sense, many petroleum marketers' associations have been involved with state funds from their inception. Many funds have established meaningful and productive relationships with these stakeholders. For example, in the last issue of *LUSTLine* we ran a piece called "The Lone Star State Reins-In a Runaway Cleanup Fund." Part 1 of that article showed how the Texas Natural Resource Conservation Commission and the various stakeholders established harmony in the face of discord, working together to revitalize an ailing fund.

Wisconsin is currently phasing out its state fund, assigning remediation of historic contamination to the fund and remediation of new releases to the owner, who must obtain private insurance. "We have a fairly close relationship with the petroleum marketers' associations and other groups who have tanks," says William Morrissey, Director of Wisconsin's Petroleum Cleanup Fund (PECFA).

"These groups formed a consortium to work out unified positions on various tank issues. Once they got through the initial phase of recognizing that the purpose of Wisconsin's fund was to cleanup historic contamination, they were able to move ahead and take the lead in addressing the broader issue of insuring risks. They talked to the insurance companies and developed guidelines for their memberships in selecting policies.

Many petroleum marketers' associations have been involved with state funds from their inception. Many funds have established meaningful and productive relationships with these stakeholders.

"Each month we write an article on anything from insurance issues to the financial status of the fund to closure or installation issues and fax it to the various groups, including installers," continues Morrissey. "They, in turn, publish this information for their members.

"Our relationship with our stakeholders gives us some important advantages," says Morrissey. "The members actually see the information we produce; the members develop a feeling for what we are trying to do as an agency; and our overall strategy of cooperation allows for a business, as well as a regulatory, relationship."

Just to show that it is possible to have a good rapport with the regulated community and still mean business, Wisconsin has pulled 40,000 regulated tanks out of the ground since 1988. Furthermore, the UST program locks dispensers on a regular basis when owners or operators haven't complied with orders.

"Our marketers know that we are spending $100,000,000 on cleanup claims and that we don't want to do this in the future," explains Morrissey. "Our stakeholders are the key to resolving problems. We need to talk to them. If they accept the concepts of what we do, then they will understand why we lock out a tank. For the most part, our stakeholders and our legislators understand the context within which we do something. If we lock out a tank and shut down some guy's livelihood because the tank is leaking, people understand, especially because the cleanup fund has been paying to cleanup those leaks. If we lock out a tank because we've written a series of compliance orders and nothing was done, most people understand the reason."

Some states, such as Iowa and Washington, operate their funds in partnership with insurance companies. Many states that are on a fund phase-out schedule are working cooperatively with insurance companies to ensure a smooth transition.

Florida, for example, has been weaning its tank owners and operators away from its fund and into insurance coverage. The fund began with $1,000,000 coverage; it currently covers the first $300,000; that will drop to $150,000 in 1997; and as of January 1, 1999, the fund will not contribute to the remediation of any new discharges. The state originally had a contractual agreement with one insurance provider to underwrite the excess coverage; more insurers are now involved. As Florida's fund phases back, the insurers are taking over the excess coverage and keeping their premiums very low, primarily because the state fund has kicked-in the up-front costs. Bill Truman, Environmental Manager with the Florida Department of Environmental Protection, says premiums are expected to remain reasonable. In Florida, the insurers have learned a lot about tanks from the state's regulatory program. In fact, insurance underwriting criteria are based on Florida's rules.

That Happy Medium

Most regulators and state fund managers who have a good relationship with stakeholders agree that building this relationship can be painstaking, but it is worth the trouble. UST regulators have a responsibility, first and foremost, to protect human health and the environment. As long as that goal underlies partnership and stakeholder parlance, then why not strive for that win/win situation? ■

EPA, States, Stakeholders Sign On For PIRI

Partnership in RBCA Implementation

In March, EPA, state governments, the American Society for Testing Materials (ASTM), Amoco Oil Corp., British Petroleum Oil Co., Chevron USA, Exxon Co., Mobil Oil Corp., and Shell Oil Co. signed a Memorandum of Understanding (MOU) which creates a voluntary Partnership in RBCA Implementation (PIRI). The agreement is a vehicle for coordinating all stakeholder efforts to support adoption and use of risk-based corrective action (RBCA) processes in state UST programs.

"This partnership offers a common-sense, cost-effective way to protect public health by targeting the leaking tanks that pose the greatest risks to public health and the environment," says EPA Administrator Carol Browner. "We look forward to working with industry and the states to achieve better environmental results."

Most states' UST programs have expressed an interest in taking advantage of the ASTM RBCA training program and developing a RBCA process. The ASTM program consists of three modules which are provided to state regulators by ASTM-approved trainers. RBCA implementation consists of assisting state efforts to develop and test their own state-specific guidelines/regulations for carrying out the RBCA process. This assistance to state efforts may come in the form of providing peer reviews, financial and technical assistance, and sites for demonstrations.

Two distinct sources of funds were established to support the work of PIRI. First, EPA has established a cooperative agreement with ASTM to provide RBCA training to state and tribal UST programs. Second, members of the petroleum industry provided funds to ASTM to establish a separate account, designated as the ASTM Private Sector Account. Other members of the private sector (e.g., other tank owners, insurance companies, real estate or banking associations) are also eligible to add funds

to the private sector account. The funding in this account will be used for RBCA training and implementation support.

Functional Roles in the Partnership

There are two different functional roles defined by PIRI for participating parties:

- Key Stakeholder - A PIRI partner who works with other partners and stakeholders to coordinate the effort to provide requested support to a given state's RBCA training and implementation.
- Stakeholder - Any party, from a major oil company to a small owner/operator, from a consulting firm to an environmental group, interested in participating in and supporting a state's RBCA training and implementation. Stakeholders may, but are not required to, contribute funds to the effort and are not considered to be official partners or voting members of PIRI.

PIRI will coordinate the formation of a "cluster" of stakeholders for each participating state. On behalf of PIRI, one partner will play the primary role (key stakeholder) in coordinating that effort for each state. Any other party (stakeholder) interested in the state's RBCA effort is encouraged to participate in the cluster. While PIRI will address RBCA issues on a national basis, each cluster's function focuses on involvement and participation at the state level. Within a cluster, PIRI's role is to facilitate requested support and to coordinate the provision of necessary resources. ■

For More Information about PIRI, contact Bob Greenfield at OUST, (703) 603-7154.

TANK RACER

EPA /Air Force Partnership To Improve Cost Estimation for LUST Cleanups

by Deborah L. Tremblay and Dana S. Tulis

Generating fast, accurate, and comprehensive cost estimates for leaking underground storage tank (LUST) cleanups can be complicated and challenging. Just ask Michael Piotrowski, president of Matrix Remedial Technologies. "There are many unforeseen or hidden costs that are difficult to predict at the beginning of a cleanup. Generating comprehensive cost estimates can be a slow, tedious process, which is especially frustrating when clients need estimates quickly."

Michael's complaints are well-placed. The average cleanup includes more than a hundred cost components from vapor extraction wells to laboratory fees to decontamination equipment. In addition, billing often takes place over numerous phases of a cleanup that can span time frames of several years.

Reviewing reimbursement claims isn't simple either. "There are no standardized cost reports," laments Lori Cessna, a cost reviewer with the Kentucky assurance fund, "each party has different billing statements."

Robert Hastings with Shell Development Company agrees, "The lack of consistency in presentation of cost estimates is a big problem. In addition, it's difficult to determine if a consultant has designed the remediation system to maximize cost savings while still meeting cleanup goals."

While each of these issues is independently problematic, together they lead to inflated and/or unnecessary cleanup costs. To improve cost estimation for both the public and private sectors, EPA's Office of Underground Storage Tanks (OUST) formed a partnership with the U.S.

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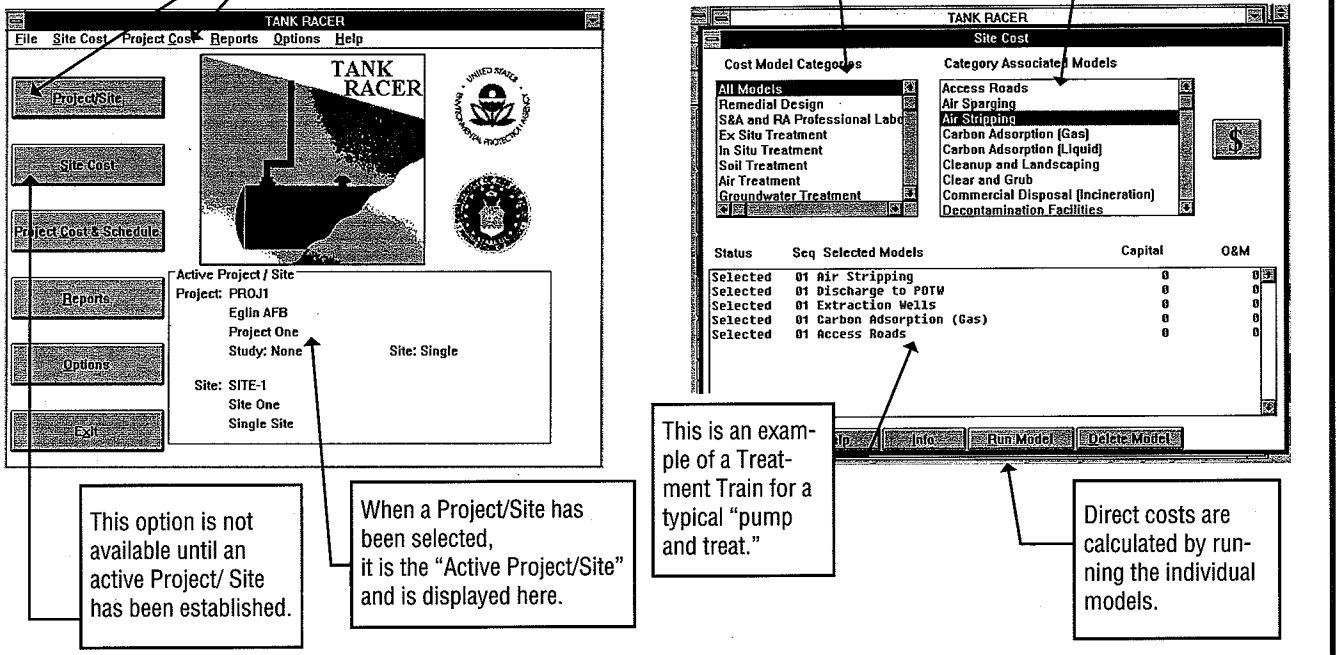
Sample TANK RACER screens



■ TANK RACER *from page 5*

Air Force to develop TANK RACER software.

TANK RACER is windows-based PC software that provides fast, accurate, and comprehensive cost estimates for LUST site assessments and corrective actions on a site-specific basis. The software is designed to enable all parties to avoid paying inflated cleanup costs.

TANK RACER supports OUST's effort to promote faster, more effective, or less costly cleanups. The software is customized for UST sites and estimates costs for all phases of remediation including:

Tank closure
Site assessment
Remedial design
Remedial action
Operations and maintenance
Site work and utilities

The Beta Test

To ensure that TANK RACER would truly meet the needs of state funds and the private sector, OUST developed a beta test group to provide input on all aspects of the software design and useability. The beta test group included representatives from eight state funds, three major oil companies, and three consulting firms. The beta testers helped OUST design TANK RACER to enable users to answer the following questions with confidence:

- ***Could a less expensive technology achieve the same results?***
- ***Are the charges in this reimbursement claim reasonable?***
- ***Does this cost estimate include all costs?***
- ***Is this piece of equipment necessary?***

To generate a cost estimate, users are prompted to enter site-specific information regarding the technologies that will be used at the site, the conditions and geology of the site, and the nature and extent of the contamination. TANK RACER then calculates location-specific costs that can be downloaded into a variety of cost reports to provide various levels of detail.

TANK RACER can produce cost estimates that are preliminary or final; the level of specificity depends on the user's needs and the nature of the data input into the program. The user controls the levels of parameters and quantities used within the system, including the default quantities and unit costs.

State funds can easily load their desired unit costs into the TANK RACER database. Major oil companies and consulting firms can do the same. The software also contains default cost data from the U.S. Army Corps of Engineers. These data are updated every year. The data include costs for alternative site assessment and remediation options such as:

Bioremediation
Air sparging
Soil vapor extraction
Natural attenuation
Dual phase extraction
Bioventing
Thermal desorption
Immunoassay test kits

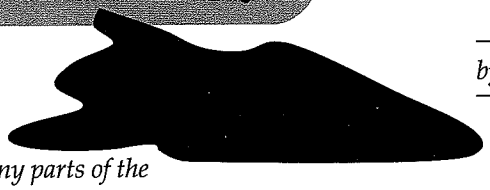
EPA strongly recommends that users take a 2-day TANK RACER training workshop prior to using the software. The total cost of the workshop and software is $495/person for regulators and $740/person for non-regulators (these rates are for workshops with 15 participants). Lower rates can be negotiated for larger workshops. ■

To learn more about TANK RACER, you may order free brochures and demonstration disks by contacting Mick Edgar or Scott Henson at Delta Research Corporation (phone: (904) 897-5380, fax: (904) 897-5380).

Investigation and Remediation

MTBE...

If Ye Seek It, Ye May Well Find It...And Then What?



by Pat Ellis and Frank Gavas

In many parts of the United States, a gasoline additive called methyl tertiary butyl ether (MTBE) is used to meet some of the requirements of the Clean Air Act. But to UST program regulators, whose job is to protect human health, safety, and the environment, MTBE has become a growing concern. What exposure levels are safe? Do we need to revisit how leaks from tanks are investigated? If we find MTBE in soil or groundwater, how do we get rid of it?

Here in Delaware, we decided to try to find out what was known (and not known) about MTBE in order to establish a state policy with respect to releases of MTBE from underground petroleum storage tanks. Our discussions with representatives from UST programs in other states indicate that there is a wide range of action and cleanup standards, as well as a wide range of awareness about the chemical.

