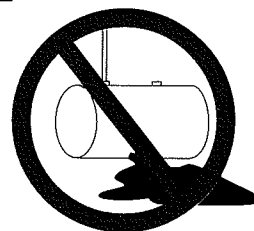


# L.U.S.T.LINE



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

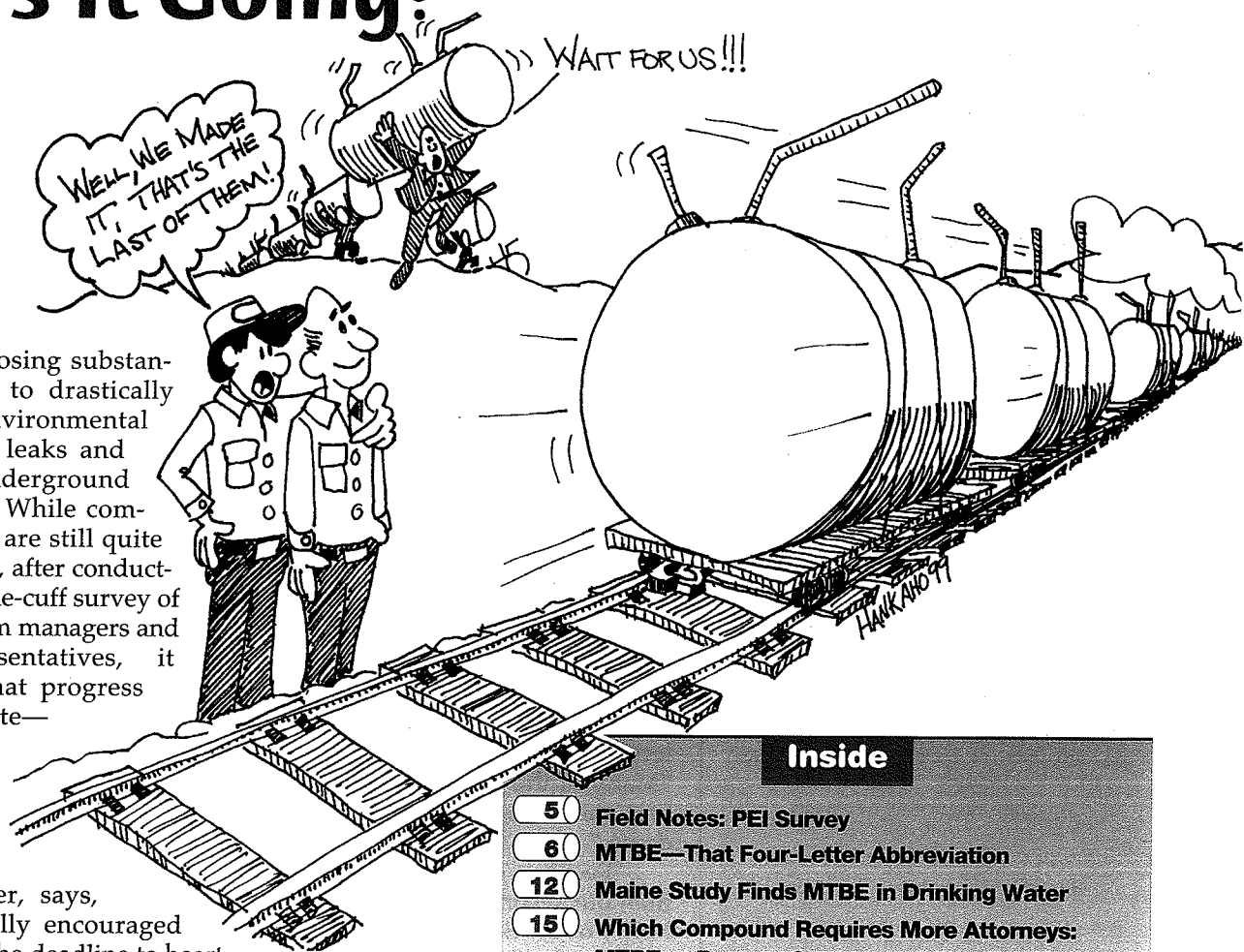
## Now That the '98 Deadline Has Come and Gone... How's It Going?

By Ellen Frye

**T**he purpose of the federal December 22, 1998, deadline for replacing, upgrading, or closing substandard tanks was to drastically reduce the environmental threat posed by leaks and spills from underground storage systems. While compliance numbers are still quite fluid at this point, after conducting a totally off-the-cuff survey of state UST program managers and industry representatives, it appears to us that progress has been quite—almost surprisingly—good.

As John Cernero, EPA Region 6 UST Program Manager, says, "We've been really encouraged that people took the deadline to heart. Some people didn't get it all quite right, but they're heading in the right direction."

That being said, it is clear that our upgraded and replaced tank universe still needs the vigilance of both regulators and tank owners and operators. EPA and the states can't just shut the book and assume the problem is licked—there are no guarantees that existing systems will not leak. States will need to turn their attention more closely to the ABCs of leak prevention. ■ *continued on page 2*



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### The Good Riddance Factor

First, let's consider the mind-boggling drop in the regulated UST population over the last 10 years. Last summer, six UST-related trade associations conducted a comprehensive survey of state and territory UST program managers regarding enforcement. The Petroleum Equipment Institute (PEI) was one of these associations. In a November letter to the members, PEI Executive Vice President Robert Renkes made the following observation, based on his review of the survey results:

"Using the numbers the state UST program managers gave us...the nation's underground storage tank population now stands somewhere around 860,000 tanks. Fifty-five percent of those are now compliant with the state UST regulations, leaving 45 percent that still must come into compliance. While at first blush the percent-

age of noncompliant UST systems seems high, it isn't so bad when you remember that there were as many as 2.1 million tanks in the United States in the late 1980s. Divide 2.1 million tanks into the number of noncompliant tanks still in the ground, and you find that over 80 percent of the total UST population of the 1980s either has been upgraded or removed from the ground over the last 10 years."

***A tank that is closed and left in place is still an environmental threat if it has not been properly closed and a headache for state UST/LUST program personnel, who will have to see that owners and operators finish the job or, in many cases, hope that someone steps forward to claim responsibility for the tank.***

Those figures were based on information in the states' databases and, as many UST managers are quick to point out, these databases are rapidly being "cleaned up" as a result of their deadline enforcement efforts. Since the passing of the deadline, UST inspectors throughout the country have been visiting UST facilities that their databases indicate are noncompliant and have been finding that many tanks are removed or at least emptied and shut down.

"We suspect we overestimated our noncompliant database target list," says Scott Deshefy, Connecticut Department of Environmental Protection UST Program Manager. "Many of the facilities we targeted first and visited were actually shut down."

"People are in better compliance than our records show," says Doug Miller of the South Dakota Department of the Environment and Natural Resources. "A lot of tanks were already shut down by the deadline, but the owners never informed us."

Some of these systems are in temporary closure, prior to either permanent closure or upgrading/replacement; others are simply closed, either properly or improperly. If tanks are closed improperly,

tank owners probably have not notified the state and have not had the required site assessments performed.

A tank that is closed and left in place is still an environmental threat if it has not been properly closed and a headache for state UST/LUST program personnel, who will have to see that owners and operators finish the job or, in many cases, hope that someone steps forward to claim responsibility for the tank. Unfortunately, some degree of environmental cleanup is required at most of these sites. The issue is, how will this work get done?

Ultimately, the numbers of substandard tank systems that are removed or permanently closed will be substantial. Their removal from the nation's stock of environmental threats can be deemed an enormous accomplishment.

And what about those gaps in fuel availability in areas where marginal facilities have closed down? "You'll find that marketers—mostly smaller oil marketers—are racing to take over areas of states that are left without gas when the mom and pops closed," says Bob Renkes. "It's happening as we speak. These new facilities tend to find their niche in areas where three or four older facilities have closed."

### Compliance Talk...Off the Cuff

Here's what some of the federal and state regulators told us when we spoke to them during January and February:

■ In Washington, about half of the state's noncompliant tanks are now closed. Compliance certificates indicating corrosion protection, spill and overflow, and insurance compliance were issued to 81 percent of the facilities in the state, accounting for 89 percent of the tanks in the state.

■ The Montana DEQ conducted an initial facility check between Christmas and New Years Day and found that most facilities were in compliance or closed. Some owners had begun to upgrade, thinking they could string out the work, but had to go into temporary closure. There was a big increase in requests for upgrading permits during the last



#### LUSTLine

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three months before the deadline. Because the weather was unseasonably warm, contractors were able to accomplish more than they normally could have.

- With the first wave of the New Jersey DEP's enforcement work, about 625 facilities elected to take advantage of an "enforcement document" incentive, whereby facility owners had the opportunity to come to DEP to sign an administrative consent order. The incentives were associated with either gaining eligibility for financial aid or paying a penalty and entering into a compliance schedule before penalties escalate.
- By mid-January, compliance in Delaware had jumped 13 percent over a two-and-half month period.
- As of February 8, Tennessee's database indicated 54.6 percent compliance, but this number is derived from a database that includes a large number of temporarily out-of-service or abandoned tanks that must be properly closed. As in most states, while these tanks remain on the books as noncompliant, exact compliance figures are tough to nail down. Tennessee's state-owned tanks are in really good shape. When all is said and done, there will be very few state-owned tanks. State agencies don't want the responsibility and liability of owning tanks; they're getting out of the fuel business.
- In California, an estimated 90 percent of the state's regulated tanks have been replaced, upgraded, or properly closed. The state's compliance certificate program really got people's attention—noncompliant owners and operators can't get fuel. Although the program kicked in on 1/1/99, some distributors had stopped making deliveries to noncompliant facilities earlier on.
- According to the North Carolina database, 75 percent of the state's facilities, or 80 percent of its total tanks, are in compliance with deadline requirements. However, a phone survey of those facilities identified as noncompliant suggested that facility compliance is closer to 85 to 88 percent. Emer-

gency generator tanks containing diesel fuel have emerged as a problem, primarily because owners had assumed they were exempt.

- John Cernero of EPA Region 6 conducted inspections in the region during the first two weeks of January. Besides finding a number of facilities in temporary closure, the most common violation he cited involved tank systems that had been replaced or upgraded but where not all metal parts had been protected from corrosion (e.g., metal components of fiberglass piping lines).

***Due to shortages, many tank owners are finding themselves out of compliance and in a waiting mode. This puts the states in the position of having to deal with owners and operators who are moving in the right direction but are in violation just the same.***

### The Shortage Factor

As predicted, many tanks owners waited until the very last minute to make their compliance move. Also as predicted, some equipment has been backlogged, particularly tanks. Likewise, contractors have been booked solid.

"Our members are reporting that compliance-related work has been 20 to 30 percent of their workload; the rest is their normal course of business," says Bob Renkes. "From a business standpoint, contractors will service their long-term customers first. The smaller facility owners who line up late are the most likely to have trouble finding a contractor."

As a result, many tank owners are finding themselves out of compliance and in a waiting mode. This puts the states in the position of having to deal with owners and operators who are moving in the right direction but are in violation just the same. States are handling this situation primarily by requiring temporary closure until the facility comes into compliance. Some states have acknowledged good-faith efforts to comply.

"We told people if they got written documentation prior to the deadline that work was in progress and they presented a compliance date, they would get a Notice of Violation but not a penalty unless they missed that date," says Doug Miller, Storage Tank Coordinator for the South Dakota Department of the Environment and Natural Resources (DENR).

### Now Back to the ABCs

One thing that Bill Reid of the North Carolina Division of Water Quality UST program noted when we spoke was that as of February 17, 53 Notices

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## ■ How's It Going? from page 3

of Violation (NOVs) had been issued for corrosion protection and spill and overfill violations, but 115 nondead-line NOVs had also been issued, mostly for leak detection violations.

"People are not paying attention to the leak detection portion of the regs," cautions John Cernero. "People have automatic tank gauges (ATGs) that are in alarm condition, but they won't believe that they have a problem—no matter how hard the ATG tries to tell them. If we're not vigilant, we'll end up creating a whole new generation of tanks systems that are not working [to prevent leaks]. We're still finding a lot of problems with leak detection."

"Leak detection!" exclaims Russ Ellison of the Virginia DEQ. "With all of this attention to the deadline, let's not forget leak detection, because leak detection is the only way we'll be able to protect the environment if a system fails."

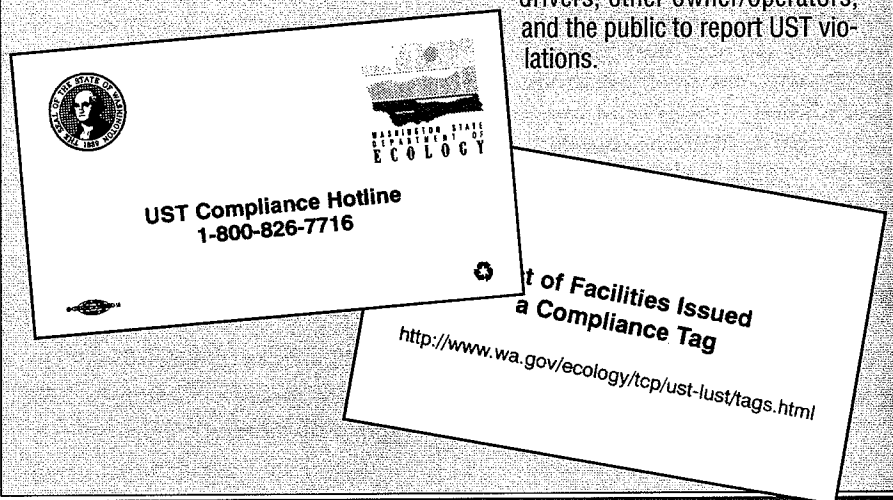
Recognizing that any of the gadgetry associated with USTs may not actually be working at any given time during the life of a system, **Maine** and **California** require that tank owners and operators have annual maintenance checks to ensure that equipment, particularly leak detection equipment, is working. These checks are performed by contractors from the private sector, who are hired by the tank owner. The California Water Resources Control Board is pushing to have a certification program for these contractors so they are trained to do proper inspections. In Maine, this work is limited to certified installers or trained manufacturers' representatives.

Clearly, states want to be sure that tank owners and operators understand how their systems work and what they need to do to ensure they work. In its planning process, EPA's Office of Underground Storage Tanks (OUST) identified similar concerns. (See **HQ Update** on back page.) As a result, OUST is turning its attention to two important UST issues: UST systems evaluation and operation and maintenance.

"It's good to see the compliance numbers going up," says Bill Reid, "because it shows that all our work over the years was worthwhile." But the job ain't over. ■

## Washington's UST Compliance Hotline

The Washington State Department of Ecology is using market-sector incentives to attempt to leverage compliance with the UST requirements. The department has issued compliance tags to UST facilities that have spill, overfill, and corrosion protection. Fuel distributors may not deliver to facilities that do not have a tag displayed. To back up this requirement, the department has posted a list of all compliant facilities on its Internet page and has established a toll-free number for truck drivers, other owner/operators, and the public to report UST violations.



## A Year and a Half After Its Final Deadline, Maine Nears 100% Compliance

**Y**es, the State of Maine is nearing 100 percent compliance with its tank removal deadline. The state had a phased-in deadline for its regulated tanks (including heating oil tanks) based on the age of the tank and its proximity to groundwater or drinking water. No upgrading was allowed; UST systems had to be removed or replaced with secondary containment systems and interstitial monitoring. The latest possible date for removal of all tanks, except those owned by municipalities and school administrative units, was October 1, 1997.

With a starting population of 34,250 USTs, the state's current tank population has been whittled down to about 5,375 conforming active tanks. "One reason why this number is so low," explains Diana McLaughlin, DEP's UST Program Coordinator, "is that many of our smaller mom-and-pop operations replaced their various product tanks with single, multicompartmented tanks."

The Maine Department of Environmental Protection (DEP) estimates that about 90 federally mandated bare steel tanks used for wholesale and retail product storage are still in the ground; about 60 of these are probably not active.

"We anticipate that a significant amount of staff resources, including legal assistance, will be needed to bring the remaining few bare-steel tank owners into compliance," says McLaughlin.

### What's Next?

Not resting on their laurels, DEP UST staff have turned their attention to the remaining active tanks. "Despite numerous education outreach programs, mass mailings, and media attention to the tank removal deadline, over 70 percent of the facilities we inspect are in violation of one or more of the applicable regulations," says McLaughlin.

"While compliance inspections are consistently the most effective tool for educating facility owners and operators about proper operation, leak detection, and maintenance of their tank systems," explains McLaughlin, "our staff resources have been limited in the past. We now look forward to having the ability to provide more proactive technical assistance to owners and operators." ■

## Field Notes

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

### PEI Keeping the State Survey Ball Rolling

Last summer, PEI and five other trade associations developed a comprehensive survey on underground storage tank (UST) enforcement issues. PEI mailed that survey to all state and territorial UST program managers on August 10, 1998. By November, PEI had received responses from all 50 states. The responses were posted on PEI's Web site ([www.pei.org](http://www.pei.org)).

The states' responses to the survey generated a tremendous amount of interest, not only from the regulated community but also from the industry trade press and the national media. Articles about UST enforcement issues and tank upgrade compliance rates appeared in such publications as the *Wall Street Journal*, *New York Times*, and *San Francisco Chronicle*.

Clearly, we've been trying to keep up with a moving target, and the information shown on our Web site has grown somewhat old and stale with time. Although UST program managers were given the opportunity to amend their answers to our questions any time after they returned the initial survey, few did. Many tank owners who visited our site this year ques-

tioned whether the responses were still valid, especially in light of the U.S. EPA enforcement strategy announced in December.

PEI had two options: Either remove the information from our Web site or aggressively seek to update the responses. We chose the latter. Letters or e-mails were sent to the states in February, encouraging UST program managers to review the information we showed and make changes to their responses where appropriate. Many have already made changes that are reflected on our Web site, while some have simply confirmed that the information previously submitted to us is still valid. Additional responses from the states will be posted as received. To access the response of a particular state, visit [www.pei.org/epa](http://www.pei.org/epa) and then click on the state you want to review.

It is PEI's intent to provide the regulated community with the most up-to-date information on UST compliance figures and enforcement strategies. We appreciate the help of the UST program managers who took the time to respond to our inquiries. ■

## SNAPSHOTS FROM THE FIELD



Buses throughout Connecticut caught the eye of more than just tank owners over a period of several months. CT DEP deemed this ad campaign a success.

If you have any UST/LUST-related snapshots from the field that you would like to share with our readers, please send them to Ellen Frye c/o NEIWPCC.



## Investigation and Remediation

# MTBE—That Four-Letter Worr...Umm... Abbreviation

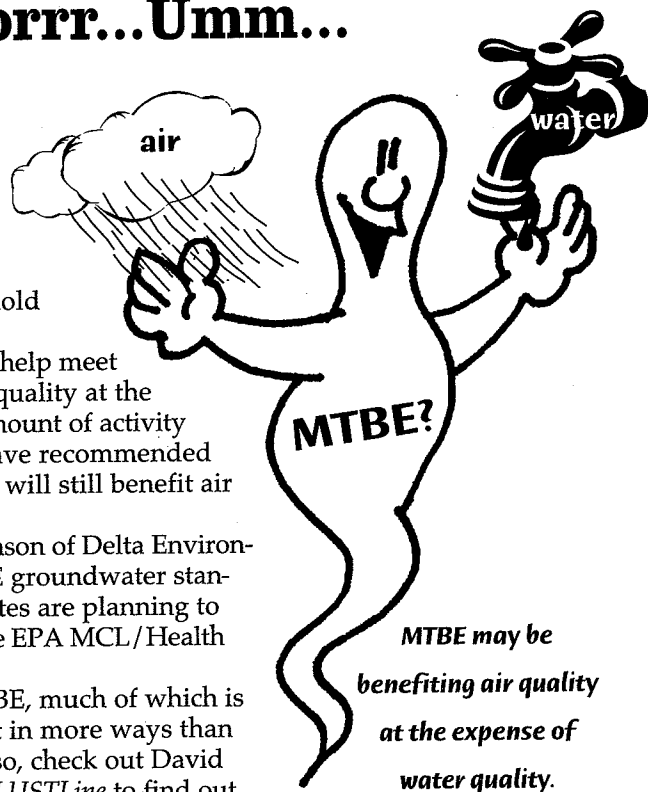
## A Special LUSTLine Update by Pat Ellis

The gasoline additive Methyl tertiary Butyl Ether (MTBE) continues to be mired in controversy across the country. MTBE-ese is no longer the province of regulators, scientists, and oil companies. Its ignominy has found its way into the household vocabulary. Its specter seems ever more pervasive and confounding.

Originally added to gasoline to boost octane, and later added to help meet the requirements of the Clean Air Act, MTBE may be benefiting air quality at the expense of water quality. Within the past few years, a tremendous amount of activity has taken place with respect to MTBE, and several recent studies have recommended phasing out the use of MTBE and evaluating other alternatives that will still benefit air quality.

According to a January 1999 survey conducted by Michael Martinson of Delta Environmental Consultants, Inc., for U.S. EPA, 15 states have adopted MTBE groundwater standards; three states have site-specific MTBE cleanup levels; seven states are planning to establish or change their MTBE standards; and five states are using the EPA MCL/Health Advisory as a basis for their health standard.

This article summarizes some of the most recent activity on MTBE, much of which is occurring in California. Keep in mind that MTBE is a moving target in more ways than one; new information is constantly emerging and being updated. Also, check out David McCaskill's article "A Little Drop'll Do Ya" (page 12) in this issue of LUSTLine to find out about Maine's study on the presence of MTBE in drinking water wells.



## The UC Davis Study

On November 12, 1998, the University of California at Davis delivered a multivolume report to the governor. Senate Bill 521—the Mountjoy Bill—required this study. California's new governor, Gray Davis, will evaluate the report and decide a course of action for the state. The study recommended that California consider a gradual phase-out of MTBE from its clean-air gasoline program. The university was paid \$500,000 by the state to conduct an unbiased and authoritative study of the health impact and environmental impacts of MTBE.

The study cautioned, "If MTBE continues to be used at current levels and more sources become contaminated, the potential for regional degradation of water resources, especially groundwater basins, will increase. Severity of water shortages during drought years will be exacerbated." The report recommends a gradual phase-out, with a series of suggested options for doing so in a manner that will allow for a thorough study of the environmental impacts of any chosen strategy. The report also concluded that emissions control technologies on newer automobiles

and new gasoline formulations have dramatically decreased the air quality benefits associated with adding oxygenates to gasoline. The potential for water contamination by MTBE is a cost that is not offset by a corresponding benefit.

*The report recommends a gradual phase-out, with a series of suggested options for doing so in a manner that will allow for a thorough study of the environmental impacts of any chosen strategy.*

One of the conclusions reached by the study for potential health problems caused by MTBE was that "There are no human data on which an evaluation of the carcinogenicity of MTBE can be based. However, substantial evidence from studies of chronic exposure by either oral or inhalation routes demonstrate that MTBE is carcinogenic in rats and mice. Based on a thorough review of these carcinogenicity studies, supporting data on pathology, and

mechanisms of tumor induction, and carcinogenicity studies of MTBE's primary metabolites (TBA and formaldehyde), we conclude that MTBE is an animal carcinogen with the potential to cause cancer in humans...." The report does continue by saying that "Uncertainties remain about the nature and extent of risk for humans, especially for exposure to doses lower than those used in animal studies."

The full text of this report, almost 900 pages long, is available on the Web at <http://tsrtp.ucdavis.edu/mtberpt>. The volumes are available separately for download. Volume I: Summary and Recommendations; Volume II: Human Health Effects; Volume III: Air Quality and Ecological Effects; Volume IV: Ground and Surface Water; Volume V: Risk Assessment: Exposure Assessment, Water Treatment, and Cost Benefit Analysis.

## Lake Tahoe Area, California/Nevada

The Mountjoy Bill also required a separate study of MTBE in the Lake Tahoe Basin. Nonpoint sources were not shown to have any significant effect on ground or surface water

quality in the basin. Point-source contamination by MTBE was also investigated. Few data exist for the Nevada portion of the basin because, as of July 1998, analysis of drinking water for MTBE has not been required in the state.

As of September 1998, Nevada had not required MTBE analysis for leaking underground storage tank (LUST) sites. Beginning in spring 1998, however, the Nevada Department of Environmental Protection (NDEP) recommended but did not require analysis for MTBE at LUST sites. Of the five sites on the Nevada side of the lake that were listed as having groundwater impacts, only two have been tested for MTBE. On the California side of the basin, the Lahontan Regional Water Quality Control Board has requested MTBE monitoring in groundwater wells at leaking underground fuel tank (LUFT) sites since June 1996. As of July 1998, 29 LUFT sites out of 43 active LUFT sites had confirmed MTBE detections.