This article summarizes available information on MTBE—the history of its use; reasons for its use; some of the literature on health concerns; fate, transport, and chemical characteristics; and cleanup technologies. There are conflicting opinions as to whether the benefits of adding MTBE to gasoline outweigh potential health risks associated with releases to the air or groundwater. What became clear to us, as we researched MTBE, was that additional work needs to be done to determine whether such additives should continue to be used in the long term. It also reinforced our belief that we must do our utmost to prevent petroleum from being released into the environment.

Fuel Oxygenates

The 1990 Clean Air Act Amendments (CAA) called for the formulation of cleaner burning and less volatile gasoline products to help address carbon monoxide and ozone pollution problems. This new formulation involved blending a certain percentage of oxygenates (organic compounds that contain oxygen) with gasoline to increase oxygen concentrations in gasoline blends. The use of oxygenates in gasoline allows for more complete fuel combustion and, therefore, fewer combustion byproducts, significantly reducing tailpipe emissions of carbon monoxide, ozone or smog-forming compounds, and hazardous air pollutants such as benzene and carbon monoxide. The oxygenates most commonly used in reformulated gasoline are methyl tertiary butyl ether (MTBE), a petroleum product made from natural gas, and ethanol, an agricultural product made from corn.

MTBE is the most widely used motor fuel oxygenate in the United States. According to *C&EN* magazine, 17.62 billion pounds of MTBE were produced in 1995. MTBE is eighteenth in chemical production in the country and the third most produced organic chemical.

Since the phase-out of lead in gasoline began in 1975, high octane oxygenates such as alcohols and ethers have been used increasingly in the production of gasoline. MTBE has been used throughout the United States to boost the octane of conventional gasolines since 1979. In that capacity, less than 1 percent was added to regular gasoline; the amount added to premium gasolines was in the range of 2 to 9 percent. MTBE has an octane rating of 110; ethanol has an octane rating of 112.5. This is in contrast to octane ratings of 97 for benzene, 103.5 for toluene, and 109.5 for xylene.

MTBE was first produced by ARCO in the 1960s, when the company patented a process for removing branched olefins such as isobutylene from hydrocarbon streams. It is manufactured by reacting isobutylene with a small amount of methanol. MTBE is now manufactured at 40 facilities in the United States. More than 50 percent is produced by seven companies in the Texas/Louisiana Gulf Coast area.

MTBE became the oxygenate favored by industry because of its low cost and ease of production at refineries, favorable blending characteristics with other fuel components, and lack of phase-separation problems in the presence of water. With increases in methanol prices and the trend toward less volatile gasolines, there has been significant interest in producing other fuel ethers, such as ETBE (Ethyl Tertiary Butyl Ether), TAME (Tertiary Amyl Methyl Ether), and DIPE (diisopropyl ether). These ethers are in use today, but far less extensively than MTBE.

The MTBE Sphere

The Clean Air Act Amendments of 1990 called for the augmented use of MTBE in certain urban areas of the country. The act requires all states with carbon monoxide pollution problems to implement "oxygenated gasoline programs," and all states with ozone pollution problems to implement "reformulated gasoline programs." (Oxygenated gasolines contain 2.7 percent oxygen by weight; reformulated gasolines contain 2 percent oxygen.)

Since 1992, oxygenates have been added to gasolines in selected areas of the country during the winter to reduce the amount of carbon monoxide (CO) in the atmosphere. Carbon monoxide pollution is caused by incomplete combustion of fuels and is more severe during winter months. There are currently 30 cities in 21 states in the oxygenated fuel program. Many other areas of the country have voluntarily chosen to use oxygenates to abate air pollution. Analysis has shown that atmospheric CO reductions on the order of 6 to 15 percent can be attributed to the use of oxygenated fuel.

Since January 1, 1995, "reformulated gasoline" (RFG) has been used year round in areas of the coun-

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try with serious ozone air pollution problems. RFGs reduce smog-forming emissions from motor vehicles by as much as 15 percent. RFG is used statewide in Connecticut, Delaware, Massachusetts, New Jersey, Rhode Island, and the District of Columbia. It is also required in portions of California, Illinois, Indiana, Kentucky, Maine, Maryland, New Hampshire, New York, Pennsylvania, Texas, Virginia, and Wisconsin, including the following greater metropolitan areas:

Los Angeles	New York
San Diego	Pittsburgh
Washington, DC	Philadelphia
Dallas-Fort Worth	Chicago
Louisville	Houston
Baltimore	Milwaukee

At present, during winter months, areas subject to the oxygenated gasoline program use an MTBE-oxygenated gasoline that contains approximately 15-percent MTBE by volume, or approximately 2.7-percent oxygen by weight—the federally mandated standard for the oxygenated fuels program. Until the production of MTBE can be increased to meet the demand, the 15-percent content in gasoline requirement will apply only during the winter months. For the rest of the year, the RFG program requires RFG to contain 2.0 percent oxygen by weight.

Approximately 65 percent of the nation's oxygenate requirement is satisfied by MTBE, which is more heavily used in the Northeast and Mid-Atlantic regions; the Midwest and Southwest regions use MTBE to fill between 30 to 60 percent of their oxygenate demand. The remaining demand is supplied by ethanol. As of January 1, 1995, approximately one third of all gasoline sold in the U.S. has been reformulated gasoline, although much of the rest of the national gasoline supply has some MTBE.

As regulators who are trying to protect human health, we are still in a dilemma, and will be until further study has been done on the long-term effects of exposure to MTBE, or until firmer numbers are released for safe exposure levels.

The Health Risk Picture

As you read the following sections on health effects and MTBE, you will probably experience a general sense of confusion and fuzziness. If you are looking for a bottom line, it simply is this: We still don't know what risk MTBE poses to human health and the environment. As regulators who are trying to protect human health, we are still in a dilemma, and will be until further study has been done on the long-term effects of exposure to MTBE, or until firmer numbers are released for safe exposure levels. Until then, we face the possibility of exposing people to unsafe levels of MTBE inadvertently. If we choose to err on the overly-protective side, we must also recognize that we may drive up cleanup costs unnecessarily.

As with any chemical, MTBE can pose a potential health risk to humans via three exposure routes: Skin contact, ingestion, or inhalation. As a component of gasoline, MTBE, unless mishandled, poses little risk from a skin exposure route standpoint. The greatest risk for human exposure to MTBE is via inhalation at gasoline pumps or ingestion from contaminated groundwater.

Health risk is evaluated by integrating knowledge of chemistry, exposure, and physiology. Most chemicals, including MTBE, can cause adverse health effects at some concentration and duration, usually at high levels over a long period of time. At this time, there is no reason to assume that a serious carcinogenic, teratogenic, or mutagenic threat is posed by MTBE inhalation. Toxicological data for MTBE ingestion is quite limited and deserves further evaluation. The following sections summarize some of the human and animal studies with MTBE.

Studies of Human Exposure

Health complaints concerning MTBE in air were first reported in November, 1992 in Fairbanks, Alaska. Individuals reported headaches, nausea, coughing, dizziness, disorientation, and eye, nose, and throat irritation. Subsequently, the Centers for Disease Control and Prevention (CDC) and the State of Alaska conducted a joint health study, which was carried out in two phases: Phase I took place while MTBE was present in the gasoline; Phase II took place when MTBE was removed from gasoline and replaced with ethanol.

The study indicated a correlation between inhalation exposure to MTBE and detection of MTBE in the blood. "The differences in blood MTBE concentration between Phase I and II were statistically significant." The study indicated there was "a statistically significant correlation between the air concentration measurements of MTBE during Phase I and subjects' blood concentrations."

The study also revealed a greater prevalence of complaints among the occupationally exposed individuals during Phase I compared with Phase II. Subjects from Phase I had a higher symptom rate than those in Phase II. Heightened public awareness of oxygenated fuels and the concurrent 14-cent per gallon rise in gasoline prices may, the EPA believes, have confounded study results.

EPA has not established a scientific explanation for the acute symptom complaints, although such complaints have been expressed in many areas of the country where oxygenates are in use. Acute symptom complaints were reported and investigated in Milwaukee, Wisconsin. In this 1995 study, Chicago and Milwaukee represented the RFG area, while the rest of Wisconsin represented the non-RFG area. However, the study is complicated by the fact that half of the RFG area used ethanol and the other half used

MTBE. With that in mind, the number of complaints between the Milwaukee area and the rest of Wisconsin was more pronounced than when the Chicago area was compared with the rest of Wisconsin.

The Oxygenated Evaluation Committee of the Health Effects Institute (HEI) in Cambridge, Massachusetts concurs with the conclusions reached by the Wisconsin investigation and the statement of the scientific panel that reviewed the study that it "does not support a conclusion that exposure to RFG is associated with widespread or serious health effects" and that the study "does not rule out the possibility that some individuals may have greater sensitivity to RFG mixtures."

From a toxicological standpoint, a possible explanation for the acute symptom complaints may be based upon low odor thresholds as related to human chemical sensitivity. Laboratory studies, using human volunteers, indicate that MTBE can be identified as a distinct odor at concentrations in air as low as 90 parts per billion (ppb), although in one case, users of an MTBE-impacted water supply complained of undesirable taste and odor when MTBE concentrations were as low as 5 to 15 micrograms per liter. At the other end of the spectrum, EPA's draft health advisory gives us thresholds of 680 micrograms per liter for odor and 700 micrograms per liter for taste.

It is reasonable to assume, based upon human genetic variability, that a given percentage of the human population is more sensitive to MTBE than others. The CDC has stated that, "It is possible that those persons willing to participate in the Alaska study were more likely to report health complaints."

Additional inhalation studies were conducted in Stamford, Connecticut and Albany, New York where the oxygenated fuel program was less publicized. The same general correlation between MTBE in air and in blood was found without the associated acute symptoms. Seven oxygenated fuel programs had been operating in the U.S. prior to the Alaska study. These programs have had a high level of public acceptance.

Pollution Engineering (Sept. 1995) reported that EPA's investigations of MTBE were stalled by ethical concerns over exposing human test subjects to carcinogens in a laboratory. A policy workshop considered having people "especially susceptible to chemically-induced symptoms" inhale vapors from different gasoline mixtures, but workshop attendees argued over risks to the subjects versus the need to gather data on MTBE quickly.

Evidence gained from future studies will shed new light on the MTBE health risk issue. The Environmental Health Institute at Rutgers University is about to begin an inhalation study in which human volunteers will be exposed to gasoline, with and without added MTBE, at concentrations that could be expected at gasoline stations. The volunteer subjects will be people who suspect that they are ultra-sensitive to oxyfuels.

Most MTBE exposures occur over a short period of time (e.g., while dispensing gasoline) and at a low concentration. Current vapor emission control devices at the pumps greatly limit gasoline levels in the breathing zone.

Animal Testing

Laboratory studies using rodents indicate that there may be long-term health effects from exposure to MTBE. Most animal testing, however, involved exposure to high levels of contaminants over a very short period of time. Whether these results would occur at the lower exposure levels that humans are more likely to experience is unknown. Also unknown is whether the data can necessarily be extrapolated from rodents to humans, and whether inhalation studies should be used to generate safe ingestion levels.

Most MTBE exposures occur over a short period of time (e.g., while dispensing gasoline) and at a low concentration. Current vapor emission control devices at the pumps greatly limit gasoline levels in the breathing zone. Additionally, studies indicate when it is inhaled, MTBE is rapidly and virtually completely eliminated from the body via exhalation and urine.

In a recent MTBE inhalation study on rats at Exxon's Bushy Run Research Center (Bird, et. al., unpublished), adverse health effects were observed only at high concentrations of 3,000 ppm and 8,000 ppm MTBE in air. The rats were exposed to the target concentrations for 6 hours a day, 5 days a week, for 24 months.

Some of the health effects observed during animal testing may be related to metabolic breakdown of MTBE. When inhaled or ingested, MTBE is quickly taken up in the bloodstream and distributed to body water. MTBE may be exhaled, excreted in urine, or metabolized to tertiary butyl alcohol (TBA) and formaldehyde. Both TBA and formaldehyde are potential human carcinogens. No human studies have been done with TBA; however, it causes kidney tumors in male rats and thyroid tumors in female mice. Formaldehyde is a rodent carcinogen which causes nasopharangeal cancer.

A recent study reported in the *Journal of the American College of Toxicology* notes that renal (kidney) changes were observed in male rats that received high doses of MTBE. The authors concluded that these changes had little toxicological significance for humans. It is interesting to note that MTBE is considered to be of relatively low toxicity. The Food and Drug Administration has approved MTBE for human intraductal injection to dissolve cholesterol stones.

The current carcinogenicity assessment of MTBE supports a hazard classification of "possible" human carcinogen or group C based on limited animal evidence. The Health Effects Institute evaluated EPA's 1994 "Health Risk Perspective on Fuel Oxygenates" and concluded that the carcinogenic effects of MTBE observed in laboratory animals are of concern with respect to the potential health risks of human exposure. EPA's report states that the two inhalation studies of MTBE support classifying the chemical in Group C as a possible carcinogen and that an additional study in which MTBE was administered orally (Belpoggi and others, 1995) may provide enough evidence to classify MTBE as a Group B2, probable human carcinogen.

■ *continued on page 10*

MTBE *from page 9*

The Lingering Questions

HEI's Oxygenates Evaluation Committee issued a special report this April entitled "The Potential Health Effects of Oxygenates Added to Gasoline: A Review of the Current Literature." This report was commissioned by EPA and the Centers for Disease Control and Prevention. The institute noted that the potential health effects from exposure to gasoline containing MTBE include: Headache, nausea, and sensory irritation in some (possibly sensitive) individuals, based on reports of exposure to oxygenates; acute, reversible neurotoxic effects, based on changes in motor activity in rats at high exposure levels; and cancer, based on increases in the frequency of tumors at multiple organ sites in rats and mice at high exposure levels.