Analysis for MTBE has only recently been required for community and nontransient water systems in California. Limited testing has been done within the Tahoe Basin so far, and no detections have been reported. As of July 1998, the California Department of Health Services listed 41 large

public water systems within the Tahoe Basin that have been monitored for MTBE, 34 of which are operated by the South Tahoe Public Utility District (STPUD).

MTBE has been detected in 5 of the 41 systems tested, 3 of which are in the STPUD. Eight additional South Tahoe wells and three motel wells are considered "threatened" by MTBE from nearby plumes (based on information about the proximity of the

**Based on the results of these studies, the Tahoe Regional Planning Agency enacted an ordinance banning water craft propelled by carbureted two-stroke engines from Lake Tahoe beginning June 1, 1999.**

plume, the source MTBE concentration level, site hydrology, and well construction details). Since September 1997, 13 STPUD wells have been shut down because of the presence or threat of MTBE contamination.

Of the five LUFT sites that have been identified as sources for MTBE plumes that have contaminated or threatened eleven STPUD and three motel wells, reported MTBE concen-

trations have ranged from 3,300 ppb to 91,500 ppb in groundwater. Plume lengths range from greater than 250 feet to greater than 1,500 feet. Benzene plume lengths range from less than 40 feet to greater than 1,050 feet. At all sites, MTBE plumes were comparable in size or larger than benzene plumes.

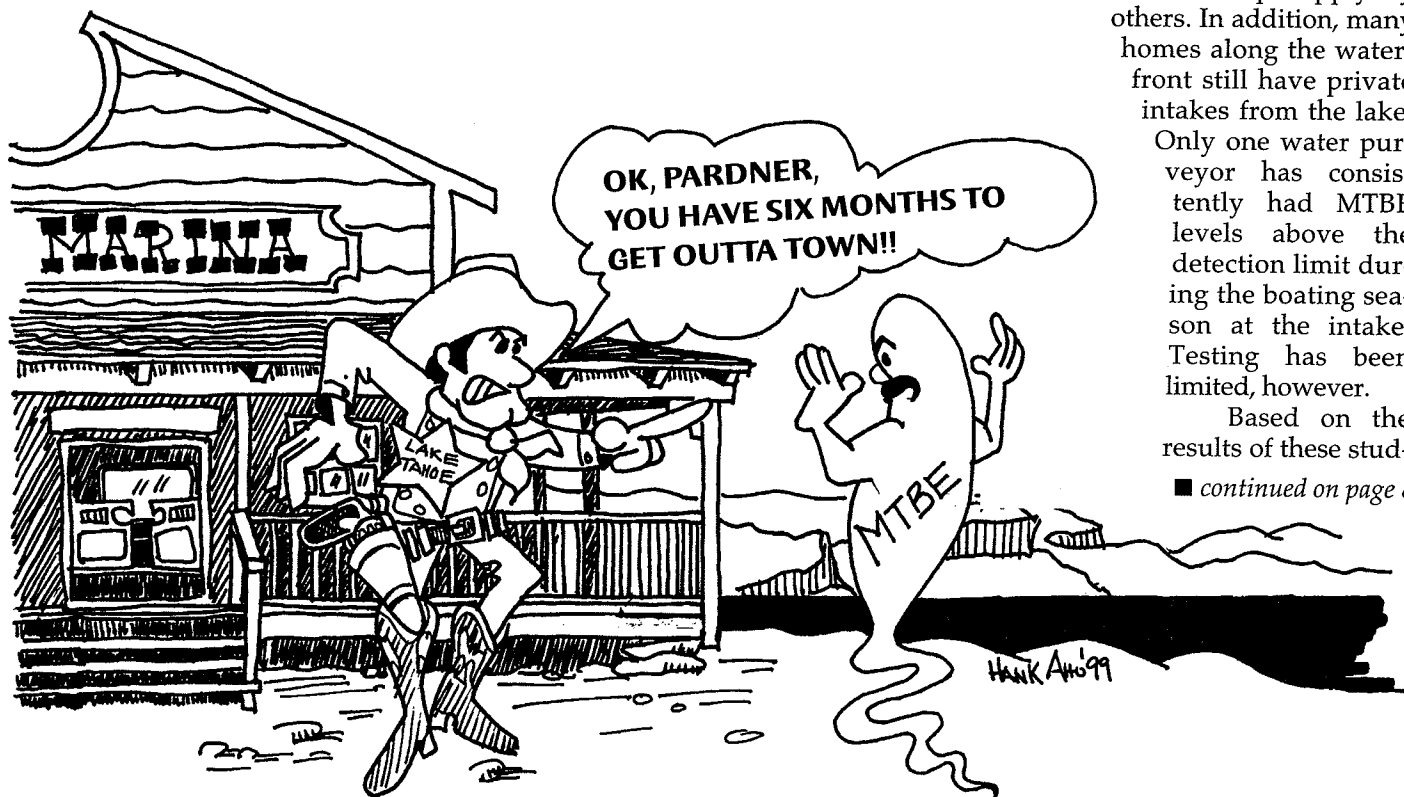
Lake Tahoe surface water has also been studied. During 1997, the U.S. Geological Survey (USGS) monitored a series of near-shore areas in Lake Tahoe where water craft activity is common, several open-water locations, and several background reference lakes that largely do not allow motorized boating. MTBE was found at levels ranging from 0.30 ppb to 4.2 ppb in areas of motorized boating, at less than 0.51 ppb in the open-water areas, and at undetectable (<0.11 ppb) in the lakes with little motorized boating.

Samples collected by the Lahontan Regional Water Quality Control Board in 1997 in areas of known boat use showed levels as high as 47 ppb near a fuel storage area and 20 ppb near a jet ski storage area. The USGS found detectable concentrations of MTBE at depths as great as 90 feet during the 1997 boating season.

Lake Tahoe is used exclusively as a source of drinking water by a number of suppliers and is used as a summer reserve or backup supply by others. In addition, many homes along the waterfront still have private intakes from the lake. Only one water purveyor has consistently had MTBE levels above the detection limit during the boating season at the intake. Testing has been limited, however.

Based on the results of these stud-

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**■ MTBE from page 7**

ies, the Tahoe Regional Planning Agency (TRPA) enacted an ordinance banning water craft propelled by carbureted two-stroke engines from Lake Tahoe beginning June 1, 1999. A Federal District Court judge dismissed all 18 claims brought by jet ski manufacturers and retailers challenging the ordinance. The TRPA ordinance was the first of its kind to apply to federally regulated waters.

The judge's order dismissed 13 of the plaintiffs' 18 claims permanently and holds that 5 claims cannot be sustained based on their current wording. The claims that were completely dismissed allege that the ordinance violated the U.S. Constitution's takings, due process, and commerce clauses; federal and state laws protecting access to navigable waterways; the U.S. Constitution's prohibition against vague laws; and a number of state laws regulating boating and access to navigable waters. The claims that were dismissed without prejudice deal with consideration of environmental impacts, and claims under the Federal Clean Water Act and Sportfish Restoration Act.

In further action against MTBE, the city council in South Lake Tahoe gave MTBE six months to "get out of town." Gasoline dealers have until April 1999 to get rid of their gasoline containing MTBE. The South Tahoe Utility District has sued oil companies to recover water treatment costs.

The South Tahoe Public Utility District has filed suit against seven oil companies and five service stations, alleging that 12 of its 35 drinking-water wells have been shut down due to MTBE contamination. The utility has sued oil companies to recover water treatment costs.

### **California Energy Commission MTBE Study**

In October 1998, the California Energy Commission (CEC) submitted a report to the legislature that examined the possibility of eliminating the use of MTBE in gasoline. The study evaluated the effect such a change would have on the supply and price of gasoline for consumers in California. The findings of this study indicate that the cost impacts for consumers are directly related to

the period of time permitted for phasing out MTBE.

If the use of MTBE were discontinued immediately, the consequences would be "dire for consumers and catastrophic for the state's economy." For example, it is estimated that a three-year phase-out of MTBE would add seven to nine cents per gallon to the cost of gasoline in California, or \$700 million per year. The CEC recommended a six-year plan to make the phase-out monetarily feasible.

*The entire text of this study is available on the Web at:*  
<http://www.energy.ca.gov/mtbe>.

### **Fuel Future for California?**

On December 11, 1998, the California Air Resource Board (CARB) refused to ease its rules that require a gasoline Reid vapor pressure (RVP) of 7 pounds per square inch (psi). Ethanol blended at 10 percent would raise RVP to 8 psi. Blends of 10 percent ethanol are required to qualify for a national tax incentive.

In September 1998, former California Governor Pete Wilson vetoed a bill that would have opened the state's oxygenate program to ethanol, allowing the ethanol to compete with MTBE. The new California governor, Gray Davis, will make a decision in 1999 as to whether to ban, phase out, or continue using MTBE in gasoline in California.

Senator Diane Feinstein (D-CA) and Rep. Brian Bilbray (R-CA) have reintroduced a bill in Congress that would remove the California requirement that gasoline contain at least 2 percent oxygenates. Congress did not act upon a similar proposal in 1998.

The California oil industry is already deciding for itself what to do about MTBE. Tosco, Chevron, and Shell have announced they will make gasoline without it. California refiners are fighting about reformulated gasoline (RFG) formulations that will meet the state's emission standards without MTBE.

Tosco has been selling RFG that uses ethanol in place of MTBE since April 1998 in a pilot program approved by CARB. The challenge was for Tosco to replace MTBE with ethanol without exceeding California's summer RVP standard of 7 psi.

Ethanol's blending RVP is 18; MTBE's is just 3-4 psi. (MTBE helps reduce the volatility of gasoline, which reduces evaporative emissions from vehicles or service stations, whereas ethanol tends to increase evaporative emissions.) Tosco

reached this ethanol RVP by removing lighter fractions from gasoline and blending the remaining fuel with ethanol to 5.7 volume percent.

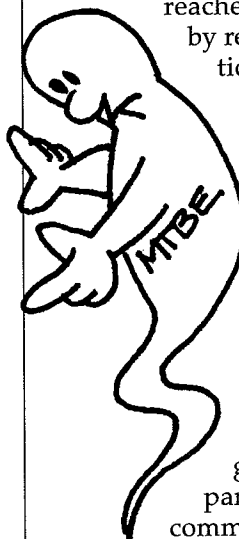
Recently, Chevron also started producing RFG that it claims meets state and federal emissions standards while containing no oxygenates. The company has declined to comment on the new formulation, but the new gasoline, like Tosco's, is designed

for those areas of the state that meet ozone standards and were recently declared by EPA to be in compliance for carbon monoxide. New CARB regulations allowing the elimination of oxygenates in these areas went into effect on September 21.

California has unique status under the Clean Air Act. Because its air pollution program predated the federal program and because air quality in portions of the state is worse than anywhere else in the country, California is allowed to have separate regulations for fuels. Thus gasoline sold in portions of the state (Los Angeles, Sacramento, and San Diego) must meet two separate sets of requirements—state and federal.

The federal requirements, specified in the Clean Air Act, mandate that RFG contain at least 2 percent oxygen by weight (a requirement now generally met by adding MTBE to gasoline). California's standards, which became effective a year later than the federal requirements, include an oxygen content specification "because of the oxygen requirements in the federal RFG program."

According to CAL EPA, however, "a key element of the California program is a mathematical or 'predictive' model that allows refiners to vary the composition of their gasoline as long as they achieve equiva-





lent emission restrictions...For areas not subject to federal RFG requirements, refiners can use the predictive model to reduce or even eliminate the use of oxygenates," except during the four winter months, when they are subject to separate oxygenate requirements to reduce carbon monoxide.

This gasoline cannot, however, be used in all parts of the state. The Clean Air Act Amendments require that gasoline sold in ozone-nonattainment areas contain 2 wt. % oxygenate. This consideration applies to the state's most populated areas.

A group called Communities for a Better Environment has filed a broad, MTBE-related suit in a local state court that accuses Unocal, Arco, Chevron, Exxon, Mobil, Shell, Texaco, and Tosco of violating California's Unfair Competition Act by profiting by selling a product they already knew to be defective.

Unocal has filed a patent-infringement against six of these companies (excluding Tosco) over RFG formulations patented by Unocal in 1994. On August 31, a federal judge ruled in favor of Unocal. Earlier, a jury had awarded Unocal 5.75 cents per gallon in royalties for gasoline manufactured by the six companies, which could amount to \$69 million. Appeals are being made by most of the manufacturers (*Chemical Engineering*, November 1998, p. 56.)

### Santa Monica, California

In the summer of 1996, the City of Santa Monica ceased pumping groundwater from its Charnock and Arcadia well fields due to persistent and increasing concentrations of MTBE in all seven water supply wells. This lost production accounted for approximately 80 percent of the city's drinking water supply. The city, in cooperation with state and federal officials and participating oil companies, initiated an investigation of MTBE contamination in the well fields to delineate the extent of contamination, identify potentially respon-

sible parties, and collect data needed to design and implement an effective remediation program.

At the Arcadia well field, the most likely source of contamination is a former Mobil service station located immediately adjacent to the well field. The city filed a lawsuit charging Mobil with "gross and willful negligence." In response to a cleanup and abatement order, Mobil has removed the tanks, dispensers, and piping; demolished the building; excavated contaminated soil to a depth of 10 feet; delineated the vadose zone contamination beyond the station property; conducted an assessment of hydrogeologic and contaminant conditions to delineate MTBE contaminant extent in groundwater and to help evaluate migration



**Concentrations as high as 610 ppb were observed at the Charnock well field, and the seven wells have been closed. In the area are 20 "possible" sources of contamination, including two pipelines that run directly through the well field.**

pathways from the release to the production wells; performed numerical groundwater flow and solute transport modeling to assist in pathway evaluation and remediation design; installed and is operating an interim pump-and-treat system for the shallow aquifer; and evaluated treatment technologies for drinking water contaminated with MTBE.

Design of a remediation system for the Lower and Production Aquifers is ongoing. The agreement between the city and Mobil requires Mobil to pay \$2.2 million for the city's past costs, including the cost of replacement water; cleanup of the drinking water to the lesser of 20 ppb or a more stringent regulatory standard, which must be met for one year without treatment before Mobil's cleanup obligations are satisfied; and a prohibition on the use of hazardous materials at the former Mobil station property. It is projected that all remedial systems will be operational at this site by February 1999.

Concentrations as high as 610 ppb were observed at the Charnock

well field, and the seven wells have been closed. In the area are 20 "possible" sources of contamination, including two pipelines that run directly through the well field. Shell and Chevron have entered into a voluntary agreement with the City of Santa Monica to replace the drinking water supply and work cooperatively to investigate contamination at the well field and implement a remediation program.

The agreement, which is temporary and requires renewals through January 6, 2000, stipulates the cleanup of the drinking water to the lesser of 20 ppb or a more stringent regulatory standard, and requires the city and Shell/Chevron to work with the U.S. EPA and Regional Water Quality Control Board to bring other companies into the agreement. Current activities under way at Charnock include pipeline testing, a regional hydrology study, joint EPA/RWQCB enforcement action, and a treatment technology evaluation.

### Glennville, California

In Glennville, California, several private drinking water wells were discovered to contain high concentrations of MTBE in July 1995. The leaking UST was replaced at the town's only gas station, but the soil and groundwater remained contaminated. The release contaminated a shopping center well, along with 21 water supply wells. The county health department installed a groundwater treatment system that was eventually shut down due to numerous malfunctions. Groundwater was not analyzed for MTBE at the time, and subsequent groundwater monitoring verified that the petroleum levels were declining.

In 1997, the State Water Board sampled previously installed monitoring wells, and some of them were found to contain up to 430 ppm MTBE and 22 ppm benzene. Unlike the earlier trend of overall declining hydrocarbon concentrations, the levels of petroleum hydrocarbons and MTBE were found to be quite high. Nearby domestic wells were found to contain from 5 ppb to 20 ppm MTBE. Residents were advised to discontinue use of their wells for domestic purposes.

■ continued on page 10

## ■ MTBE from page 9

Tank tightness testing indicated that the new tank was leaking. Characterization of the product indicated that the gasoline was manufactured in the early 1990s. Currently, the affected residents are being supplied with bottled water for domestic use. The Water Board recently decided to install point-of-entry carbon treatment units on four of the affected wells. The Board will also install a 10,000-gallon water storage tank at the shopping center and import water from the nearest town, about 40 miles away.

Two lawsuits have been filed by the residents against several major oil companies. A direct-action lawsuit filed on behalf of 70 current and former Glennville residents alleges that the oil companies failed to warn community members of health risks associated with MTBE and BTEX compounds and failed to maintain their USTs. A class-action suit names four Glennville residents and extends to other California residents who live near leaking USTs, making similar allegations and requesting punitive damages, medical monitoring for future health problems, and contamination monitoring.

### Livermore MTBE Study

A study by the Lawrence Livermore National Laboratory was funded by the California State Water resources Control Board (SWRCB), U.S. Department of Energy (DOE), and Western States Petroleum Association (WSPA) to characterize the fate and transport of MTBE at leaking UST sites. A final report was issued in June 1998.

Groundwater monitoring data were examined at 236 UST sites in California with 1,858 monitoring wells. Findings indicated that MTBE is not significantly degrading in existing monitoring networks and may be regarded as recalcitrant under site-specific conditions. The primary attenuation mechanism for MTBE is dispersion. It was estimated that there are at least 10,000 MTBE-impacted sites in California.

Although the study showed that individual MTBE plumes are nearly equivalent in length or shorter than corresponding benzene plumes (based on 20 ppb and 1 ppb delin-

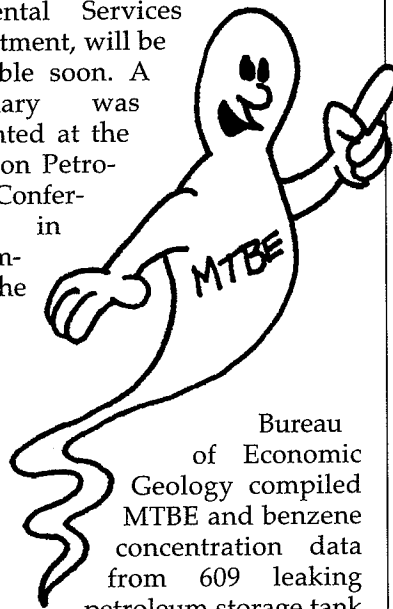
eation, respectively), results predict that this relationship will change with time as contaminant plumes gradually dissociate.

Interpretation of plume lengths is complicated by the fact that a single site may have experienced several releases, resulting in overlying plumes of gasoline with and without MTBE. Because of the mobility of MTBE and recalcitrance to biodegradation, MTBE has the potential to impact regional groundwater resources. Water resource management on a regional scale will become increasingly important.

*The Livermore MTBE study is available on the Internet at:*  
<http://www-erd.llnl.gov/mtbe/new-mtbe.html>.

### Texas MTBE Plume Study

The Texas MTBE plume study, supported by the API Health and Environmental Services Department, will be available soon. A summary was presented at the Houston Petroleum Conference in November. The Texas



Results show that MTBE is detected in shallow groundwater beneath 93 percent of the sites in most parts of the state. Most sites have MTBE concentrations that exceed the lower limit of the EPA advisory level (80% > 40ppb). Geometric mean plume length for an MTBE concentration of 10 ppb is 182 feet. MTBE extends beyond the monitoring well network in about 10 percent of the sites. MTBE plumes are, on the average, about 27 feet longer

than benzene plumes and are longer than their companion benzene plumes at 56 percent of sites. There is some preliminary evidence that MTBE plumes may be naturally attenuating at many sites in Texas, but better site-specific temporal data are needed to confirm the occurrence of natural attenuation of MTBE and to estimate the fraction of sites that have stable, growing, or receding plumes.

### Drinking Water Standards

#### Federal

In December 1997, EPA's Office of Water released a new Drinking Water Advisory on MTBE. In general, the advisory advises water suppliers to ensure that MTBE levels do not exceed 20–40 ppb, a level most likely to avert unpleasant tastes and odors.

*Copies of the drinking water advisory, Consumer Acceptability and Health Effects Analysis on Methyl Tertiary-Butyl Ether (MtBE), are available through the Internet at:*  
<http://www.epa.gov/OST/drinking/mtbe.html>.

In addition, MTBE is included in the Drinking Water Contaminant Candidate List required by the Safe Drinking Water Act. This list was published in February 1998. Final decisions on whether to establish a standard on at least five contaminants are to be made by August 2001. U.S. EPA's Office of Research and Development is working to identify MTBE research needs. A final report, "Oxygenates in Water: Critical Information and Research Needs," was issued in December 1998 (EPA/600/R-98/048).

*The report is available on the Internet at:*  
<http://www.epa.gov/ncea/oxyneeds.htm>.

#### California

Two statutes were signed into law in California in 1997 regarding MTBE and drinking water. SB 1189 (Hayden) and AB 592 (Kuehl) required the California Department of Health Services to develop secondary and primary drinking water standards (MCLs) for MTBE. To establish these standards, CAL EPA's Office of Envi-

ronmental Health Hazard Assessment compiled available data on both the carcinogenicity and developmental and reproductive toxicity of MTBE.

Following is an excerpt from the report, "Evidence on the Carcinogenicity of Methyl Tertiary Butyl Ether (MTBE)": "There is evidence for the carcinogenicity of methyl tertiary butyl ether (MTBE), based on several findings from animal studies. However, critics have questioned the interpretation of each of the individual findings...An argument has been made that the mechanism of induction of these tumors, although unknown, may be nongenotoxic, and consequently the findings may not be relevant to humans exposed at environmental levels."

In this report, the carcinogenicity studies are reviewed and the issues that have been raised are addressed in the context of a detailed discussion of pathology and mechanisms for each tumor site. Positive animal carcinogenicity data and some further concordance in tumor sites for formaldehyde and TBA—metabolites of MTBE—provide support for the conclusion that there is evidence of carcinogenicity in animals. However, uncertainties remain about the nature and extent of risk at very low doses and about the particular tumor sites that are most relevant to humans.

*Documents related to carcinogenicity and developmental and reproductive toxicity are available by searching the OEHHA Web page, which can be accessed at <http://www.oehha.org>.*

A public meeting of the Carcinogen Identification Committee of OEHHA's Science Advisory Board was held on December 10, 1998. Presentations for MTBE were to include staff presentation, Committee discussion, public comments, and Committee discussion and decision. A December 12, 1998, article in the *Sacramento Bee* reported that state officials said that they would have to look at the draft Public Health Goal as a result of findings that there may not be enough evidence to declare that MTBE can cause defects. The

## EPA Forms Blue-Ribbon Panel

On November 30, 1998, EPA Administrator Carol Browner announced that a blue-ribbon panel had been formed to review the important issues posed by the use of MTBE and other oxygenates in gasoline. The panel is chaired by Dr. Daniel Greenbaum, President of the Health Effects Institute, and Robert Perciasepe, Assistant Administrator for Air and Radiation at U.S. EPA.

The panel will (1) examine the role of oxygenates in meeting the nation's goal of clean air; (2) evaluate each product's efficiency in providing clean air benefits and the existence of alternatives; (3) assess the behavior of oxygenates in the environment; (4) review any known health effects; and (5) compare the cost of production and use and each product's availability—both at present and in the future. The panel will also study the causes of groundwater and drinking water contamination from motor vehicle fuels, and explore prevention and cleanup technologies for soil and water. The panel will report to EPA within six months, with recommendations on how to ensure health protection and continued improvement in both air and water quality. ■

*The panel has a Web site at <http://www.epa.gov/oms/consumer/fuels/oxy-panel/blueribb.htm>. The Web site includes press announcements, a list of panel members, announcements of future meeting, minutes from meetings, and links to EPA and outside MTBE resource material.*

statement came from the Deputy Director of the OEHHA office.

Earlier, CAL EPA had proposed a public health goal for MTBE of 14 ppb in drinking water. A subcommittee of OEHHA's Scientific Advisory Board had voted that studies of MTBE did not provide enough evidence to conclude that the chemical causes reproductive or developmental harm. Another committee could not muster the votes to endorse the finding that MTBE is a carcinogen. The scientific board's findings were based on studies that looked at the effect of the chemical on laboratory animals, mainly from breathing the vapors.

The Board's conclusions are consistent with those of the U.S. EPA, which lists MTBE as a "possible human carcinogen," meaning that only limited evidence exists that the agent causes cancer. These findings are not likely to ease political and public pressure about the compound. MTBE will not be listed as a carcinogen or as a substance that causes birth defects or infertility by the State of California. This decision was announced by CAL EPA's OEHHA Proposition 65 Committee during December policy meetings. The com-

mittee "found insufficient support for the proposition that MTBE is a carcinogen and that there was not a demonstrable majority in favor of listing within that committee."

James Spagnole, spokesperson for CAL EPA, said that the science board's findings "probably would not change the state's efforts to find alternatives to MTBE... but it leaves open the question as to whether we should replace it with ethanol or formulate a low-pollution gasoline without any of the oxygenates."