Although questions persist about how to interpret each of these observed effects, they nevertheless point to a potential human health risk. No epidemiological studies of health effects of prolonged exposures to MTBE have been conducted. Because of this lack of human data, the potential human cancer risk of MTBE exposure must be estimated using data from studies such as long-term animal bioassays for genotoxicity. Evidence demonstrates that long-term high level exposures to MTBE by either oral or inhalation routes of exposure cause cancer in rodents.

Looking qualitatively at the whole picture, it is unlikely that using fuel containing oxygenates would substantially increase the overall health risk from fuel used in motor vehicles. HEI's Oxygenates Evaluation Committee did not find that the questions about potential health risks were sufficient to warrant an immediate reduction in oxygenate use. It did conclude, however, that a number of important research needs must be met if there is to be continued widespread use of oxygenates over the long term.

In an October 16, 1995, draft letter to EPA Assistant Administrator for Air and Radiation, Mary Nichols, the White House Office of Science and Technology Policy says MTBE poses no immediate threat to human health but also notes that the long-term health impacts of the additive are unknown (Environmental Policy Alert, October 25, 1995).

It is important to note that MTBE is a component of gasoline which is considered a "probable" human carcinogen (ORD, US EPA, 1993). Experts at HEI concluded, based upon a review of the current body of evidence, that there seems to be little likelihood of a human hazard from MTBE under normal use (MTBE Task Force, 1995).

As we promised earlier, at this point in your reading, you probably feel as though you've been riding a health effects roller coaster!

Cleanup Standards?

Because MTBE is added to gasoline, it may be found in groundwater when gasoline is spilled or released from underground storage tanks or piping. In fact, all known environmental releases of MTBE have been associated with its production, storage, and use in gasoline. Because much of the country relies on groundwater as its major supply of potable water, the presence of MTBE in the soil-groundwater environment is cause for concern.

In a recent study conducted by the U.S. Geological Survey, water samples were collected from 211 shallow monitoring wells in 8 urban areas and 524 shallow wells in 20 agricultural areas. Chloroform and MTBE were the two most frequently detected volatile organic compounds (VOCs). MTBE was detected in 1.3 percent of the agricultural wells and 27 percent of the urban wells at varying concentrations that ranged from below detection to 23 parts per million (ppm). In Denver, Colorado, MTBE was detected in 79 percent of the wells sampled.

Currently, there are no established federal drinking water standards for MTBE or any of the fuel oxygenates. Roy L. Smith, senior toxicologist with EPA Region 3, has issued a risk-based concentration for MTBE of 180 parts per billion (ppb) in tap water. Klan and Carpenter (1994) have calculated a reference dose for MTBE in drinking water of 200 ppb. A reference dose is an estimate of a daily exposure to the human population likely to be without appreciable risk of deleterious health effects during a lifetime. These levels are designed with safety factors that are considered to be reasonably protective of human health.

Without a national standard, many states have established their own cleanup standards for MTBE with ranges as low as 40 ppb in

What is a Drinking Water Health Advisory?

The federal Health Advisory Program, sponsored by the EPA Office of Water, provides information on the health effects, analytical methodology, and treatment technology that would be useful in dealing with the contamination of drinking water. Health advisories describe nonregulatory concentrations of drinking water contaminants at which adverse health effects would not be anticipated to occur over specific exposure durations. These advisories contain a margin of safety to protect sensitive members of the population.

Health advisories serve as informal technical guidance to assist federal, state, and local officials responsible for protecting public health when emergency spills or contamination occur. They are not to be construed as legally enforceable federal standards. Health advisories are subject to change as new information becomes available. ■

South Carolina and as high as 50,000 ppb in Massachusetts, for low risk sites. Eleven states have established drinking water standards for MTBE. Only about 20 states currently monitor for MTBE.

EPA has included MTBE on its drinking water priority list as a candidate for future federal regulation and is scheduled to release a final health advisory regarding MTBE in 1996. The agency has had a draft drinking water lifetime health advisory for MTBE since January 1992 and is currently considering a drinking water health advisory in the range of 20 to 200 ppb. (See Health Advisory sidebar.) Final decisions have not been made at the federal level regarding regulating MTBE. EPA expects to issue a final health advisory during the fall of 1996.

Atmospheric Washout

The atmospheric deposition factor may account for a number of widespread reports concerning low level MTBE measurements (up to 2 ppb) in areas where petroleum releases are unlikely to have occurred. EPA's Toxic Release Inventory states that 3.8 million pounds of MTBE are released into the environment per year from the 141 facilities that report to the inventory; 2.4 percent is released directly to water. An estimated 3.7 million pounds of MTBE are released to the air each year from gasoline production and blending processes. Releases related to vehicle use add up to 40 to 50 million pounds per year from evaporative emissions and 110 to 130 million pounds per year from exhaust emissions. Refueling activities account for the release of approximately 3.7 million pounds per year.

According to Richard A. Rykowski in a manuscript submitted to *Risk Analysis: An International Journal*, based on estimates of annual rainfall and the percent of the country using MTBE gasoline, wet precipitation gives us a potential 2.3 million pounds per year of MTBE in the rain, assuming a very conservative transfer efficiency. However, the percent of water that percolates to the groundwater is only about 3.6 percent of the annual rainfall. Most of the rainfall runs off into surface water, and the rest usually evaporates or transpires back into the atmosphere. This groundwater infiltration provides a potential net transfer of 82,000 pounds per year into the groundwater system from wet precipitation.

Solubility

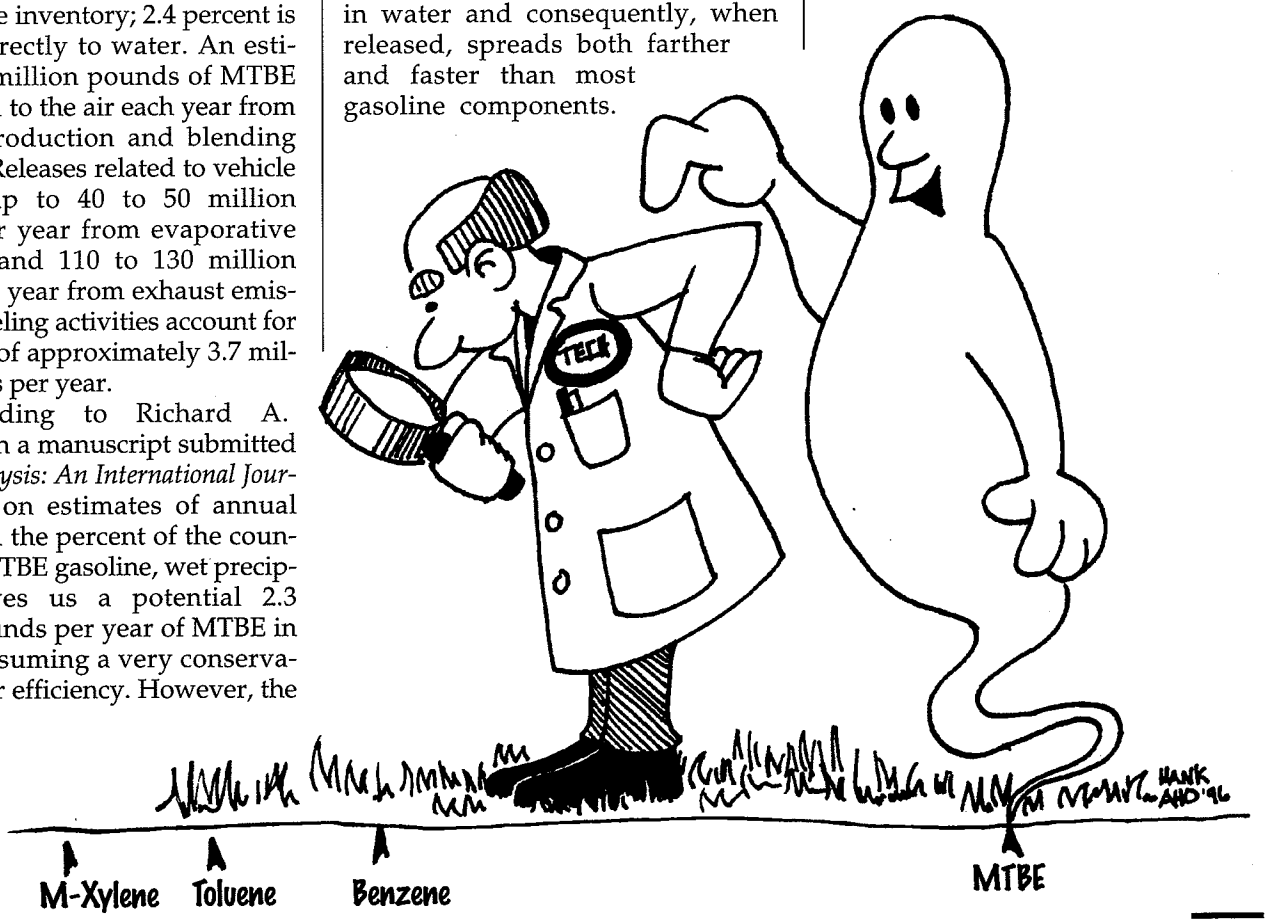
Studies of the behavior of benzene, toluene, ethylbenzene and xylenes (BTEX) in the subsurface have investigated the fate of these compounds in pure form or as derivatives of gasoline, with no additives. However, because of their high water solubility, oxygenates such as alcohols and ethers, pose special concerns with respect to groundwater quality. When released, they can be expected to occur in high concentrations (e.g., 1,000s of ppm) in groundwater and may influence the fate and transport of other gasoline constituents such as BTEX.

MTBE is 4.3 percent soluble in water. When compared to the relative solubility of benzene (0.18%), toluene (0.05%), and xylene (0.02%), MTBE is substantially more soluble in water and consequently, when released, spreads both farther and faster than most gasoline components. Methanol is completely water soluble and moves at the same speed as groundwater.

Conrad and Deever report in a 1995 study that one result of the high solubility of MTBE is its rapid depletion from the gasoline phase when in contact with groundwater and water infiltrating from the surface. As a consequence, interpretation of groundwater and free product analyses from a spill site could be quite confusing if MTBE is detected in the water but not in the free product. Because of their lower water solubilities, the aromatic compounds will be leached from the gasoline phase at a much slower rate than the MTBE. Thus, a spilled product may appear to be relatively fresh based on BTEX concentrations, yet most of the original MTBE could be missing.

It has been hypothesized that oxygenates in gasoline may act as co-solvents, increasing the water solubility of typically less soluble fuel constituents such as BTEX. In a laboratory study by Piel (1989), however, ethers such as MTBE did not exhibit a co-solvency effect for aromatic compounds such as BTEX. However,

■ *continued on page 12*



■ **MTBE** *from page 11*

alcohol additives, methanol and ethanol, may increase the water solubility of some aromatics. Since alcohols and ethers are octane enhancement alternatives to aromatics, the addition of up to 15 percent MTBE in gasoline results in a reduction in gasoline aromatic content, and consequently a reduction in the BTEX groundwater threat.

Conrad and Deever report that a 1990 study by Mihelcic demonstrated a moderate co-solvency effect for aromatic compounds as MTBE concentration increased. They also reported that a 1991 American Petroleum Institute study in the Borden Aquifer showed that while MTBE at very high aqueous concentrations (up to the MTBE solubility limit) may have an apparent co-solvency effect on pure BTEX compounds, this effect is not significant at the much lower dissolved concentrations typical of oxygenated gasoline in contact with water.

MTBE may serve as an early warning indicator, limiting the consumption of and exposure to contaminated water. Because MTBE has high solubility and low odor and taste thresholds for human beings, it will form the leading edge of a release and should be detected immediately by odor or taste in impacted potable water.

Fate and Transport

From a fate and transport standpoint, there are trade-offs associated with the introduction of oxygenates. Besides their high solubility, the other big factors associated with the release of these compounds into the environment is their relative mobility and, in the case of MTBE, persistence. Mobility refers to the ease of transport (i.e., lack of retardation) of the compound in groundwater, using the groundwater velocity as the standard of comparison. Persistence addresses the rate of mass loss due to microbial transformation processes. BTEX and methanol are known to be biodegradable, while MTBE appears to be slightly degradable to non biodegradable.

Roy F. Weston, Inc. conducted a modeling study to determine the expected migration profiles of oxygenates and aromatics in a groundwater aquifer. That study determined that the profile of the oxygenates is nearly that of the water itself. Alcohol moves at the same speed as the groundwater; ethers move slightly less quickly than groundwater and much faster than the aromatics.

Jim Davidson of Alpine Environmental, Inc. reviewed 30 blended gasoline spills in one state, where there was a range of 2 to 7 years since the fuel release. When considered two-dimensionally, the area contaminated by MTBE was typically 1.5 to 2 times larger than the area impacted by BTEX alone. He points out that other spills in other locales may have different ratios.

In 1994, the Institute for Groundwater Research at the University of Waterloo, under contract to the American Petroleum Institute, presented the results of a field study of the fate and transport of two gasoline additives, methanol and MTBE, in groundwater. The study attempted to determine the influence of these compounds on the fate and transport of benzene, toluene, ethylbenzene, and xylene in groundwater.

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The study compared the behavior of three simulated releases: 100-percent gasoline; 10-percent MTBE and 90-percent gasoline; and 85-percent methanol and 15-percent gasoline. The objective was to create three dissolved contaminant plumes of similar size that would travel side by side in the same flow system and geochemical environment. Sodium chloride was added to each plume to act as a conservative, unreactive tracer. Concentrations of dissolved components were monitored over a 16-month period in three dimensions using a dense network of multilevel sampling probes.

The comparative assessment of the fate and transport of both BTEX and the oxygenates was accomplished by evaluating the relative mobility and persistence of these compounds. The study showed that the methanol and MTBE mobility is similar to that of the chloride and groundwater, while the BTEX constituents are less mobile. Benzene moves at about 90 percent of the groundwater velocity, toluene at about 75 percent, and ethylbenzene and xylene move at about 67 percent. Neither MTBE nor methanol causes a measurable difference in the mobility of the BTEX constituents relative to the control case. MTBE is recalcitrant to biodegradation in the aquifer. Methanol is rapidly degraded after an initial lag period of about 100 days. BTEX constituents degrade in all plumes—toluene and m-xylene are the most easily degraded, followed by o-xylene and p-xylene, and benzene.