The secondary standard for MTBE, 5 ppb, became effective January 7, 1999. Secondary standards, not to be exceeded in water supplied to the public, address "aesthetic" qualities of drinking water supplies. Primary MCLs include consideration of health risks, the technical feasibility of meeting the MCL (in terms of monitoring and water treatment requirements), and costs associated with compliance. MCLs are not to be exceeded in water supplied to the public. CAL EPA's Office of Environmental Health Hazard Assessment (OEHHA) has proposed a Public Health Goal (PHG) of 47 ppb MTBE based on noncancer endpoints and

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## Investigation and Remediation

# Tanks Down East

by W. David McCaskill

David McCaskill is an environmental engineer with the Maine Department of Environmental Protection. **Tanks Down East** was once a regular feature of LUSTLine. It's been a long hiatus, but Dave's back. As always, we welcome our readers' comments.



## A Little Drop'll Do Ya Maine Study Finds the Presence of MTBE in Drinking Water Wells to Be Widespread and of Curious Origin

It was May, the air was hovering above freezing, mud season was tailing off, and we were finally recovering from the after effects of the "Big Ice Storm of 1998." On top of that, our UST replacement schedule deadline was a full year ahead of the rest of the nation—nonconforming tanks were springing out of the ground like fiddleheads along the Kennebec River. Things seemed pretty cushy here in the Land of Lobster. But then, just like New England weather, there was a sudden atmospheric shift. One day the newspaper headlines are touting the economic benefits of the upcoming tourist season, the next day they're railing about three separate stories on MTBE contamination!

The MTBE sites were all "high profile"—a public drinking-water well field with low levels of MTBE but high levels of public anxiety; a private well belonging to an anxious resident in that same town, who had his well tested and reported high levels of MTBE to the press; and a school well screaming with MTBE.

Needless to say, the "town fathers" in the affected communities were concerned about the reputation of their drinking water, especially with tourist season just around the corner. Of course, there was a lot of finger pointing.

### A Viruliferous Dilemma

It was like we were back in those heady days of LUST 10 years ago.

Groundwater contamination was back in the news in full force. But now a new four-letter word had been added to the public lexicon—MTBE (methyl butyl tertiary ether) and it was grabbing all the media headlines and sound bites. (Maine's use of reformulated gasoline [RFG], which contains approximately 11 percent MTBE by volume, was launched in 1995 to meet the Clean Air Act [CAA] requirements for reducing ozone-producing automobile exhaust.)

To make a long and sordid story short, the water district wells were contaminated with around 0.4 to 4.7 ppb (it doesn't sound like much—but you tell the townspeople that) of MTBE from several possible overfills (approximately 10 gallons each) associated with a double-walled UST system at a convenience store that had opened last July. (See *LUSTLine* # 30—"Holes in Our UST Systems.") The MTBE levels around the tank area reached 7,000 ppb at one point. And...oh...that new convenience store/gas station was built just 700 to 1,000 feet from the water district wells.

The contamination found by the homeowner, who lived two miles away from the convenience store, was only the tip of that iceberg; 11 households in that neighborhood had wells with MTBE levels above 100 ppb and another 13 households were at risk. The source in this case was a previously unreported gasoline spill from a car accident that took place in early December 1997.

Fifty miles away from these incidents, a school's bedrock well had been contaminated with 800 ppb of MTBE from a "mystery" spill. The location of the spill wasn't a mystery, however, inasmuch as an 18-inch circle of dead grass was found near a bedrock outcrop 300 feet upgradient of the well. Under that dead grass was 8 yards of gasoline-contaminated soil. The source could have been a lawnmower or any of the assorted cars and trucks customarily parked in the vicinity of the fractured outcrop.

With three contamination events in one week, it seemed as though we were in the midst of an MTBE epidemic! The daily news updates and howls from the public and politicians challenged our governor to take bold action. He determined that 1,000 household wells and all of the public drinking water supplies in the state should be tested for MTBE.

### The Battle Plan

During the summer of 1998, the Maine Department of Environmental Protection (DEP), the Bureau of Health (BH), and the Maine Geological Survey developed a plan for selecting and sampling 1,000 household drinking-water supplies and 793 of the 830 nontransient public drinking-water supplies for MTBE. Four other major constituents of gasoline—benzene, toluene, ethyl benzene, and xylene (BTEX)—were tested for as well.

Initially 5,000 randomly selected residences were identified and then matched with census data to determine if they were on public or private drinking-water supplies. The list was pared down to 951 households confirmed to be on residential water supplies and also willing to participate. The sample points were entered into the state's Geographic Information System (GIS) so that maps could be generated.

A consultant was selected to take the samples. Laboratory analyses were performed by the Department of Human Services (DHS). The MTBE detection level for this project was 0.1 ppb. The health standard for MTBE in drinking water in Maine is 35 ppb; the action level for the DEP to respond with water treatment/remediation at a well is 25 ppb.

### Lo and Behold!

Three months later the fieldwork was completed, and on October 13, 1998, the results were published. A full copy of the report, *The Presence of MTBE and Other Gasoline Compounds in Maine's Drinking Water: A Preliminary Report*, is available at <http://www.state.me.us/dhs/bob/mtbe.pdf>.

Of the household water supplies sampled, 15.8 percent had MTBE detected, 1.1 percent at levels exceed-

ing the state's drinking-water standard of 35 ppb. Other BTEX constituents were rarely found. MTBE was detected in 16 percent of the public water supplies tested, but no samples were above 35 ppb. Low levels of toluene were found in 13.1 percent of the public water supplies. For both types of water supplies, the contaminated wells were found throughout the state, from the southern, higher-populated counties, where RFG is mandated, to the northern, less-populated areas, where it is not. As we like to say up here, we found the stuff from Kittery to Fort Kent! Based on the study, it is estimated that somewhere between 1,400 and 5,200 domestic wells could be expected to have MTBE concentrations above 35 ppb. So far, only a few new MTBE-contaminated site cases have dribbled in to our office.

Follow-up data collected by the state indicate that small spills of gasoline unrelated to underground or aboveground fuel tanks can significantly impact a water resource. The DEP response staff visited the 14 homes found in the survey with contamination above the drinking water standard. The findings were somewhat surprising and disturbing because they went against the common assumption that MTBE contami-

nation would be associated with USTs and/or ASTs. Distance from gasoline tanks was factored into this study, and no statistically significant correlation was found. Let's look at a few choice examples, and I'll think you'll start to see where the problem lies.

### Tools and Toys

A location with 260 ppb of MTBE was a rural site located in the southern coastal region. It seems that the owners of the house found their backyard bedrock outcrop a convenient place to store old engine parts. Chances are there may have been some backyard mechanical work going on there as well.

A mid-coastal island site had a hit of 236 ppb, but this time the suspected culprit was not auto repair but marine outboard motor repair. This finding is not at all uncommon; the DEP has found MTBE as well as waste oil contamination in wells at other coastal fishing communities.

In another example, 78 ppb was found at a mid-Maine inland site where the well was located in a shed attached to the house. Gas cans and a snowmobile were stored outside the shed and only 5 feet from the well. If that's not good enough reason for this well to become contaminated, last year, a truck with five 5-gallon gas cans in the bed caught fire some 300 to 400 feet upgradient from the well.

A 51 ppb "Small Surface Spill Identified" was a case where the gas tank on a car parked on a gravel driveway overlaying a dug well had leaked for a week! It doesn't stop

there; auto repairs routinely took place in a garage just 20 feet away from the well.

These are some of the more "extreme" cases, but four of the other sites with high levels of MTBE have no known source, except that the wells are in close proximity to the driveway or have gasoline-powered cars, trucks, or ATV's parked close by.

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## ■ Tanks Down East from page 13

### The Upshot

So, with the elevated levels of MTBE in RFG, it appears that a little drop will do ya. If drips and drabs from backyard mechanics, leaking gas tanks along the roadside, or 10-gallon fuel delivery overfills can do this much damage, then Maine says enough is enough. In May, 1998, Governor King of Maine notified EPA Administrator Carol Browner of his intent to exercise Maine's right to opt out of the reformulated gasoline program but asked EPA to withhold final action on the request until the drinking water study had been completed.

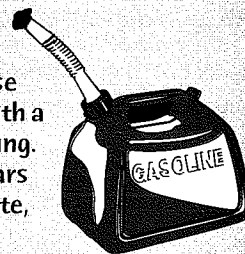
On February 24, Maine's Board of Environmental Protection adopted regulations that will replace RFG after May 1 with another type of gasoline sold widely in the South. This fuel, which is expected to sell for about the same price as RFG, will have to be replaced with a lower-volatility fuel in the summer of 2000 to keep the state in compliance with the Clean Air Act. The debate over MTBE, however, is still not over. Three bills have been introduced in the legislature that would ban MTBE altogether or set other gasoline standards.

DEP's current backlog of petroleum-contaminated sites is 300-plus, so we are not sure how we're going to skin the MTBE contamination cat if it indeed comes our way. We have dealt with MTBE since the mid 1980s in very low ppb levels at LUST sites. But, if the MTBE contamination is actually linked to such activities as filling and spilling gasoline in peoples' backyard, then the bottom line is that as long as we are hooked on gasoline tools and toys, dealing with this groundwater threat ain't gonna be easy.

To counter this environmental threat from gasoline-powered tools and toys, DEP developed some guidance for homeowners. I've summed up these little pearls of wisdom in hopes that they might help other states. Short of moving your well to a protected zone far upslope of your house and driveway, the most that you can do is to properly manage gasoline as well as all the other potentially toxic household substances. These tips are pretty much common sense but, based on our study, they are not common enough. ■

## Tips for Keeping Your Gasoline and Household Chemicals Out of Your Water Supply

- ✓ **Keep as little gasoline around the home as possible.** Gasoline is both flammable and toxic (with or without MTBE), and it is one of the most dangerous chemicals you will encounter on a regular basis.
- ✓ **Store all gasoline (and other toxic chemicals) as far away and downslope from your well (and your neighbor's well) as possible.**
- ✓ **Buy only what you need, and use it up!** Most manufacturers do not recommend storing gasoline in power equipment for more than a month, so make sure to run your equipment dry.
- ✓ **There are no cheap or easy answers for the proper disposal of gasoline that has become "gummy" or contaminated with dirt and water.** Check with your state or town to see if there is a household hazardous waste pick-up day in your area.
- ✓ **If you do end up with some left-over fresh gas at the end of a season of yard work, add fuel stabilizer before it gets old (generally more than 30 days from purchase).**
- ✓ **Never mix left-over gasoline/oil from a two-cycle engine with crankcase oil and take it to a service station or municipal trash transfer station.** Many times, these places burn the waste oil in space heaters and the gasoline could cause an explosion.
- ✓ **Never, ever—don't even think about—burning brush with leftover gasoline!**
- ✓ **Store gasoline in U.L.-listed (red for gasoline, blue for kerosene) containers.** Clearly label these containers to identify the contents and fit them with a spout to allow contents to be poured without spilling. Never store gasoline in containers such as glass jars or plastic milk jugs. These can break or deteriorate, causing a spill or a fire!
- ✓ **Store all gasoline containers in a well-ventilated shed or detached garage, away from the reach of children.**
- ✓ **Once a month, check for leaks from fuel tanks, engines, or storage containers (U.L.-listed plastic containers will not rust).**
- ✓ **Little leaks and spills can really add up and cause groundwater contamination.** Don't be a do-it-yourselfer when it comes to changing your car's crankcase oil (which may contain a small measure of MTBE). Have it done at an oil change shop or service station that recycles the waste oil. Paying \$19.95 every 3,000 miles is cheap insurance against groundwater contamination.



### Remember:

- ✓ Buy only what you need.
- ✓ Use what you've got.
- ✓ Store away from your home and well.
- ✓ Watch for leaks.





## Investigation and Remediation

# Which Compound Requires More Attorneys: MTBE or Benzene?

by Blayne Hartman

*Editor's Note: This is the third in a series of articles reviewing some of the physical/chemical properties that are commonly used in environmental assessment and remediation. This article will focus on the property of solubility and how to apply it to a common environmental problem.*

**Okay, following the tradition of the prior two articles, see if you can answer this quiz:**

Consider a site that has gasoline free product that is in contact with groundwater. In terms of corrective action at the site, which compound will ultimately involve more attorneys:

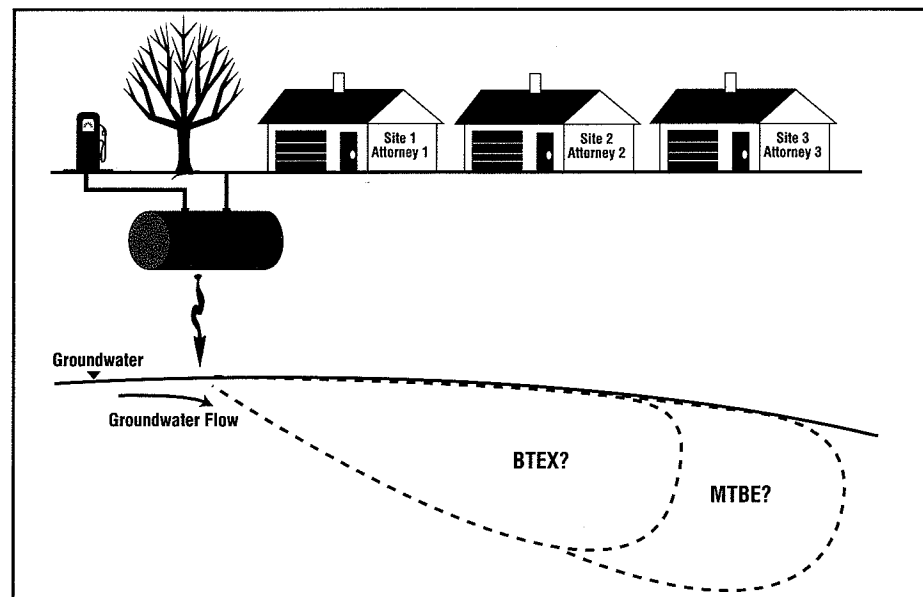
- (a) MTBE
- (b) Benzene
- (c) Equal attorneys for both compounds.
- (d) Is this another attorney joke?

*Hint: It's not a joke. So we're down to three choices. Another hint: The answer has something to do with the length of the contaminant plumes and whether the groundwater concentrations that each compound will create exceed acceptable levels. To determine this, we need to make a comparison of the starting concentrations of these compounds at their source, relative to acceptable groundwater concentrations. We begin this task by looking at the concept of solubility.*

### Solubility

The solubility of a compound is defined as the equilibrium concentration of a compound dissolved in water when the water is in contact with the pure compound. The greater the solubility, the higher the concentration of a compound in the water.

Solubilities have been measured empirically (i.e., in the laboratory) for a wide variety of compounds and are tabulated in many reference books. They can be expressed in a variety of different units; most typically they are expressed in terms of mass of the compound per volume of water, such



as milligrams per liter (mg/L) or micrograms per liter ( $\mu\text{g/L}$ ).

Solubility is very compound-specific. If you reflect back to your days in high school or freshman chemistry (without too much pain, I hope), you might recall the old saying, "Like dissolves like." Water is a polar compound and hydrocarbons are primarily nonpolar, which means they are not alike. Consequently, hydrocarbons, by their nature, are generally not very soluble in water. However, where hydrocarbon compounds contain an oxygen molecule (e.g., ethers), solubilities increase dramatically. MTBE is such a compound, and as you've probably already figured out, this is why MTBE is much more soluble in water than benzene.

### Now Back to Our Calculation

If we had a pure compound, the resulting maximum water concentration would simply be equal to the solubility. However, for a mixture of compounds (e.g., gasoline), the concentration of each compound in the

water is equal to its mole fraction in the mixture multiplied by its individual solubility:

$$C_w = S * MF$$

Where:

- $C_w$  is the concentration of a compound in the water,
- $S$  is the solubility of the pure compound, and
- $MF$  is the mole fraction of that compound in the mixture.

Using this expression, the equilibrium groundwater concentration of any compound in gasoline can be calculated easily. Values for MTBE and benzene are summarized in Table 1. Note that the starting concentration of MTBE in the groundwater is 120 times greater than the starting concentration of benzene (!), due to a solubility that is more than 20 times higher than that of benzene and a mole fraction in gasoline that is 5 times higher than that of benzene.

Based on the concentrations noted in Table 1, you might immediately conclude that MTBE is defi-

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## ■ MTBE or Benzene? from page 15

ninitely more of a problem than benzene. But wait—it all depends on what groundwater concentrations we eventually have to reach to meet acceptable, or nonthreatening, levels. Even though MTBE might start out 120 times higher than benzene, it doesn't matter if the acceptable levels for MTBE in groundwater are 120 times greater than those for benzene (all else being equal).

The crux of the matter is this: By how much, or by what factor, must the starting concentrations be reduced to reach acceptable levels? Let's define a reduction factor as the amount that we need to reduce the starting concentration to reach acceptable concentrations (starting concentration divided by the acceptable concentration). Table 2 summarizes reduction factors for MTBE and benzene for two different acceptable groundwater concentrations.

Depending on the acceptable levels chosen, the numbers in Table 2 show that MTBE starting concentrations need to be reduced anywhere from 24 to 40 times more than benzene. This in itself is a formidable task, but the situation is exacerbated when one considers that many of the natural processes that reduce groundwater concentrations are thought to be not nearly as effective for MTBE as they are for benzene (e.g., biodegradation or sorption onto soils).

### Factoring in Distance

Let's try to put some hypothetical distances to this concept. Using a very simple groundwater flow model (Domenico), we can calculate the expected lengths of the contaminant plumes in groundwater based on starting concentrations and acceptable ending concentrations for various groundwater flow rates (Table 3). As you can see in Table 3, expected lengths of benzene plumes above acceptable concentrations are in the range of hundreds of feet, while expected lengths of MTBE plumes are in the range of thousands of feet. In fact, these calculations indicate MTBE plumes on the order of two miles in length!

Fortunately, in the real world, equilibrium concentrations are rarely observed at the contaminant source. Starting concentrations for both MTBE

**Table 1.** Summary of relevant physical properties and calculated equilibrium groundwater concentrations of MTBE and benzene from gasoline. Mole fractions of the various compounds were selected to represent an "average gasoline" composition.

	S (mg/L)	MF	C <sub>w</sub> (mg/L)
Benzene	1,750	0.025	44
MTBE	42,000	0.125	5,250

**Table 2.** Reduction factors (RF) for benzene and MTBE from their equilibrium water concentrations (C<sub>w</sub>) to two acceptable levels (C<sub>a1</sub>) and (C<sub>a2</sub>).

	C <sub>w</sub> (mg/L)	C <sub>a1</sub> (mg/L)	RF	C <sub>a2</sub> (mg/L)	RF
Benzene	44	0.005	8,800	0.001	44,000
MTBE	5,250	0.015	350,000	0.005	1,050,000
Ratio			40		24

**Table 3.** Expected plume lengths for benzene and MTBE starting at equilibrium water concentrations (C<sub>w</sub>) and reaching an acceptable level (C<sub>a</sub>). Values assume a constant source and the daily attenuation rate of benzene taken to be 10 to 100 times greater than that of MTBE.

	C <sub>w</sub> (mg/L)	C <sub>a</sub> (mg/L)	0.1 ft/day	1 ft/day
Benzene	44	0.005	70 to 300	300 to 900
MTBE	5,250	0.020	750 to 10,000	3,000 to 10,000

**Table 4.** Expected plume lengths for benzene and MTBE starting at water concentrations more commonly observed in groundwater (C<sub>w</sub>) and reaching an acceptable level (C<sub>a</sub>). Values assume a constant source and the daily attenuation rate of benzene taken to be 10 to 100 times greater than that of MTBE.

	C <sub>w</sub> (mg/L)	C <sub>a</sub> (mg/L)	0.1 ft/day	1 ft/day
Benzene	10	0.005	60 to 230	230 to 560
MTBE	75	0.020	260 to 1,060	760 to 1,090

and benzene are significantly lower than the equilibrium values, and the resulting plume lengths, primarily for MTBE, are significantly shorter.

Table 4 summarizes the calculated plume lengths using starting concentrations for benzene and MTBE equal to the 95 percentile from Orange County, California, well data. Note that while the calculated lengths of the benzene plumes are nearly the same as in Table 3, the lengths of the MTBE plumes are significantly shorter. While we can all breathe a sigh of relief that contaminant plumes of one or two miles in length are not common, these calculations still suggest that MTBE plumes will be longer than benzene plumes by two to five times.

### The Answer to the Quiz

Longer plumes tend to cross more

properties. The more properties involved, the more property owners involved—all with their own attorneys. So, based on the values shown in Tables 3 and 4, the correct answer is (a): MTBE. The high solubility of MTBE, along with its relative high percentage in gasoline, creates the potential for higher starting concentrations in groundwater. Meanwhile, the low acceptable groundwater concentrations for MTBE, coupled with its poor natural attenuation potential, yields plume lengths that are significantly longer than benzene.

Before you start congratulating yourself for choosing the right answer, you need to be aware of recent studies by the Lawrence Livermore National Laboratory (June 1998) and the University of Texas (1998) that compare measured plume lengths (not calculated) of BTEX and

MTBE. In a comparison of data from 63 leaking underground fuel tank (LUFT) sites in California, the Livermore study concludes that the plume lengths for MTBE and BTEX are either the same or shorter than benzene! This would suggest that choice (b) is the correct answer.

How can the plume lengths be the same, you wonder? Well, so did the Lawrence Livermore group. Its answer? The MTBE plumes are "young" (i.e., relatively recent releases that haven't reached steady state) and are still expanding. In other words, the researchers expect that the MTBE plumes will increase in length over the years, much like we'd expect from our modeling results. So, choice (a) it is.

But wait. There may be another explanation. Could it be that, just as with BTEX plumes, bioactivity is responsible for controlling the size of the MTBE plumes? Is it possible that when the BTEX is no longer available, the MTBE becomes the preferred food source (electron donor)? This conclusion goes against conventional dogma that MTBE is not readily degraded by microorganisms

(MTBE—also known as **Many Things Bioremediate Easier**).

The University of Texas paper suggests that natural attenuation of MTBE is occurring at rates much faster than expected. If this is the case, it may be possible that the reason that the plume lengths for BTEX and MTBE in the Livermore study are nearly the same is because MTBE, like BTEX, is being controlled by biological activity, not necessarily the age of the input. Translated: The MTBE plumes may already be at maximum length!

So, now what's the answer to the quiz? Well, if you're a modeler, the answer is (a). If you look at the plume length data from the recent Livermore study, the answer is (b). If you believe the explanation offered by the Livermore group (plumes will be growing), the answer is (a). If you believe that natural attenuation of MTBE could be occurring faster than we think, the answer is (c).

### In Truth...

We don't know the right answer. At present, not enough actual field data have been collected on MTBE to

really know how it behaves. We still have much to learn. It may, indeed, turn out that risk-based decision making is very appropriate for MTBE, just as it has been for BTEX in the past five years. For this reason, it is crucial that regulatory agencies be careful before attempting to apply basin-wide action levels and equally important that reasonable groundwater concentrations be set, or the cleanup costs for MTBE contamination could "break the bank." Fortunately, it may be that the microorganisms are already working on the problem. *Stay tuned.* ■

*Blayne Hartman is a regular contributor to LUSTLine. This article is taken from a presentation on physical/chemical properties that he gives as part of a training course on environmental geochemistry. For more information, either e-mail Blayne directly at [bh@tegenv.com](mailto:bh@tegenv.com), or check out his Web page at [www.tegenv.com](http://www.tegenv.com).*

*The author wishes to thank Curtis Stanley of Equilon Corporation for providing and allowing the use of the reduction factor and plume lengths calculations.*

### ■ MTBE from page 11

14 ppb based on cancer (OEHHA, 1998). The Department of Health Services will utilize the PHG to develop the primary MCL. A primary standard must be adopted by July 1999.

According to a January 1, 1999, article in *New Fuels and Vehicle Report*, the California State Auditor's office, in an audit released at the end of December, asserted that the Department of Health Services (DHS) was aware of the MTBE problem as early as 1990, but did not establish regulations to test for it until 1997. It did not adopt interim emergency regulations even though it had the authority to do so.

"Health Services, the regional water boards, and local agencies have not enforced laws that require prompt follow-up monitoring for chemical findings and contaminated sites, notified the public about chemicals found in drinking water, and managed the cleanup of chemical contamination of groundwater."

### Other Recent Cancer Evaluations of MTBE

The International Agency on Cancer Research has found that there are no data directly showing that MTBE causes cancer in humans, and that there is limited evidence that MTBE is an animal carcinogen. Its overall assessment was that MTBE is "not classifiable as to its carcinogenicity to humans."