Jim Davidson (1995) reports that all available evidence demonstrates that MTBE's presence does not interfere with, or slow down, the biodegradation of hydrocarbon compounds. Because of its very low biodegradability, MTBE is not expected to use significant oxygen which might cause a reduction in the aerobic biodegradation of aromatics. In contrast, methanol has been found to inhibit the biodegradation of aromatics in two ways (API, 1994): Initially by methanol toxicity and then, later, because the bugs prefer to eat the methanol before they eat the aromatics.

Cleanup Technologies for MTBE

Remediation technologies that are relatively effective in removing BTEX from soil or groundwater include air stripping, carbon adsorption, soil vapor extraction, UV-catalyzed oxidation, in-situ biological treatment, and ex-situ (aboveground) biological treatment. However, with the exception of soil vapor extraction, which appears to be very effective for MTBE, the other processes do not appear to be as effective for MTBE as for BTEX. Thus, treatment costs will be higher, or the time required for remediation of MTBE will be greater than for BTEX. In general, remedial options are likely to increase as new tech-

nologies are evaluated. The following is a brief overview of the effectiveness of current cleanup technologies in treating MTBE.

Air Stripping The relatively high solubility of MTBE in comparison with BTEX compounds indicates that MTBE is not as easily stripped from water. However, it is technically feasible to remove MTBE from groundwater by stripping if the air/water volume is higher than for BTEX. It is estimated that operating conditions that would remove 99 percent of the BTEX constituents would remove only about 75 percent of the MTBE.

Bass and Sylvia (1992) found that heating the water in an air stripper was an effective way to increase stripper efficiency. Using exhaust from the catalytic oxidizer and an inline heater, the influent water temperature could be increased by as much as 64° F, increasing MTBE removal efficiency from 75 to 94 percent. Butillo and others (1994) further confirmed the increased efficiency of heated air stripping, which would require less activated carbon in the polishing process.

Carbon Adsorption Although effective in removing aromatics like BTEX, carbon adsorption as a stand alone technology is not cost effective for MTBE removal. The carbon required to remove equal concentrations of MTBE and BTEX would be at least 3 times as high for MTBE as for the BTEX compounds. A 2-cubic foot carbon bed used for household treatment lasts a month or less with an influent MTBE concentration of only a few parts per million. Therefore, the characteristics of the organic matter present in the groundwater should be considered when evaluating its effects on granular activated carbon (GAC) adsorption capacity.

Carbon filtration is frequently used as a point-of-entry (POE) treatment system for impacted domestic wells. GAC is quick and easy to install, but breakthrough can occur within weeks with a 2-cubic foot unit where MTBE levels are in the 200-300 micrograms/liter range. As an emergency or interim measure, GAC can be a good alternative to reduce health risks, but it cannot replace continued efforts to remediate the groundwater contamination at its source, or to provide a permanent, alternative supply of safe drinking water.

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Soil Vapor Extraction Soil vapor extraction is commonly used to remove gasoline contaminants from the unsaturated zone at spill sites. Computer modeling has shown that it is easier to remove MTBE than BTEX and naphthalene due to its relatively high vapor pressure and low affinity for organic carbon in the soils. The other oxygenates like ETBE and TAME would be removed less easily, due to their higher boiling points and lower vapor pressures.

Bioremediation The resistance of ether oxygenates like MTBE to biodegradation is well documented. At the University of Oklahoma, Suflita and Mormile tested alcohol, ketone, ester and ether oxygenates for susceptibility to anaerobic decay. The ethers were generally not degraded, regardless of the electron acceptor used. There may still be some hope for a bioremedial option, however. A research group at the Shell Development Company in Houston, Texas recently isolated a mixed bacterial culture that is capable of degrading MTBE. Also, a study was conducted by the Petroleum Environmental Research Forum (PERF) to evaluate the aerobic biodegradability of MTBE in an ex-situ bioreactor. Biodegradation was observed immediately after inoculation with an isolated MTBE-degrading bacterial culture.

UV-Catalyzed Oxidation MTBE and other organic contaminants in groundwater can be oxidized in an aboveground treatment process using hydrogen peroxide (H2O2) or ozone (O3) and an ultraviolet (UV) light source to catalyze the oxidation reaction. To destroy equal amounts of BTEX and MTBE, it would take 2 to 5 times as much electrical energy to destroy the MTBE.

Point-of-Entry Treatment Systems In designing point-of- entry (POE) treatment systems, wide variations in flow must be taken into account. This is particularly true in the case of individual water supplies. Two alternatives exist to deal with these variations, either longer-term monitoring prior to system design, or designing in larger safety factors to account for variations.

One possible POE design consists of aeration, followed by GAC as a safeguard. In addition, pre-treatment may be necessary to control iron and manganese, and disinfection may be needed due to increased microbial activity. Several studies have shown that MTBE will be the controlling factor for POE systems using GAC, because of rapid breakthrough.

A number of papers have been written about treatment technologies for groundwater contaminated with MTBE and other oxygenates. For example, a 1991 study by IT Corporation for the American Petroleum Institute provides an overall evaluation of eight technologies for the removal of MTBE from groundwater: Air stripping with carbon adsorption, air stripping with off-gas incineration and carbon adsorption, air stripping alone, heated air stripping, steam stripping, diffused aeration, biological treatment, and ultraviolet oxidation. The study also provides a cost analysis of each technology based upon the design criteria.■

References used in this article are available upon request. Please contact NEIWPCC at (508) 658-0500.

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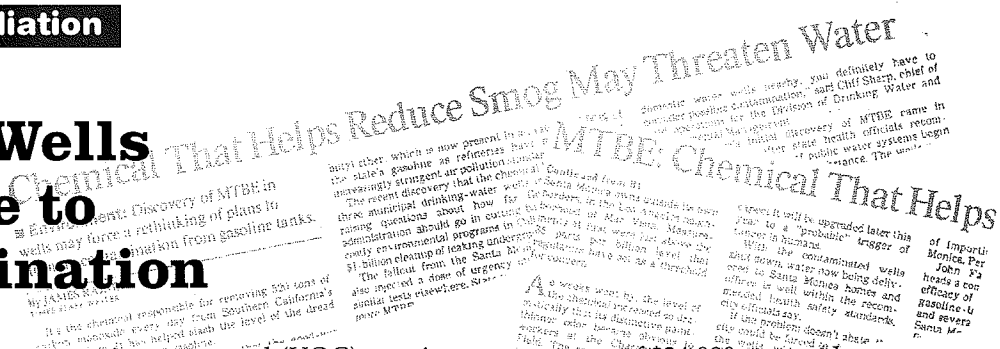
Investigation and Remediation

Santa Monica Wells Shut Down Due to MTBE Contamination


Chemical That Helps Reduce Smog May Threaten Water
MTBE: Chemical That Helps

The discovery of MTBE (methyl tertiary butyl ether) in drinking water wells in Santa Monica, California has resulted in the shutdown of four of five wells in the city's primary Charnock Well Field located in the Mar Vista area of Los Angeles. The well field provided 40 percent of the city's drinking water. MTBE was detected in early February shortly after the State Department of Health Services recommended that water supply systems add MTBE to their volatile organic compound (VOC) monitoring analyses. Testing for MTBE will become mandatory later this year.

Initial measurements in the Santa Monica wells were just above the 35 parts per billion (ppb) action level set by regulators; since then levels have reached concentrations as high as 590 ppb. With the four wells shut down, the city has had to purchase additional water from the Metropolitan Water District of Southern California, imported from the Colorado River and Northern California, at a cost of $24,000 per week.

The city has instituted extensive testing to determine the responsible party(s). As part of this investigation the city is identifying all gasoline facilities within reasonable proximity to the wellfield and reviewing their current and past site histories. Once the responsible parties have been identified, the city will require that the responsible party(s) solve the problem they have created and compensate the city for costs that have been incurred. ■

On The MTBE Horizon

White House Office of Science and Technology Policy Report

The White House Office of Science and Technology Policy (OSTP) conducted a comprehensive study on the effects of oxygenates (e.g., MTBE) on air quality, health, surface and groundwater quality, and fuel performance. OSTP completed an internal draft of this report and submitted it to the National Academy of Sciences (NAS) for peer review. NAS reviewed the report and on June 11 released its evaluation of the draft report. OSTP will look at this evaluation, make changes as appropriate, and release a final report later this summer.

Although the OSTP report has not been released as yet, the NAS report has. The following two paragraphs are a statement from EPA in response to the June 11, 1996 "National Academy of Sciences Report on Air Quality and Health Effects of Winter Gasoline."

"We agree with the National Academy of Sciences that additional research is valuable to completely understand the full benefits of oxygenated fuels in cold weather. EPA asked for the NAS review to make sure that all questions about MTBE are properly raised and addressed. The Academy confirms that the oxygenated fuels program does not pose risks that differ greatly from conventional gasoline, nor does it appear to pose a substantial human health risk.

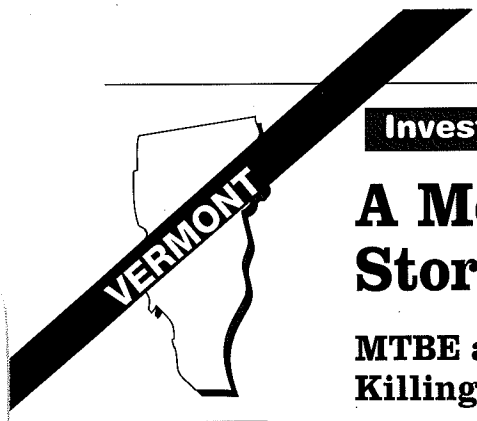
Carbon monoxide from motor vehicles, which oxygenated gasoline helps to reduce, causes significant health risks including aggravated heart and lung disease. EPA and the states have had years of experience with the winter oxygenates program. Since the introduction of the program, cleaner fuels have contributed to improved air quality for millions of Americans. Along with the studies completed by several other scientific organizations, the NAS research recommendations will be able to help us in our ongoing effort to responsibly monitor the effectiveness of the [oxygenates] program under temperatures of 20 degrees. If future research were to show that MTBE did not produce real benefits for cleaner air and human health, we would act to modify the program."

Also on the Horizon

Seventeen technical papers were recently submitted to *Risk Analysis: An International Journal* for consideration as publications in an MTBE-dedicated supplemental issue. These papers address three broad areas: Health benefits of MTBE; health and safety of MTBE inhalation; and health and safety of MTBE ingestion via drinking water.

Cleanup Strategy Issues

MTBE contamination may turn out to be an important issue as states develop their RBCA programs and select their chemicals of concern. If MTBE is chosen as a chemical of concern, it would clearly have an impact on state remediation strategies. ■



Investigation and Remediation

A Moving Story

MTBE at Summit Lodge—Killington, Vermont

by Bob Haslam

In November of 1993 the Vermont Department of Environmental Conservation (VT DEC) received a report from a landowner in Killington, Vermont that his bedrock drinking water supply had a gasoline odor. Subsequent analysis of samples collected from this water supply revealed BTEX compounds at concentrations approaching 9,000 ppb and MTBE concentrations of nearly 2,000 ppb.

The contaminated site is adjacent to Summit Lodge, a major ski resort, that is surrounded by vacation homes, restaurants, retail shops, and two apartment complexes. Another 85 bedrock water supply wells are located within a 2,000 foot radius of the contaminated well.

The source of contamination was a 20-year old 275-gallon gasoline UST located at the lodge, approximately 180 feet from the contaminated water supply. The UST, which was designed as an aboveground heating oil tank, was unpermitted and the owners maintained no product inventory. Interviews with the owners revealed that the tank's throughput was quite high despite its small size. Releases from this 275-gallon tank resulted in a $600,000.00 cleanup. Why? The answer is MTBE.

The Hole Boring Picture

There is no overburden aquifer at this mountain site. Thus, releases from the tank , which may well have been ongoing for a number of years, migrated directly into fractured bedrock. In addition, the drinking water well had been drilled unwittingly through the contaminated bedrock. A low-yielding, contaminated upper fracture and a high-yielding, non-contaminated lower fracture provided the water yield of this well. The new bore hole provided a direct connection between the two fracture zones—the higher head upper fracture was leaking approximately 1.5 gpm to the lower fracture, particularly when the well was under non-pumping condition. Over 1 million gallons of water contaminated at concentrations averaging approximately 25,000 ppb total BTEX and 3,000 ppm MTBE are estimated to have leaked into the lower fracture zone before any hydraulic control over the contaminated plume could be initiated.

Monitoring results over the next 18 months tracked a contaminated plume migrating through the bedrock and ultimately impacting 27 bedrock wells in the vicinity of the release. The rate of migration was influenced by the high use of the aquifer by the large number of residences and businesses, and the high solubility and mobility of MTBE.

Early on, the need for an immediate and comprehensive remedial response for this site was evident. Because of the known potential for MTBE to migrate long distances in groundwater and the large numbers of potential receptors at this site, the decision was made shortly after discovery to actively remediate the bedrock aquifer and overburden soils. After an expedited, but thorough, site characterization, a remedial strategy was selected. Soil vapor extraction was chosen to remediate the soils in the source area. Pump-and-treat was implemented in the bedrock aquifer, not so much to remediate of the aquifer as to limit the migration of additional contaminants through it.