The National Toxicology Program, administered by the Department of Health and Human Services, has decided against listing MTBE in the upcoming ninth edition of the NTP "Report on Carcinogens." This decision came from the third NTP group to conduct a review of MTBE for the ninth edition. Two previous groups split as to whether to list MTBE as "reasonably anticipated to be a human carcinogen." The first group voted 4-3 to list MTBE, while the second voted 3-4 against listing it. The third vote was 5 in favor, 6 opposed, with 1 abstention. Next, the recommendations of all three review

groups and public comments will be presented to the NTP Executive Committee for review and comment, following which the Director of NTP receives all four independent recommendations and makes the final decision to submit the report to the Secretary for review and approval. ■

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*She has been a member of an EPA MTBE workgroup organized to determine state information needs, is co-editor of a quarterly newsletter on MTBE issued by the MTBE Workgroup of the Association of State and Territorial Solid Waste Management Officials (ASTSWMO), and is a member of the EPA Blue-Ribbon Panel reviewing the use of MTBE and other oxygenates in gasoline. She is the co-author of a previous article on MTBE in LUSTLine Bulletin 24. Pat can be reached by e-mail at [pellis@dnrec.state.de.us](mailto:pellis@dnrec.state.de.us).*

## 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 comments and questions. If there are technical issues that you would like to have Marcel discuss, let us know.

## Hmm...If Only Overfill Prevention Worked!

One of the people in the tank business I really enjoy talking with has his own business and has invented a number of UST-related devices, including vapor recovery, tank testing, and automatic line testing equipment. Over the years, he has introduced some of his children into his company, including his son. A few years ago at a trade show, I asked him where his son was.

"He's left the company," he said, "and he's really happy." His son had been in charge of marketing Stage II vapor recovery equipment for the company; he'd since switched to selling mountain bike gear and apparel. He loved being in a business where people actually wanted to buy what he was selling.

That comment stuck with me. It's true, UST regulations all too often force people to buy things they don't want. Sometimes, the regulations require things that make business sense to a forward-thinking person (e.g., corrosion-protected tanks).

Likewise, ATGs have become a very popular leak detection choice, not because buyers think they are great at finding leaks (as UST inspectors know, the leak detection function is frequently overlooked), but because the ATG provides more convenient and more accurate inventory data—a business benefit.

But sometimes rules seem to require frills that make no economic sense. "Why, when I bury a 10,000-gallon tank, can I use only 9,000 gallons of it? Why am I wasting 1,000 gallons of storage capacity?" asks the tank owner. If the buyer perceives no business benefit to the required device, chances are he or she will invest in the cheapest choice that meets the regulations.

The problem with overfill prevention is that the buyer (the tank owner) is not the user (the tank truck



*Operator vigilance during delivery is critical to spill prevention.*

driver). The buyer, seeing no operational benefit to one device over another, chooses the cheapest, typically the float vent valve. If the tank truck driver were making the choice, how many drivers do you think would purchase a device that would shower them in gasoline if they had the misfortune of trying to deliver too much fuel into a tank?

Overfill prevention is not working because the hardware is not purchased by the end user, and as a result, the available hardware is not very user-friendly. Float vent valves can be a hazard to a delivery person's health, drop tube devices slow deliveries down, and alarms are a nuisance. Tank truck drivers are motivated to avoid, ignore, or otherwise defeat overfill prevention hardware that, in an ideal world, should help them do their job rather than get in the way.

So let's look at ways in which existing overfill prevention hardware can be neutralized and then describe what a tank truck driver's "dream device" for overfill prevention might look like.

### The Light Dawns

It was some years ago in Texas. I had taken a class into the field to conduct UST compliance inspections. At one of our stops, I remember being somewhat puzzled at the sight of petroleum product within a foot or so of the top of an underground tank fill pipe. I looked over the paperwork for the facility and verified that an overfill prevention device was in place. I then checked with the facility operator, a well-intentioned gentleman who had only recently assumed responsibility for the storage system. He said that there had been a delivery into the tank the day before.

Wanting to know more about his storage system, the facility operator had spoken to the delivery person. The driver had mentioned a "pressure relief valve" adjacent to the fill pipe that was used to relieve the pressure in the tank to allow the tank to be filled completely.

Hearing this, I scratched my head for a few minutes, and then I knew...the light bulb in my mind shone brightly. Here's what was

going on: The facility had a ball float valve overfill prevention device. By opening the drain valve adjacent to the fill pipe in the spill containment manhole, the tank could be vented through the drain mechanism, bypassing the float vent valve and allowing the delivery to continue. (See *LUSTLine* #21, "What Every Tank Owner Should Know About Overfill Prevention.") It was then I realized that for the float vent valve to work, the tank top had to be airtight, and that, in fact, there might be many cases where this requirement might not be met.

### The Case of the Bypassed Ball

A few weeks ago, while reviewing delivery records associated with a spill incident, I noticed some numbers that told a similar story to the one mentioned above. The delivery records included before- and after-delivery stick readings that the driver had made. The post-delivery liquid level readings included numbers like 112 inches and 98 inches; the ball float valve in the tank should have stopped the delivery at around 78 inches. Because the tank was only 92 inches in diameter, the records pointed to several instances where the ball float had been bypassed and the tank was filled right up into the fill pipe. This circumstance would almost certainly have resulted in a spill of the delivery hose contents—in this case, it also probably caused or at least contributed to a million-dollar cleanup.

### The Case of the Missing Ball

I have also heard stories from installers about ball float valves that are found to be missing their ball. Examination reveals that the cage that normally holds the ball appears to have been subjected to some physical abuse. The likely scenario is this: Ball float valves are often installed directly below the Stage I vapor recovery riser. When delivery drivers clamp onto the vapor recovery fitting with their hose and adapter, they are, in effect, attaching a 10-foot-long wrench.

By kicking the hose counterclockwise, they can loosen the vapor recovery adapter sufficiently to be able to unscrew it by hand. Then they

can insert their gauge stick down the Stage I riser and pound on the ball of the float vent valve until it drops out of the cage and into the tank. The Stage I vapor recovery adapter is replaced, and no one is the wiser.

Perhaps this scenario is initiated by the float vent valve sticking in the closed position so that the driver cannot even begin to make his or her delivery. In any case, the driver will no longer have the bother of a float vent valve that reduces the capacity of the tank or that causes him or her to take a hosing in product.

### The Case of the Broken Stick

Drop tube devices are also a general nuisance in the eyes of most delivery personnel. At best, they slow down the product flow by restricting the working diameter of the drop tube. At worst, they malfunction so that they close even when the tank is nearly empty and product cannot be delivered into the tank at all.

In between, they interfere with taking the before- and after-delivery stick readings. As with the ball float, the frustrated driver can use the delivery hose and delivery elbow as a pipe wrench to loosen the fill adapter, remove the drop tube, and make the delivery. Other drivers merely break off the top of a gauge stick and drop it down the fill pipe, propping the valve of the drop tube device open so that it cannot close. This slows down the delivery some-

what, but at least allows the delivery to occur.

### The Case of the Deaf Driver

Alarms, of course, can simply be ignored.

### Why Overfill Prevention Doesn't Work

The point I'm making with all these case examples is that the overfill technologies that by now should be in universal use at all active motor fuel facilities are not user-friendly and can easily be bypassed or overridden. The long-term result is that tragedies such as the one that happened in Mississippi (see *LUSTLine* #30, "Inferno Kills Five and Critically Injures One...") or contamination cases such as the one described in my last *Tank-nically Speaking* article (*LUSTLine* #30, "The Holes in Our UST Systems") will continue to occur.

### How Can We Make Overfill Prevention Work?

While acknowledging that we have come a long way in the implementation of effective UST technology in the last decade, we must also acknowledge that all is not perfect and that there is room for improvement. So in the spirit of Total Quality Management and continuous improvement in which the federal UST program was born, here is my vision of what a better overfill pre-

■ *continued on page 20*



*Determining the ullage in a tank prior to delivery is critical to preventing overfill incidents.*

**■ Tank-nically Speaking** *from page 19*

vention approach might look like:

■ **An overfill prevention device MUST be user-friendly.** It should improve, rather than interfere with, the speed and convenience of making a delivery.

■ **The overfill prevention device should be part of the truck, not the tank.** Overfill prevention that is based on the truck will allow the driver to deal with deliveries in a consistent and uniform way, avoiding any traps for the unwary driver. Right now, a driver does not necessarily know whether he or she is dealing with a float vent valve, a drop tube device, an alarm system, or some combination of these. The driver may be able to see a drop tube device, but it is not unusual for installers to put in both a float vent valve and a drop tube device. This could result in a most unpleasant surprise to the delivery driver if the float vent valve closes before the drop tube device and the driver assumes that he or she is dealing with a drop tube device rather than a float vent valve. (See *LUSTLine* #21, "What Every Tank Owner Should Know about Overfill Prevention.") Having the overfill device on the truck should also have economic advantages, because there are many fewer tank trucks in this country than there are tanks.

■ **The overfill prevention system should be bypass- and override-proof.** There should be no way for the driver to continue to deliver product to a tank that is nearly full.

What I envision is something like this: Imagine a small box mounted on the tank truck, conveniently located relative to the valves where the delivery hose is connected. This box is able to control the air-operated valve that is already present in tank trucks in the bottom of each compartment. The box on the tanker is able to communicate with a small transmitter located in the underground tank spill containment manhole. The transmitter would be connected to an inexpensive level sensor located inside the tank.

The control box on the truck would receive the tank-level informa-

tion from the transmitter and display the volume of fuel presently in the tank. This would save the driver the time required to stick the tank, calculate the volume in the tank and the ullage, and record this information. This feature alone would endear this device to most drivers. The remaining capacity in the tank could also be displayed so the driver would know right away whether the volume of fuel in the truck will fit in the tank.

As the fuel flows into the tank, the volume of product in the tank and the ullage remaining would be displayed in real time. Conspicuous green, yellow, and red lights could be incorporated into the control box so the driver would know when everything was OK (green), when the tank was approaching the full level (yellow), and when the valve had closed and product flow was stopped (red). This way, the driver would be alerted immediately when product flow stops and would waste no time waiting around while no product was flowing through the delivery hose. When the drop is completed, the driver would insert the paperwork into a slot in the control box on the truck where a little date/time/volume stamper would print the initial and ending volumes in the tank and the amount of fuel delivered. Again, the driver would not need to stick the tank after the delivery and record the results.

### **The German Approach**

A similar, but not so sophisticated approach has been used for many years in Germany. The German approach requires that the driver make an electrical connection as well as a hose connection between the truck and the tank so as to make a delivery. A high-level switch in the tank then closes a valve in the tanker when the tank is nearly full. I envision updating this technology by adding some wireless communication between the tank and the truck, so the driver has no additional work, as well as providing inexpensive level sensing in addition to valve actuation.

### **First and Foremost: Reliability, Safety, and Environmental Protection**

The system I envision has the following advantages:

- It makes the delivery operation easier for the driver, because he or she would not need to stick the tank;
- It does not slow down the delivery by restricting the diameter of the drop tube;
- It makes draining of the hose after the overfill device has operated as fast as it used to be;
- From a public safety perspective, spilled fuel or the release flammable vapors during a delivery would be dramatically reduced, because this technique does not rely on the tank top being air-tight to work;
- The threat of "blow back" of fuel onto the driver is eliminated along with the need to "relieve the pressure" by using the drain mechanism of the spill containment manhole; and
- From an environmental perspective, reliable overfill prevention that drivers want to use rather than bypass would result in better protection of the environment.

### **The Reality of Overfill Prevention**

As I see it, a major marketing obstacle for this solution is that it rests with both the tank and the truck. In most cases, the tank and the truck belong to different people, so this solution would require an ideological and financial investment on the part of both parties. Also, this solution involves the truck owner in the underground tank overfill business, an area that regulations have placed in the domain of the tank owner. On the other hand, the technology has the potential to make delivery mistakes much less frequent, thereby, perhaps, lowering insurance rates for both UST owners and fuel delivery companies. The technology should also shave a minute or two off the time required to make a delivery, which could create a financial incentive to invest in the technology.

Of course the biggest obstacle to this technology right now is that it doesn't yet exist—at least as far as I know. ■





## From Our Readers

We received this letter [with edits] from Richard Levandowski, Deputy State Fire Marshal, Montana State Fire Marshal's Bureau, regarding our article "Inferno Kills Five and Critically Injures One in Mississippi" in LUSTLine #30.

The article reinforces exactly what is observed too often in the State of Montana and, I can assume, what occurs quite often in many other states. The saddest part of this entire matter is that these types of "accidents" can be prevented.

[Mr. Kevin Henderson's (Mississippi DEQ)] statement that, "as far as he knows, in most states, the act of making fuel delivery is not regulated," requires clarification.