Impact

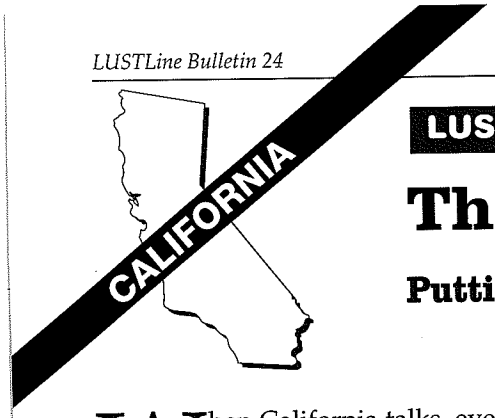
After 18 months of operation, over 200 gallons of gasoline have been recovered from the bedrock aquifer through pump and treat; just over 1,100 gallons have been recovered from the soils by vapor extraction. Recovery rates are estimates based on mass conversions using PID data for the vapor system and water quality data for the groundwater system. To date, the soils are almost entirely remediated. Only 9 of the 27 wells remain contaminated. Those of us who were involved with the cleanup believe that the degree and duration of impact to the water supplies was greatly reduced as a result of the active remediation at the site.

Had the VT DEC not evaluated the contamination from MTBE, the remediation strategy would have been markedly different. Remediation would likely have been focused only on the overburden soils—which would have greatly reduced project costs.

The impact from BTEX compounds was limited to the two wells nearest the source area. Twenty-five of the 27 contaminated wells were affected only with MTBE. The MTBE plume migrated some 10 times the distance of the BTEX plume and was approximately 20 times the aerial extent of the BTEX plume.

Had the VT DEC not evaluated the contamination from MTBE, the remediation strategy would have been markedly different. Remediation would likely have been focused only on the overburden soils—which would have greatly reduced project costs. However, such shortsightedness would have resulted in MTBE exposure to a large population of well users. ■

Bob Haslam is a Hazardous Materials Specialist with the Vermont Department of Environmental Conservation's Waste Management Division.



LUST Investigation & Remediation

The Report That Made a Splash

Putting the Lawrence Livermore Report Into Perspective

When California talks, everyone listens. That's why its important to get the facts straight about things that happen in California...especially the facts that have to do with a certain report conducted by the Lawrence Livermore National Laboratory (LLNL) for the California State Water Resources Control Board (SWRCB) and partially funded through a California LUST cooperative agreement with EPA Region 9. Various media sources did a great injustice to the LLNL report, SWRCB's response to the report, and to LUST programs across the country by misrepresenting the findings.

News stories and talk shows across the country fanned the rumor that the LLNL report and subsequent memoranda from SWRCB were intended to halt UST removals and cleanups. On the contrary, the LLNL report and SWRCB actions are not an attempt to discontinue cleanup of petroleum releases in the State of California. This report is, according to a statement from EPA's Office of Underground Storage Tanks, part of an ongoing effort to update and streamline the process by which petroleum releases are cleaned up without compromising protection of human health and the environment. This report is part of an effort to bring good science to the management of petroleum releases in California.

Questions have been asked concerning the implications of this report with respect to the national UST program and individual state programs. "The LLNL study has to be thought of in the context of the California program," says Kevin Kratina, Chief of the New Jersey Department of Environmental Protection's Bureau of USTs and Co-chair of Association of State and Territorial Solid Waste Management Officials' (ASTSWMO's) LUST Task Force. "LLNL applies only to how California was implementing its program. Each state runs its own LUST program. To look at this report in terms of other states, you must fully understand how other states operate."

A number of state UST programs and legislatures received phone calls and press releases from die-hard foes of tank regulation, flaunting the report as ultimate proof that UST programs should be terminated. Afterall, the LLNL report had concluded that naturally occurring microorganisms in the soil could cleanup releases better and cheaper than technology could. Well, yes, sometimes...but, again, let's get our facts straight.

"When the report was ultimately reviewed by EPA and the states in an objective manner," says Kratina, "it was clear that the study fully supported tank closure, source contamination removal, and groundwater cleanup and monitoring within the context of a state's risk-based decision-making process."

Why the LLNL Study?

California has been re-examining its approach to cleaning up LUST sites. This decision came about, in large part, because the state's cleanup rate for LUSTs was less than 24 percent, far below the national average of 38 percent in 1994. The state has over 28,000 confirmed releases. On top of this, the state cleanup fund is shelling out a good portion of the cleanup money, and the demand far outstrips available revenue. California officials estimate it will take another $2.5 billion to get the job done by the fund's sunset date of January 1, 2005.

"Every site has been treated with the same high priority for cleanup," explains David Deaner, Manager of California's UST Cleanup Fund. "If we had been using a risk-based corrective action approach, many of these sites would have simply been monitored or even closed."

In an attempt to get a grip on its LUST conundrum, SWRCB contracted with LLNL to conduct a study on the fate and transport characteristics of petroleum leaks in California using historical data from a large number of sites. The study was undertaken to provide scientific information to support decisions regarding the state's LUST cleanup policies. An effort was made to select sites from areas in California where the majority of USTs and petroleum releases are located.

Shortly after the SWRCB decided to undertake the LLNL study, the state legislature directed the board to evaluate its leaking underground fuel tank (LUFT) program. In addition to placing several mandates on the LUFT program, the legislature called for the establishment of a Technical Advisory Committee comprised of professionals with expertise in such fields as chemistry, biology, geology, engineering, and health. The committee had the task of reviewing the following areas of the state's LUFT program:

- Groundwater monitoring requirements;
- Remediation techniques and methodologies;
- Criteria for satisfactory completion of remediation;
- Cleanup standards; and
- Policies, guidelines, and methods used to establish cleanup standards.

The Technical Advisory Committee submitted its recommendations to the SWRCB in early June regarding changes the California LUFT program needs to make to ensure that cleanup standards are technically feasible and necessary to protect human health, safety, and the environment.

The LLNL Report Recommends...

The LLNL conducted an 18-month review of the regulatory framework and cleanup process currently applied to California's LUST sites. The report, which was issued last

October, included the following recommendations:

- Utilize passive bioremediation as a remediation alternative whenever possible.
- Immediately modify the American Society of Testing Materials (ASTM) Risk-Based Corrective Action (RBCA) framework based on California's historical LUST case data.
- Apply a modified ASTM RBCA framework, as soon as possible, to LUST cases where fuel hydrocarbons have affected soil but do not threaten groundwater.
- Modify the LUST regulatory framework to allow the consideration of risk-based cleanup goals higher than maximum contaminant levels (MCLs).
- Identify a series of LUST demonstration sites and form a pilot LUST closure committee.

EPA Says...

EPA supports the review of accumulated historic data in an effort to perceive trends and to make better program decisions. Lisa Lund, Acting Director for EPA OUST, states that there is much in this report that can assist California in designing a risk-based corrective action process that includes categorization and screening tables. EPA is concerned, however, with the broad recommendations made by the report based on limitations of the technical study of the historic data.

For example, the study evaluated only benzene as the contaminant of concern. Although benzene, which is readily degradable, is routinely found at LUST sites, compounds such as methyl tertiary butyl ether (MTBE) which is very soluble, highly mobile in groundwater, and resistant to biodegradation, and polyaromatic hydrocarbons (PAHs) were not evaluated. Exposure pathways beyond groundwater impacts (e.g., air, surface water, soil) were not reviewed in detail. Fate and transport in geological conditions such as bedrock, fractures, or karst environments were not reviewed.

The study was limited to 271 sites representing fully characterized contaminant plumes in groundwater, compared to over 10,000 LUST sites statewide that impact groundwater and a total of 28,000 LUST sites. For reasons such as these, according to EPA, the recommendations in the LLNL report should not be applied to sites or scenarios that differ dramatically from the parameters of the study. The authors recognized that the study had limitations and state that only more predictable release scenarios were investigated.

> ***"...natural attenuation is an active remediation choice; that it is chosen at a site that is deemed to not be low enough risk to simply close but that requires some action to protect human health and the environment. As such, monitoring should be performed to ensure that what is expected is actually occurring at the site."*** *Lisa Lund*

Natural Attenuation Does Not Mean "Do Nothing"

The study's conclusion concerning natural attenuation also causes EPA some concern. EPA has expressed on many occasions that natural attenuation is one of many available remedial options that may be appropriate at a LUST site. "It should be noted," states Lund, "that natural attenuation is an active remediation choice; that it is chosen at a site that is deemed to not be low enough risk to simply close but that requires some action to protect human health and the environment. As such, monitoring should be performed to ensure that what is expected is actually occurring at the site."

EPA's LUST program does not advocate one cleanup technology over another; rather, the focus is on determining the appropriate technology or combination of technologies taking into consideration both the conditions of the site and the nature and extent of the release. EPA maintains that, in general, these decisions need to be risk-based and made on a site-by-site basis, with all exposure pathways and chemicals of concern evaluated and monitored. Passive bioremediation is just one of many available remedial options that may be appropriate at a LUST site.

Passive bioremediation should not be interpreted to mean "do nothing." This remedial option requires characterization of the site, assessment of potential risks, evaluation of potential effectiveness, and documentation of remedial progress (monitoring) similar to other remedial action technologies. EPA supports the appropriate application of passive bioremediation for cleanup of LUST sites and is currently working with ASTM to develop a national standard for remediation by natural attenuation.

"The Lawrence Livermore report certainly gave the impression that active remediation is being applied at many sites in California where very low levels of groundwater contamination remain," says Kevin Kratina. "Many other states have already been applying natural attenuation in similar cases or even closing these sites out."

The ASTSWMO LUST Task Force is preparing a position paper on the LLNL report. In its draft, the task force states that it supports the use of natural attenuation following source removal as defined by implementing agencies, provided adequate site assessment and receptor evaluations are completed and remedial effectiveness is monitored.

"Natural attenuation is a cost-effective remedial action. In New Jersey we've found there is, on average, a $175,000 difference between active remediation and natural attenuation," says Kratina. "We've been using natural attenuation as the primary approved remedial action at approximately 65 percent of New Jersey's UST cases that have approved remedial action plans for the last 3 years."

Paradigms Shifting

As far as the ASTSWMO LUST Task Force is concerned, the LLNL report provided the very basis to foster a paradigm shift within California's regional water boards and county and local UST cleanup implementing agencies toward more cost-effective groundwater remediations by using natural attenuation through some kind of a RBCA decision-making process. This paradigm shift has occurred to varying degrees within many implementing agencies in California and across the country within the context of laws, regulations, and policies established by the implementing agencies. ■

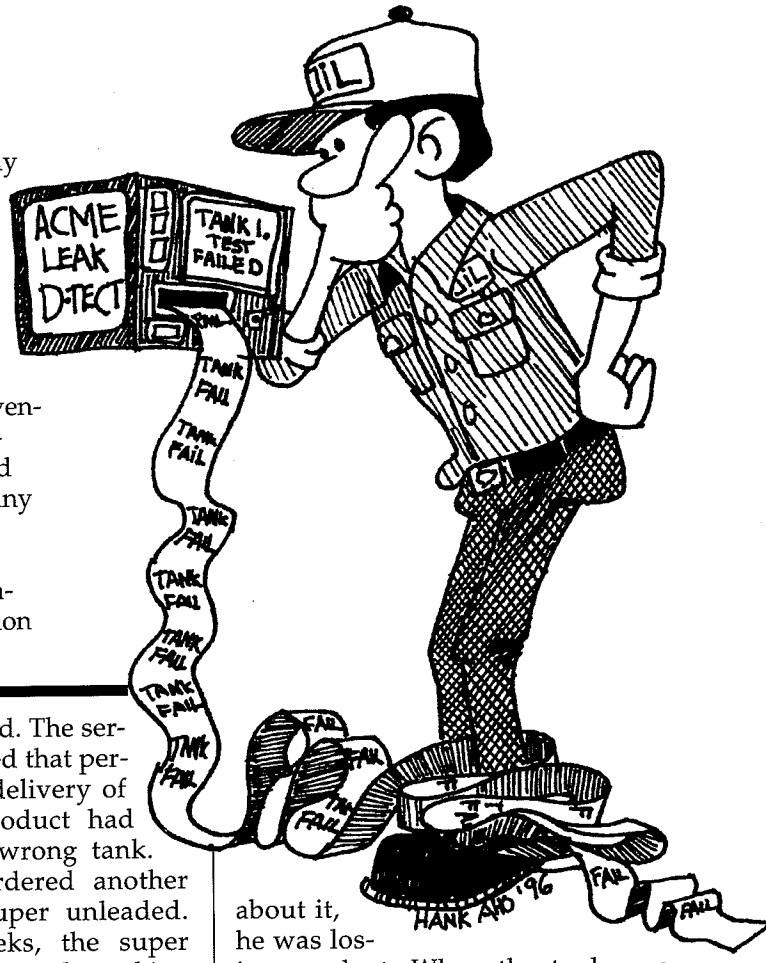
Leak Prevention

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.*

The ABCs of ATGs



Fifteen years ago, if you wanted to know how much liquid was left in your underground gasoline tank, there was only one way to do it: Insert a long wooden stick into the tank and see at what level the stick was wet. In today's world of large tanks, very high throughput facilities, and careful management of fuel inventories, the wooden stick is rapidly becoming obsolete. Liquid fuel measurement has entered the electronic age, and the wooden stick is being replaced by the automatic tank gauge or "ATG."

Automatic tank gauges can dramatically improve fuel inventory recordkeeping and underground tank leak detection accuracy. Unfortunately, however, while the technology has entered the electronic age, a great many owner/operators haven't—many still regard their tank gauges as convenient, but over-priced, wooden sticks. They do not fully utilize the fuel management capabilities of these devices, nor do they understand the regulatory requirements associated with their use as tank leak detection devices.

When ATG Means "Another Tank's a Goner"

Here's a true story that illustrates how some people don't understand the ABCs, let alone the XYZs, of ATGs. A tank owner installed an ATG at a facility where the tanks were a few years old. Everything was fine for the first few months, but then one morning the ATG printout showed that the super unleaded tank had failed a leak test. The owner called the service person.

The service person got a reading of the product level from the tank gauge, confirmed the reading with a gauge stick, declared that everything was working fine, and went on to his next call. But the next morning the printout, again, indicated a failed test. The service person returned and removed the probe from the offending tank. The problem went away...but not for long. A week later the service person was called back because the super unleaded pump wasn't working.

The service person determined that the pump was fine, but that the tank was empty. The owner said this was impossible; he had not sold that much super unleaded. The service person suggested that perhaps the previous delivery of super unleaded product had been made to the wrong tank.

The owner ordered another 3,000 gallons of super unleaded. Within a few weeks, the super unleaded pump stopped working again, and like before, the tank was determined to be empty. This time the service person suggested that someone was stealing the product. The owner ordered another 3,000 gallons of super unleaded and waited, under cover, for a week at his facility to catch the thief. The thief never appeared, but within a few weeks, the super unleaded tank was, once again, prematurely empty.

At this point, the owner began to suspect that the tank might have a problem. The service person (who had also installed the tank) insisted that the tank could not be leaking. The owner ordered another 3,000 gallons of super unleaded, locked the fill pipe and dispenser, and monitored the product level with a gauge stick (because the ATG probe had not yet been replaced). No doubt about it, he was losing product. When the tank was finally excavated, the affliction was apparent: the steel tank had split a seam. And, to top it off, the town's water supply well was a half mile from the tank.

The irony of this story is that had anyone bothered to look, the ATG would have revealed at the press of a few buttons that there had been no delivery to the wrong tank and no one was stealing product in the middle of the night. Instead, millions of dollars were spent cleaning up 10,000 gallons of product when a little knowledge about ATGs (and quick response to the problem) could have cut the loss to a few hundred gallons.

So let's zoom in on these ATGs and answer such basic questions as: How do they work? What kinds of information do they provide? And

what recordkeeping procedures are required when they are used to meet leak detection requirements?

How Do ATGs Work?

An ATG system consists of a probe that is permanently installed inside each buried storage tank and a box, or "console," that is mounted on a wall inside the facility. The console, which is connected to the probes by wires, processes and communicates the information produced by the probes. There are three common types of ATG probes: Magnetostrictive, ultrasonic, and mass measurement. All three types of probes are well suited to the job and can provide the required level of measurement accuracy.

Magnetostrictive Probes consist of long rods that extend down to the bottom of the tank. The rods have two donut-shaped floats that can move up and down the length of the rod. One float is designed to float on top of the product level in the tank; the other floats on top of any water that may be present in the bottom of the tank. Both floats contain magnets.

To understand how a magnetostrictive probe works, you must think back to high school physics and remember that whenever an electric current flows through a wire, a magnetic field is produced around the wire.

The probe determines the liquid level by sending a pulse of electric current down a wire inside the rod. The pulse of current induces a magnetic field around the wire which interacts with the magnetic field produced by the magnets in the floats. This interaction of the two magnetic fields produces a slight twisting movement in the wire that travels along the wire to the top of the probe.

A small sensing coil at the top of the probe detects the arrival of this twist. The time elapsed between the initiation of the electric pulse and the arrival of the wire's twisting movement at the top of the probe is precisely measured and is used to determine the distance between the floats and the top of the probe. This distance is converted to depth of liquid and the depth is converted to volume of liquid, based on information that has been programmed into the ATG concerning the dimensions of the tank.

Magnetostrictive probes typically measure temperature at five discrete points on the probe, using temperature sensing devices called thermistors that are built into the central rod of the probe.

...while the technology has entered the electronic age, a great many owner/operators haven't—many still regard their tank gauges as convenient, but over-priced, wooden sticks. They do not fully utilize the fuel management capabilities of these devices, nor do they understand the regulatory requirements associated with their use as tank leak detection devices.

Ultrasonic Probes work by sending a high frequency sound wave from a transducer, located in the bottom of the tank, upward through the liquid in the tank. The sound wave reflects from the surface of the liquid and travels back to the transducer which acts as a microphone and "hears" the signal. Like the magnetostrictive probe, it is the travel time of the signal that is measured and used to calculate the liquid depth, which is then converted to liquid volume, based on the tank dimension information that has been programmed into the ATG.

Because the speed of sound in a liquid varies with temperature, there are calibration rods built into the probe that are a known distance from the transducer. Using measurements of the time it takes for signals to reflect from these rods, the device calculates the temperature of the product and corrects the product level measurement for temperature effects.

Water in the bottom of the tank can be measured by setting the transducer above the tank bottom and sending a signal downward that will reflect off the water/product interface if one is present. Another water measuring technique involves using a small float that sits at the bottom of the probe. A small wire extends upward from this float and is bent at a right angle above the transducer so that this wire will reflect a small portion of the sound pulse back to the transducer, providing an measurement of water depth.

The software that processes the transducer signals must be able to distinguish the reflections coming from the water interface (water sensor), the calibration rods, and the liquid level.

The Mass Measurement technique utilizes a sealed, hollow glass cylinder that is several inches in diameter and slightly less than the diameter of the tank in length. The glass cylinder is suspended inside the tank from a very sensitive scale that monitors its weight. According to Archimedes' principle, the weight of the cylinder will be reduced by an amount that is exactly equal to the weight of the liquid displaced by the cylinder.

In other words, the weight of the glass cylinder is proportional to the percentage of the probe that is submerged below the liquid level in the tank. For example, when the tank is nearly full of product and the glass cylinder is almost fully submerged, the weight of the cylinder measured by the scale will be approximately half the weight measured when the tank is half full and the cylinder is only half submerged. With proper calibration, the weight of the cylinder is converted by the ATG software into a liquid level.

The mass measurement technique compensates for temperature effects quite elegantly. The weight of the glass cylinder depends on the weight of the liquid that the cylinder displaces, and the weight of the liquid (its density) varies with temperature.

Fortunately, the liquid density and the liquid volume are inversely related; as the liquid becomes less dense, the liquid volume increases and vice versa. As a result, a rise in temperature of the liquid produces an increase in the volume of the liquid (and a rise in liquid level) and a corresponding decrease in the density of the liquid, so that the net weight of the liquid displaced by the glass cylinder remains constant. Consequently, the weight of the

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glass cylinder also remains constant despite changes in temperature.

To make the liquid level measurement independent of temperature changes is a little more difficult in an underground tank, because the surface area of the liquid varies with the liquid level in the tank. For this reason, changes in liquid level will not be exactly compensated by the changes in liquid density unless the glass cylinder is shaped so that it is proportional to the shape of the tank. To accomplish this, the glass cylinder has a slightly larger diameter in the middle and tapers toward both ends. This shape reflects that of the tank which has a larger horizontal diameter in its mid-section than near its top and bottom. Because of the precisely calculated taper in the glass cylinder, changes in liquid level caused solely by temperature do not affect the weight of the probe.

Water in the bottom of the tank is detected by a separate sensor that uses conductivity to measure water depth. Because knowledge of the product temperature is not required for this measurement technique to work, ATGs equipped with this type of probe usually report only the gross volume (see below) of liquid in the tank.

What Information Do ATGs Provide?

Although there are some differences in the probe technology and internal software of the many brands of ATGs available, virtually all of them provide identical output information. Typical ATG output includes:

- **Facility Identification** The facility name and address are printed on paper tape output to identify the facility.
- **Date** The current date is printed on paper tape output.
- **Time** An internal clock is required to conduct leak tests. ATGs also can be programmed to print reports or conduct tests at specified times.
- **Product Liquid Level** The depth of product in inches (usually to the nearest hundredth of an inch).
- **Gross Product Volume** The volume of product calculated from the measured depth of liquid and tank dimension information entered into the ATG by the installer. Note that while the liquid level can be measured very accurately, the accurate calculation of product volume is completely dependent on the data provided by the person installing the ATG
- **Net Product Volume** This is the temperature-compensated volume of product or the volume the product would have if it were at 60° Fahrenheit.
- **Water Depth** The depth of water in the tank in inches (usually to the nearest tenth or hundredth of an inch).
- **Water Volume** The volume of water present calculated from the measured depth of water and the tank dimension information entered into the ATG by the installer.
- **Ullage Volume** The capacity of the tank minus the gross volume of product. This is the volume of the empty space in the tank.
- **90 Percent Ullage** The usable space left in the tank. Most tanks have overfill prevention devices that do not allow the tank to be filled above a certain point (often 90% of tank capacity). The 90-percent ullage is the number that should be considered when ordering product for a tank.
- **High-Level Alarm** Programmed by the installer to warn when the product level exceeds a set level. It can serve as overfill prevention when the ATG is connected to an external alarm that will notify the delivery person that the tank is nearly full.
- **Low-Level Alarm** Programmed by the installer to warn when the product level is below a set point.
- **High-Water Alarm** Programmed by the installer to warn that it is time to remove water from the tank
- **Theft Alarm** Programmed by the installer to warn that a withdrawal is occurring from the tank at a time when the facility is not operating.
- **Delivery Volume** An automatic calculation of delivery volume based on "before" and "after" delivery readings of tank volume.
- **Test Result** A report of the results of the last evaluation of the tank integrity.

In addition to the standard features listed above, most ATGs also can be equipped (at additional cost) with the following features:

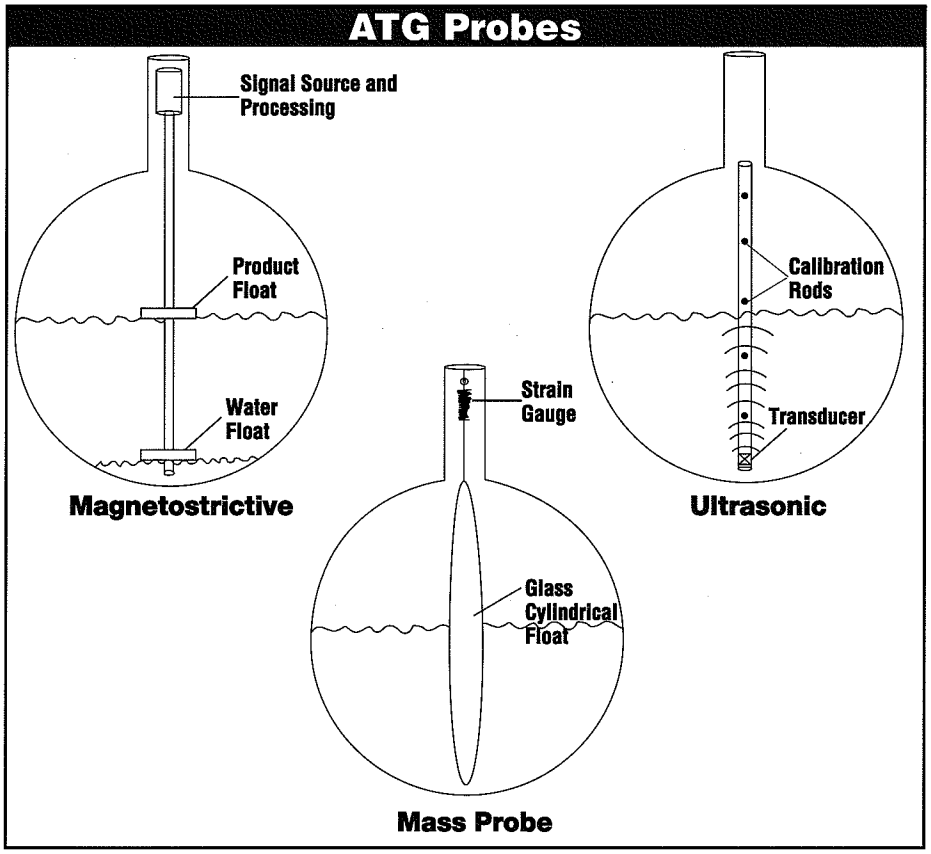
- **Sensors** A wide variety of liquid and vapor sensors can be connected to ATGs to monitor piping sumps, interstitial spaces of tanks, or monitoring wells.
- **Line Leak Detectors** ATGs by themselves only provide leak detection for the tank. Additional hardware can be added to the submersible pumps that will meet all required leak detection requirements for pressurized piping.
- **Communications** ATG consoles can be equipped with modems for remote communication capabilities, ports to permit communication with point of sale (POS) systems to integrate sales and inventory data, and automatic dialers to alert off-site personnel of conditions at a facility.

What Do The Rules Require?

In addition to all the capabilities listed above, ATGs also can be used to meet federal and state leak detection regulations. According to regulations, the ATG must detect leaks of 0.2 gallons per hour (gph) with a probability of detection of at least 95 percent and a probability of false alarm of no more than 5 percent.

A volume of 0.2 gallons is about 3 cups. A probability of detection of 95 percent for leaks of 0.2 gph means that if you were to conduct a leak test on 100 tanks, each of which is leaking at a rate of exactly 0.2 gph, you would correctly identify 95 of these tanks as leakers, and incorrectly call the other five tanks tight. A probability of false alarm of 5 percent means that if you were to conduct a leak test on 100 tanks, each of which is absolutely tight, you would incorrectly identify five of these tanks as leakers.

- **Monthly Verification of Tank Integrity** When ATGs are used for leak detection, regulations require that the integrity of the storage tank be verified every 30 days. There are three approaches used by ATGs to verify tank integrity:



Periodic Test This is the approach first developed by ATG manufacturers to detect leaks. To conduct the test, the tank must not be in service and the product temperature must be fairly stable. The liquid level and temperature are monitored over a period of time (4-8 hours). A significant change in the liquid volume during the test period that is not caused by temperature results in a failed test.

Continuous Test Many facilities are open on a 24-hour basis and owners do not wish to shut down once a month to allow the ATG to conduct a periodic leak test. In response, ATG manufacturers have developed ATGs that continuously test the tank. These devices work by closely monitoring the liquid volume whenever the storage tank is idle for more than a few minutes. By piecing together liquid level data from intervals when the system is idle, the ATG eventually gathers enough information to determine whether the tank is tight.

Although piecing together data from a number of quiet intervals to establish that a storage system is tight is conceptually simple, the task is, in fact, difficult to execute. Factors such as evaporation and condensation of product, tank deformation, variation in leak rate with liquid level, not to mention temperature stability and frequent deliveries of product challenge the ATGs ability to gather reliable data and accurately interpret the results.

As with all quantitative leak detection devices, manufacturers are required to document the performance of continuous test ATGs. Because there were no existing evaluation protocols that were directly applicable to this type of device, manufacturers developed their own test protocols.

As might be expected, such self-evaluations proved to be a bit lenient. The state of California called the manufacturers to task and refused to accept the manufacturer's evaluations as adequate documentation of the equipment performance. In the fall of '95, after more than a year of discussions, California personnel and manufacturer's representatives agreed on the parameters for an acceptable evaluation. As of June of '96, California was still reviewing the results of the new evaluations.

One manufacturer calls this technique of continuous testing "Continuous Statistical Leak Detection (CSLD)" because statistical analysis of the data is required to determine a tank's leak status. This technique should not be confused with statistical inventory reconciliation (SIR). CSLD conducts a test solely by monitoring the liquid level of the tank during inactive periods. SIR evaluates a tank by comparing numerous estimates of the amount of product pumped, the volume of product delivered, and the volume of product remaining in the tank (see below).

Inventory Another approach used by some ATG owners to meet leak detection requirements is to use the inventory information provided by the ATG as the raw data for a statistical inventory reconciliation (SIR) system. SIR performs sophisticated statistical analyses on basic inventory data (amount pumped, amount delivered, tank liquid volumes) to establish whether the storage system is tight. Although SIR can work with inventory readings taken with a wooden stick, the increased accuracy and consistency of ATG data can improve the accuracy and reliability of the SIR results.

The use of SIR does not require that a storage system be out of service, so 24-hour facilities equipped with ATGs that perform periodic tests do not need to shut down to meet the regulations. In addition, SIR analyses should detect product lost through piping leaks, so monthly piping leak detection requirements can also be met using this technique.

■ Recordkeeping

No matter what technique is used to verify the integrity of a storage system, records of at least the last year of leak detection results must be kept on hand. Some states require that records be kept for longer periods (Minnesota wants records to be kept for 10 years), so check with your state agency before throwing any old records away.

For ATGs that are conducting periodic or continuous testing, the paper printouts indicating the test results are convenient leak detection documentation. Note that I am talking here of a test report that documents the result of a tank test, not the standard printout that lists the liquid

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level, temperature, and volume of product in the tank. Only one test report every 30 days needs to be retained to document that tests are conducted at the proper frequency. A great many ATG owners are found to be in violation of leak detection requirements because they fail to keep a record of test results.

Results of monthly SIR analyses also should be kept on hand for at least a year to document compliance with regulations.

■ Reporting

Any single failed ATG test result that cannot be readily explained must be reported to state regulatory agencies. An explanation for a failed test might be that the test was started too soon after a delivery (and so temperature had not stabilized) or that fuel was pumped inadvertently during the test interval, or that the ATG was improperly programmed.

If an ATG conducts periodic tests on a daily basis or is a continuous model and prints daily test reports, you need only keep one test result per month for recordkeeping purposes, but you must report to the regulatory agency any failed test that cannot be readily explained. Likewise, any SIR results that indicate a leak should also be reported to regulatory agencies.

■ Certification of Equipment Performance

All ATGs installed after December 22, 1990 must be accompanied by a certificate from the manufacturer stating that the ATG meets the 0.2 gph leak detection performance requirements set in the federal regulations. The regulations state that the manufacturer must certify the performance of the equipment, but the owner of the equipment must retain proof of this certification.

This certificate is also useful to the owner because it states valuable information about the device, such as the liquid level required for a valid test, the required minimum duration of the test period, and the time required after a delivery before a test can be conducted. These are handy facts to know if you have a failed test result and are looking for an explanation.

ATGs must be understood in order to be used effectively. Manufacturers can increase customer satisfaction by making their ATGs easy to install, program, and use. Owners can get their money's worth only if they read and understand the operating instructions for their ATGs.

How can you tell if you have this certificate? Look for a piece of paper that reads at the very top "Results of US EPA Standard Evaluation," and contains headings that state "Evaluation Results," "Test Conditions During Evaluation," and "Limitations on the Results." If you do not have it, call your ATG supplier.

■ Proper Calibration, Maintenance, and Repair

If your inventory records contain significant discrepancies or the ATG is producing invalid test results, be sure to call in a service person to find out what is going on. There are reports that as many as 75 percent of ATGs are improperly programmed when they are installed and, therefore, fail to produce the quality data of which they are capable (and that you paid for). Some ATG manufacturers now certify technicians to work on their equipment. When the ATG is serviced, you are required to keep records of the type of service performed for at least a year (longer in some states).

■ ATGs and Inventory Control

A literal reading of the federal regulations (40 CFR 280.43(c)) indicates that facilities using ATGs for leak detection also are required to keep detailed inventory records. The ATG manufacturers have requested interpretation of this and have been told that facilities with ATGs that are not certified by the manufacturer as meeting the leak detection requirements of the regulations (see above) also are required to keep inventory control records. Facilities with ATGs that are certified to meet the federal performance requirements are exempt from the inventory recordkeeping requirements.

A number of states (e.g., Florida, Texas, California) require that inventory control records be kept regardless of what type of leak detection method is used. Check with your state regulatory agency to determine whether you are required to keep inventory control records for leak detection purposes even if your ATG is certified by the manufacturer.

The Future of ATGs

ATGs are continuing to evolve. Already there are models where the tank probes are directly connected into personal computers, eliminating the need for an expensive console to process the probe data and communicate results. Accompanying software allows any computer to function exactly like an ATG, with vastly improved capabilities for graphical display of information, report generation, and printing.

There also are greatly simplified consoles being developed that will do little more than serve as a communications interface. A remote computer will call up this communications box, download inventory information, and produce management reports for all of a marketer's facilities automatically. USTs, which a decade ago were still in the age of wooden sticks and Model T Fords, are now able to cruise the information superhighway.

What I believe is the most exciting development in the ATG field is the hybridization of ATG's and SIR. ATGs that work with only tank information have several limitations:

- They cannot conduct product inventory (sales information is lacking);
- They make conducting a CSLD type of test a much more complicated procedure than it might seem at first glance.

By allowing an ATG to access sales information directly through the dispensing meter, however, all of these problems can be addressed.

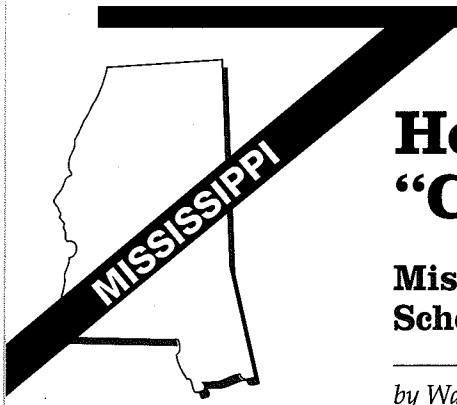
- Inventory can be kept without any intervention from unreliable humans. Therefore, it becomes possible to conduct very accurate SIR and inventory management that up until now has only been wishful thinking.
- SIR has the advantage of including piping leak detection at no extra cost.

Having the SIR software in the ATG box also allows leak detection to occur in essentially real time. This means that small leaks could probably be identified in a matter of hours, and the SIR/ATG combination should even be able to function as a pressurized piping line leak detector (i.e., find 3 gph piping leaks in one hour), thus meeting ALL of a storage system's leak detection requirements in one fell swoop.

Of course, this rosy picture is highly dependent on the accuracy and consistency of the meters that dispense product and requires an unshakable faith in the ability of statistics to successfully tease out a kernel of truth from a tangle of data.

P.S.

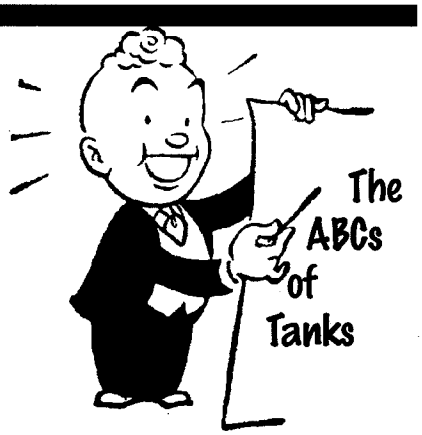
ATGs in their many forms can ensure environmental protection and profitability of petroleum product storage and marketing facilities. But as with any tool, ATGs must be understood in order to be used effectively. Manufacturers can increase customer satisfaction by making their ATGs easy to install, program, and use. Owners can get their money's worth only if they read and understand the operating instructions for their ATGs. Keep in mind that the story at the beginning of this article is true. Don't let it happen to you. ■



How Do You Spell "Comply"?

Mississippi Institutes A Compliance School for UST Violators

by Walter Huff



The primary purpose of any regulatory program is to get the regulated community to comply with the regulations. In an effort to achieve compliance with its UST regulations, Mississippi's UST program has initiated a program whereby an UST owner or operator can attend a compliance workshop in lieu of paying a penalty for less egregious violations. The 3-hour workshop is aimed at getting managers of tank facilities that are in violation of the UST regs up-to-speed regarding those laws and regulations. The attendee must be in a responsible management position with the company that is in violation so that he or she will ensure that compliance work is accomplished. If the attendee fails to complete the workshop and/or to achieve a score of 70, he or she will be required to pay the penalty.

This workshop is essentially a mandatory outreach program. Heretofore, we provided outreach programs for owners and operators in a number of cities throughout the state and had very poor attendance.

We feel that our compliance workshop approach has many advantages, the greatest of which is that it educates the tank owner/operator about all the UST regulations, not just the one for which he was penalized. This overall education is particularly advantageous in cases where the violator owns multiple service stations. Prior to attending this program, the owner/operator may have had a violation at one service station concerning one aspect of that leak detection system and not know anything about a cathodic protection problem that exists at another facility.

With the new program, the owner/operator has 90 days after the compliance workshop to move all of his facilities into compliance with the regulations. After the workshop, the owner/operator should know what needs to be done. As far as the Department of Environmental Quality (DEQ) is concerned, the owner/operator can no longer use the excuse that he didn't know what the regulations required the next time we inspect his facilities.

If the owner/operator attends the workshop and then violates any of the regulations within a 3-year period, he will not be given the opportunity to go to the compliance workshop again. He must pay the fine. However, if after 3 years the owner has not violated any of the regulations, we "wipe the slate clean" and start all over again—as if he had never been penalized for violating a regulation. This process is similar to that of most car insurance companies; the premiums go up if there has been an incident and then back down if there have been no incidents over a certain number of years.

One advantage to the program that we hadn't anticipated is that some companies send several of their managers in the event that one of them fails the test. As far as we are concerned, this is a win/win situation in that two or more individuals in the same company know what they must do to comply with the regulations.

The compliance workshop has been a great benefit to our UST program. The tank owners are more informed about the regulations, and they know we are serious about violations. An added benefit is that we have had less involvement with our legal division and, therefore, we reach faster resolutions. All of these factors add up to a more streamlined process and a cleaner environment. DEQ plans to conduct similar compliance workshops in other branches of the department. ■

Walter Huff is Chief of the Mississippi Department of Environmental Quality's Underground Storage Tank Branch. For more details about the compliance workshop, contact Walter at (601) 961-5142.

Field Notes

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

API's New RP 1604, "Closure of Underground Petroleum Storage Tanks," Replaces 1987 Edition

If you remove or dispose of underground petroleum storage tanks, you should have a copy of the American Petroleum Institute's (API's) nine-page recommended practice entitled *Closure of Underground Petroleum Storage Tanks* (API RP 1604, third edition, 1996). As the title implies, the document provides procedures for the closure in place, removal, storage, and the off-site disposal or sale of used underground tanks that have contained flammable or combustible liquids. Although the recommended practice specifically addresses UST systems at service station facilities, the principles outlined in API 1604 can be applied to similar systems used at other petroleum storage facilities.

U.S. EPA's Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tank Systems (40 CFR Parts 280 and 281) provide that API 1604 can be used as a guide to comply with the agency's requirements governing tank cleaning and closure procedures (40 CFR 280.71). As far as API is concerned, this edition supersedes the second (1987) edition for API 1604 (known then as *Removal and Disposal of Used Underground Petroleum Storage Tanks*) referred to in EPA's Standards. API states in the foreword to Closure of Underground Petroleum Storage Tanks that "according to EPA, an owner or operator conforms with this provision (40 CFR 280.71) of the Standards if it used the 1987 edition, which was in force when the Standards became final. However, an owner or operator who uses this amended version will also be meeting the requirement of the 1987 edition, and EPA encourages the use of the most recent version."

I also encourage you to use the third edition of API 1604. To begin with, this edition is much more user-friendly than the 1987 version. In addition, it incorporates most of the provisions included in the six-page supplement to API 1604 (1987), published by the American Petroleum Institute in 1989. Users of the 1996 edition can find all the material they need in one spot and not have to constantly flip from the old 1987 version to the 1989 supplement to make sure they haven't missed anything.

When you carefully compare the 1987 edition (as revised by the 1989 supplement) with the 1996 edition, you will notice that just about every section includes some changes in API's recommended procedures. Some changes are simply editorial in nature. Others, however, may change the way you handle tank closure, removal, storage, and off-site disposal. Here are a few of the differences we noticed when we compared the two documents:

- The old version (1.3.2.2) states that "a combustible gas indicator (CGI) should be used to check for hazardous vapor concentrations." The 1996 recommended practice (1.3.2.2) says: "A combustible gas indicator (CGI) should be used to check for hazardous vapor concentrations in and around the work area." Another section (4.3.1) of the 1996 recommended practice now requires CGI readings immediately before initiating work in the tank area or to the tank.

- The 1987 version of API 1604 (2.2d) required the contractor to "disconnect electric power to the pumps" when securing a tank to be temporarily out of service. The 1996 edition (2.2d) provides an alternative: "Disconnect or lock-out the electric power to the pumps."

- The revised API 1604 contains a new section (3.3) on site evaluation prior to permanent closure or change of service.

- Sections 4.2.2 and 4.2.3 of the 1996 edition permit small, specific quantities of water to be used to flush the piping and rinse the tank.

- Section 4.3.4 of the revised (1996) version now permits the contractor to use crushed dry ice or shaved dry ice to render a tank inert.

- API has changed its procedure for testing the tank atmosphere and excavation area for flammable and combustible vapor concentrations. The 1987 recommended practice (4.3.2) required that readings of 20 percent of the lower flammable limit be obtained before the tank could be considered safe for removal from the ground. The 1996 edition requires that readings of 10 percent of the lower explosive limit be obtained before the tank is considered safe for removal (4.4.2).

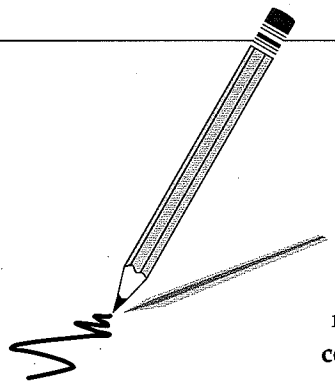
- Section 4.4.6 of the 1987 edition required that tanks be removed from the site as promptly as possible after vapor-freeing procedures were completed. Section 4.6.6 of the 1996 edition permits the tanks to be either cut up, crushed or removed from the site.

- The 1996 version contains a section (6.1.1) which requires tanks, before they are reused, to be recertified by the original manufacturer prior to reuse. This language is stronger than in the previous edition.

- Section 7.2.1 of the revised API 1604 adds a sentence to the old 7.2.1 that admonishes contractors to "use explosion-proof, non-sparking tools" when disposing of a tank.

Copies of API 1604 can be ordered from American Petroleum Institute, Order Desk, 1220 L Street, N.W., Washington, D.C. 20005. Telephone: (202) 682-8375. Fax: (202) 962-4776. Price is $22. ■

Qs and As



Where UST regulations are concerned, questions do pop up. No matter how obscure the question, someone out there needs an answer. From this issue of LUSTLine forward, we will explore and answer a gamut of tanknical questions, ranging from the painfully simple-minded to the delightfully idiosyncratic. Our answers are derived from a carefully considered interpretation of the federal rule, based on EPA guidance. Keep in mind, individual state requirements may differ. Your questions and comments are welcome.

Q. *When is the last possible date that inventory control + tightness testing can be used as a legitimate method of leak detection for an existing tank? For a newly-installed tank?*

A. For existing tanks (i.e., those installed on or before December 22, 1988), the last possible date that inventory control + tightness testing can be used is December 22, 1998. For newly-installed tanks (i.e., any tank installed after December 22, 1988), there is no single date; all new tanks may use inventory control + tightness testing for the first 10 years after installation. For example, a tank installed in 2001 can use this method of leak detection until 2011.

Q. *How often must cathodically protected, double-walled steel tanks be tested?*

A. Double-walled steel tanks don't require cathodic protection monitoring.

Q. *What five design and construction standards must be in place in order for a suction piping system to be exempt from release detection requirements?*

A. According to 40 CFR 280.41(b)(2)(i-v), for a suction piping system to be exempt from release detection requirements, it must have the following:

- Below grade piping that operates at less than atmospheric pressure;
- Below grade piping that is sloped back to the tank;
- Only one check valve in each line;
- A check valve that is immediately below the suction pump;
- A method for ensuring that compliance with the above four items can be readily determined.

Q. *True or False? When inventory records are kept for leak detection purposes, the volume of water present (if any) must be subtracted from the volume of product in order to calculate the book inventory.*

A. According to 40 CFR 280.43(a)(6), this statement is False. Water volume is not important when conducting inventory for leak detection.

Q. *What size leak must a line leak detector detect? In what time frame must this leak be detected?*

A. According the 40 CFR 280.44(a), a line leak detector must be able to detect a leak of 3 gph at 10 psi within one hour.

Q. *What are the regulatory criteria for determining whether piping connected to an UST requires leak detection? Does a submersible pump manifold (the portion of a submersible pump that is directly above the tank) require leak detection?*

A. According to 40 CFR 280.41(b), underground piping that routinely contains regulated substances must be monitored for releases. The answer to the second part of this question depends on the meaning of "underground." If underground means below grade, then the submersible pump manifold must have leak detection. If underground means buried beneath the soil, then a submersible pump manifold would not need leak detection as long as it is visible. EPA has not defined "underground," although the de facto definition appears to be that it means "buried."

Q. *Should the absolute value of the calculated leak rate be compared to the leak threshold for reporting a "pass" or "fail" result? Or is it only product losses above threshold that are considered leaks?*

A. The absolute value of the leak rate must be compared to the leak threshold.

Q. *Once mechanical line leak detectors detect a leak, do they restrict the flow or shut off the flow? To what flow rate do they restrict the flow? Is there any mechanical line leak detector that is capable of pump shutdown?*

A. Mechanical line leak detectors restrict the flow when they detect a leak. Although mechanical leak detectors are designed to detect leaks of 3 gph, they indicate the presence of such a leak by restricting the flow to 3 gpm. Vaporless Manufacturing Inc. has a line of mechanical line leak detectors that is capable of pump shutdown.

Q. Who or what is the "Red Jacket" line leak detector named after?

A. Native American Chief Red Jacket (1750-1830) of the Seneca tribe. His first name was O-te-tiani, which means Always Ready. He was a swift runner who could outpace all his companions when hunting deer. During the Revolutionary War, the British employed him as a messenger. In payment for his services, he was given a red jacket, which he dearly loved and which became his sobriquet for the rest of his life. He was renowned for his oratory and delivered many eloquent speeches on behalf of his people in attempts to protect and preserve his people's heritage. Early advertising for the Marley Company's new submersible pump proclaimed it "Red Jacket, chief of pumps."

■ *continued on page 27*

Coast to Coast is provided as a regular feature of *LUSTLine* to update state and federal UST, LUST, and cleanup fund personnel about the activities of the Association of State and Territorial Solid Waste Management Officials' (ASTSWMO) Tanks Subcommittee. If you want to learn more about the Tanks Subcommittee, contact the Subcommittee Chair, Scott Winters (CO) at 303/620-4008, or Stephen Crimaudo (ASTSWMO) at 202/624-5828.

Tanks Subcommittee

Over the past few months, the ASTSWMO Tanks Subcommittee has been active on a variety of general tank program issues of concern to state UST programs. A search for a new Tanks Subcommittee Chair resulted in the appointment of Scott Winters (CO), formerly the Co-Chair of the LUST Task Force. The subcommittee met in February to discuss a variety of issues, including an OUST update and status on FY-96 appropriations, the national UST/LUST conference, and task force projects discussed below.

LUST Task Force

The LUST Task Force made a change in leadership, filling a vacant co-chair position with Richard Spiese (VT). Richard is the author of a task force survey, or administrative "toolbox," which presents case examples of 27 states that have had experiences with administrative land use issues, liens, deed restrictions, off-site impacts, and risk goals. The results were put onto a spreadsheet format with an attached key and may be useful to state program managers who are considering implementing administrative procedures as part of risk-based corrective action (RBCA) policies. Richard presented this information in March at the UST/LUST national conference in Chicago. The survey results have been distributed by ASTSWMO to all state UST/LUST program managers.

Co-chair Kevin Kratina (NJ) has worked with the task force to prepare a position paper on the Lawrence Livermore National Laboratory Report on California's Leaking Underground Storage Tank Historical Case Analysis.

Mike Anderson, Indiana Department of the Environment, is the newest member of the LUST Task Force. For more information on LUST Task Force activities, call co-chairs Richard Spiese (VT) at (802) 241-3888 or Kevin Kratina (NJ) at (609) 633-1415.

UST Task Force

The UST Task Force is continuing its efforts to promote compliance with the UST 1998 technical requirements. Doyle Mills (KY) conducted another 1998 UST compliance data survey and received responses from 24 states, representing all 10 EPA regions. Results of the survey, "Where Are We With Respect to Meeting 1998 Technical Standards, A State Database Survey," were presented at the UST/LUST national conference. Results indicated a trend toward increasing compliance, but falling far short of 100 percent by the 1998 deadline.

The task force also continued work on its "report card" on the Federal UST/LUST program, which will assess the accomplishments and future needs of Subtitle I. This information can also be used to measure the status of compliance with the 1998 technical standards. The UST Task Force and the subcommittee members consider this task a priority. To date, the group has assigned the tasks listed in an outline that was drafted earlier.

For more information on UST Task Force activities, call task force co-chairs Vickie Church (San Diego County, CA) at (619) 338-2243 or Paul Sausville (NY) at (518) 457-4351.

State Cleanup Funds Task Force

The State Cleanup Funds Task Force attended a UST Financial Responsibility Stakeholders Meeting this February in Arlington, Virginia. This meeting was a first attempt to organize an open dialogue session between state regulators, represented by members of the State Cleanup Fund Association, and a variety of stakeholder groups, represented by such national organizations as the Petroleum Marketers Association of America (PMAA), National Association of Convenience Stores (NACS), the Society of Independent Gasoline Marketers (SIGMA), and representatives from the insurance industry. The Task Force members hope to hold more such meetings.

Members also organized, along with EPA, the successful June 10-12 State Fund Administrator's Conference that was held in Charleston, SC. The theme for the conference was "A Safe Environment: Getting the Job Done."

Bill Alpine, UST Division Director of the Massachusetts Department of Public Safety, is the newest member of the State Cleanup Funds Task Force. If you

■ Coast to Coast *from page 26*

have questions or comments on State Cleanup Funds Task Force activities, call either Dan Neal (TX) at (512) 239-2258 or Christine Long (AZ) at (602) 207-4327.

TIE Task Force

The Training and Information Exchange (TIE) Task Force continues to address the training and information needs of the state UST/LUST programs. TIE is developing a Tanks Subcommittee Home Page for use on the World Wide Web. The task force has assigned its members to serve as liaisons to the UST, LUST, and State Cleanup Funds Task Forces.

If you have questions or comments on TIE Task Force Chair Pat Jordan (WY) at (307) 777-7684. ■

■ Qs and As *from page 25*

Q. *A tank floats out of the ground and appears undamaged. The owner/operator wants to return it to service. The tank is between 5- and 10-years old. Since the tank will have to be removed and reinstalled, will it have to meet new tank or upgrade standards before it is returned to service? Will it have to meet manufacturer's certification or UL requirements?*

A. If re-installed, the UST must meet new tank standards. Re-installation of existing tanks is considered a new installation even if done in the same hole. The tank should also be re-certified to confirm adherence to a code of practice, be it UL, sti-P3, or whatever.

Q. *How do volumetric test methods compensate for the presence of water in the tank backfill?*

A. 1) Measuring the depth to the water table and determining the height of the water table above the bottom of the tank;

2) Calculating the hydrostatic pressure exerted at the bottom of the tank by the water outside the tank;

3) Calculating the hydrostatic pressure exerted at the bottom of the tank by the product inside the tank; and

4) Calculating the difference between the hydrostatic pressures caused by the water and the product to obtain a net pressure.

Each leak detection method has a specification for a positive or negative net pressure on the bottom of the tank. This differential pressure can be obtained by increasing the product level (the preferred method) or by lowering the product level (to measure ingress of water into the tank). Some test methods compensate for groundwater by conducting a test at two different product levels and comparing the results. The effectiveness of these techniques has not been evaluated. ■

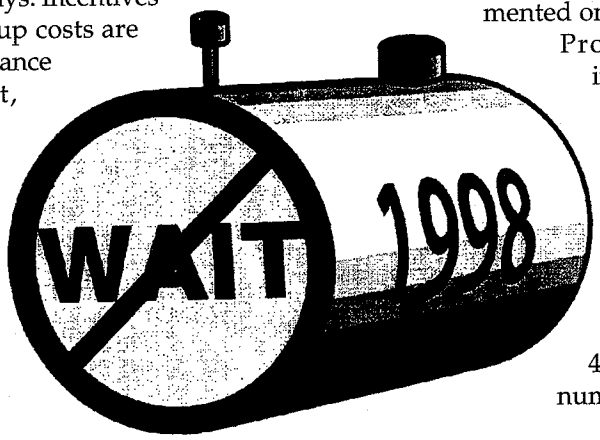
New From EPA OUST

Pay-For-Performance Cleanups: Effectively Managing Underground Storage Tank Cleanups

"Pay-For-Performance Cleanups" is a document for LUST policy makers, program managers, and cleanup overseers who could profit from using pay-for-performance cleanup agreements. Underground storage tank (UST) cleanups are often "bought" using time-and-materials agreements that can result in high cleanup costs, slow cleanup progress, and failure to reach cleanup goals. In contrast, pay-for-performance cleanup agreements pay contractors a fixed price as measurable environmental goals are reached. Paying for cleanups through such agreements rewards contractors for quickly and efficiently reaching cleanup goals.

Pay-for-performance agreements produce speedier cleanups that protect public health and the environment sooner than later. They enable state staff to focus their attention on environmental results instead of on auditing contractors' internal costs. They minimize paperwork and administrative costs and delays. Incentives that otherwise inflate cleanup costs are curtailed by pay-for-performance agreements. As a result, cleanup financing can stabilize in a cleanup program based on pay-for-performance contracts.

Using pay-for-performance cleanup agreements programmatically saves money and sustains environmental protection by:



- Focusing cleanup dollars on cleanup work;
- Focusing state staff work on environmental results;
- Reducing administrative costs and paperwork for the state and for contractors;
- Enabling more accurate budgeting and spending projections;
- Making financial audits of cleanups much clearer; and
- Rewarding effective, efficient cleanup contractors and technologies.

This document originates in the experience of the UST Bureau of the New Mexico Environmental Department as it introduced pay-for-performance UST cleanups in that state. However, this document both extends and supplements New Mexico's experience with ideas from other state officials, experienced cleanup contractors who have commented on its drafts, and the U.S. Environmental Protection Agency. This document is intended as a starting point from which state officials, cleanup contractors, and UST owners can design pay-for-performance cleanup programs tailored to their own special circumstances.

To order a free copy of "Pay-For-Performance Cleanups" (EPA 510-B-96-002), call EPA's RCRA/Superfund Hotline. The toll-free number is (800) 424-9346; for the hearing impaired, the number is TDD 800-553-7672. ■

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