I would like to advise any state that adopts and enforces any of the nationally recognized fire codes, such as the Uniform Fire Code (UFC) here in Montana, that they do have "regulation" on fuel delivery. Let me explain.

### 1994 Edition of the Uniform Fire Code

#### ■ Section 7904.5 Loading and Unloading of Tank Vehicles and Tank Cars

- **7904.5.4.6 Attendant required.** The operator or other competent person shall be in attendance at all times while a tank vehicle or tank car is discharging cargo. When practical, the tank vehicle or tank car shall be positioned such that the operating controls and the discharging end of the hoses are both in view of the operator or other competent person.

I interpret this to mean that the driver/delivery person is to remain in the "immediate vicinity" of the vehicle anytime he or she is discharging the cargo. Here in Montana, for some unknown reason, drivers are under the impression that they can be 25 feet away from the vehicle. I continually ask, "Where in this section of the UFC does it say the driver can be 25 feet from the vehicle?" The code makes no reference to any specific distance. This is further confirmed by the following section of the UFC.

- **7904.6.3.2 Leaving vehicle unattended.** The driver, operator, or attendant of a tank vehicle shall not leave the vehicle while it is being filled or discharged. The delivery hose, when attached to a tank vehicle, shall be considered to be part of a tank vehicle.

I see drivers sitting in the cab of the transport truck. I can assume they are completing their paperwork. On occasion, they may be sitting in the cab smoking a cigarette (another violation of the fire codes). In many cases, the cab is located more than 25 feet (the "magical distance" that someone has conjured up) from the discharge end of the hose. Granted, "the driver has not left the vehicle"—however, is he or she within this magical 25 feet or within immediate control of the valves?

I have researched many back issues of fire codes, from the UFC to the National Fire Prevention Association (NFPA), and can find no reference to the 25-foot number.

As stated above, I interpret the UFC to say that the driver/operator shall remain in the immediate vicinity of the vehicle while cargo is being discharged. This means he or she shall be right at the control valves on the vehicle so that in case something happens, as in the Mississippi incident, the valves can be closed immediately. The paperwork part of the job, the smoke break, the bathroom break, or whatever can be taken care of before or after the delivery is completed.

This leads to the next issue that needs to be addressed: training. Many, if not all, of these overfill incidents can be prevented if employers would properly train their employees. The U.S. Department of Transportation (DOT) and many state DOTs require training under the "Transportation of Hazardous Materials" laws. Is this training being provided? Who is responsible for providing it?

Some may think I'm "hard-nosed" about this subject. That may be. I honestly feel that two things need to take place in this country to avert this type of unnecessary loss of life and property (property can be replaced—life cannot):

1. **Owners** of the companies who hire employees to deliver these hazardous materials and who fail to properly train their employees should be fined a minimum of \$250,000 per incident and spend a minimum of six months in jail. The fine monies, after deducting court costs, should be distributed to the "next of kin" of any victims of an accident.
2. **Employees**, who through their negligence, cause such an incident should be fined \$50,000 per incident. If a life is lost as a result of the incident, the employee should be charged with negligent homicide in addition to the fine. If the employee's life is lost (and we experienced one such incident in Montana in July 1998), the owner of the company should be charged with negligent homicide.

*Do you think such penalties would get the attention these matters deserve?*

Continuing on with the UFC requirements, under while discharging cargo we have the following:

- **7904.6.7 Fire protection.** Tank vehicles shall be equipped with a fire extinguisher with a minimum classification of 2-A, 20-B:C. During unloading of the tank vehicle, the fire extinguisher shall be out of the carrying device on the vehicle and shall be 15 feet or more from the unloading valves.
- **7904.5.4.7 Chock blocks.** At least two chock blocks not less than 5 inches by 5 inches by 12 inches in size and dished to fit the contour of tires shall be used during unloading operations of vehicles.

*How often are these requirements observed?*

Most states that adopt fire codes should have these or similar requirements in place. Check with your state fire marshal's office to find out what codes are in place and who is charged with enforcing them. ■

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*The foregoing text is the opinion of the writer and does not necessarily reflect the views of the Montana State Fire Marshal or the Montana Department of Justice.*

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## State Cleanup Funds

# Fraud and Abuse—The Audit Tool

By Cynthia T. Williams and  
Robert S. Cohen

In the last issue of LUSTLine, we discussed how Medicare tools for fraud and abuse detection/prevention can apply to the state cleanup fund scenario ("What State Cleanup Funds Can Learn from Medicare"). One of the more powerful tools is the "post audit." Recognizing that the term "audit" can send shivers down the spine of everyone from taxpayers to government contractors, we humbly submit that a properly executed audit is, in fact, a powerful and fair cost-containment tool. Allow us to explain.



Imagine coming home one evening to find your home has burned to the ground. Fortunately you have insurance. You rebuild by hiring contractors from the yellow pages. You send the invoices to the insurance company, which promptly pays the lot of them.

Sound unreal? It should, inasmuch as insurance companies typically have preferred vendors, adjusters (preapproval), and various other mechanisms in place to control costs and prevent fraud and abuse. Insurance companies also have *auditors* to verify that their cost control is effective.

In the worst-case scenario, trust funds are like an insurance company without cost control. In the best case, they are like an insurance company without internal auditors. The insolvency crises that many trust funds have experienced or are experiencing have given renewed focus to fraud and abuse. While regulators and legislators continue to share war stories about the perpetration of fraud and abuse within their state funds, it is primarily done within the context of *future prevention* of such activities.

To understand and ultimately prevent such abuse, each state must

take seriously the concept of auditing trust funds so as to obtain valuable information that will provide insight and further enhance the current program. The lesson from the Medicare analogy is that to achieve *prevention today*, states must take a "look back" or *detect* what happened in the past, *even* if the present program has changed. Neither total responsibility for contracting cleanups nor preapproval is sufficient to prevent fraud and abuse.

### Desk Review/Approval Process versus Post Audits

The post audit is distinguished from the normal review/approval process of claims or invoices in the following way: The post audit is a comprehensive process that allows auditors to examine in greater detail the transaction(s) involved within the documentation submitted. This usually gives auditors a greater freedom to examine and correlate a particular contractor's efforts at many sites. For example, in Florida, a recent audit of all of the projects of a particular contractor during a specific time period showed days with more than 24 hours billed by individuals. This is a

clear pattern of fraud.

Of course, auditing each and every claim submitted to a state cleanup fund would not be cost-effective and would slow down progress, defeating the overriding purpose of the fund, which is to clean up the environment. One of the most powerful cost-containment strategies that a state fund program can develop is a carefully designed desk review/approval process coupled with a comprehensive post-audit process for selected high-risk claims. The Internal Revenue Service has relied on this strategy for many years. This type of audit is directed at the beneficiary of the trust fund as opposed to the internal audit of the fund agency.

### Benefits of Post Audits

The post audit is an integral and necessary part of the claims administration process if state funds are to run according to sound business principles. Some of the benefits of adopting a post audit process include:

- **Prevention** - The post audit identifies those contractors who abuse the trust fund. It provides significant criteria for determining the

level of effort for the initial review and identifies those parties who do not play by the rules. State funds can then use this evidence to take appropriate action against the contractor to prevent further abuse (e.g., remove it from the fund's contractor pool). Again, this is an IRS technique that is fair and works.

- **Deterrence** - As your fund's reputation for conducting fair and thorough post audits becomes known throughout the industry, honest contractors will be extra careful and others may be deterred from pursuing work in your state or other states.
- **Cost recovery actions** - The post audit provides state fund attorneys with evidence about how much and what should be recovered if they choose to take action against those parties whose claims are found to contain fraud and/or abuse.

## A Reality Check

The rules and regulations dealing with audits are often vague and provide little direction or authority for post audits. Many states lack procedures to implement post audits. Even on a good day, staffing within many state agencies is hardly adequate to administer the fund programs. Therefore, the ability to perform post or concurrent audits on claims not yet paid is often set aside as not "cost-effective" or necessary.

But, as programs evolve with unit rates, preapproval provisions, and so on, the obligation to taxpayers to go back and find fraud and abuse does not diminish. Audits can, in fact, be done either by the state regulatory agency's own Inspector General's Office or through outsourcing independent audit teams such as certified public accountants. All government regulatory agencies and most private industry have requirements and standards for post audits. The procedures are well defined and routinely implemented.

## The Florida Example

The Florida legislature is one of the few in the country to have mandated post audits. This action was initiated as a result of fraudulent claims that

were submitted to the trust fund for restoration work never performed. Furthermore, documented fraudulent invoicing, carried out with the cooperation of a government employee, was discovered. Fortunately, the fraud was found before the \$12 million in reimbursement claims were paid.

In 1997, the Florida legislature directed the Auditor General of the state to contract with certified public accounting firms to perform post audits. Although Florida's audit program has been operating for only one year, there are many valuable lessons other states may wish to embrace regarding the post-audit concept.

*One of the most powerful cost-containment strategies that a state fund program can develop is a carefully designed desk review/approval process coupled with a comprehensive post-audit process for selected high-risk claims.*

## What Works?

The key to the post-audit criteria is a well-developed claims selection process. Since all claims cannot be audited, criteria must be developed to determine which claims have a greater likelihood of abuse. This may be accompanied by random audits to validate the selection process.

The IRS has developed selection criteria and "profiles" for determining whose income tax returns should be audited. Similar profiles are needed for the state funds so that they can zero in on the claims most likely to yield evidence of fraud or abuse. This selection process is not always obvious. In Florida, it took one full year to settle on viable criteria. Based on this experience, let's look at a selection process that has broad application to state funds:

- **Assemble a team of informed and involved parties who will define the selection process by providing collaborative knowledge of state regulations, guidelines, and procedures.** At a minimum, this team should include:
  - The Fund Administrator and

other appropriate staff;

- Members of the Office of General Counsel within the regulatory agency who will have the task of referring perpetrators for prosecution and initiating cost-recovery actions;
- Members of the Inspector General's Office within that regulatory agency who will be involved in the audit process; and
- Law enforcement officials in the event that fraud is discovered during the process.

- **Establish profiles of risk.** Simply put: The team should determine where weaknesses in the regulations, rules, and guidelines may have allowed potential abusers to take advantage of the system (both in the past and currently). Once these "weak spots" have been identified, establish profiles of those parties who might have taken advantage of the situation.

- **Identify the resources for data within the agency.** Unfortunately, many states (including Florida) have found that some of the most useful information in the audit process had not been collected historically. New tools must be developed to aid in this process. In Florida, the state's database of claims did not track the names of the environmental contractors. With this dearth of information, once a perpetrator of waste, fraud, or abuse is found, the state has difficulty in determining the extent of the problem.

- **Ensure that an audit program encompasses all risk areas, such as scope of work, actual performance of task, and proper documentation of efforts.** Your process should allow specific claim audits to cease when the level of risk is known to decrease. For example, a claim that appears imminently reasonable in terms of bottom-line costs for the scope of work and level of documentation should not be subject to a full audit.

- **Send program-specific knowledgeable auditors into the field to audit the 'transaction' itself.** In Florida, as in many other states,

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## ■ Fraud and Abuse *from page 23*

parties other than those who are "true responsible parties" are permitted to submit claims to the fund, including environmental cleanup firms and investors.

### What Doesn't Work?

- **Underemphasizing the selection process.** One of the fastest ways states can send good money chasing bad is by not putting enough effort into the selection process. Unnecessary time and resources may be spent focusing on audit procedures and not on who gets audited.
- **Performing the same procedures on every claim or auditee.** Varying levels of audits should be utilized so that audit dollars are spent effectively. Audit procedures (and programs) that make it necessary to carry audits to completion without being able to "cease" when it becomes obvious that the risk of waste, abuse, and fraud is low are ineffective. The auditing team needs to be able to do some "partial audits" and stop when no "findings" arise or continue on to "full audits" when findings are found.
- **Making direct payment of claims to the contractor.** Claims in which the responsible party is out of the loop have proved to contain higher-than-average incidents of fraud and abuse. The responsible party's review and interaction with the contractor have the benefit of another review of costs (in many cases). In instances where the responsible party is not sophisticated enough to contract for environmental cleanup (the mom-and-pop stations), they are also not sophisticated enough to select a contractor. In these cases, it is better for the state to set up a mechanism to contract directly with the contractor. Alternatively, these sites should be considered high risk and flagged for post audit.

### The Myth Behind PreApproval

Preapproval of work scope and cost should not be viewed as a stand-

*Preapproval of work scope and cost should not be viewed as a stand-alone tool for prevention of fraud and abuse.*

alone tool for prevention of fraud and abuse. While the concept of preapproving work scopes and costs is a step in the right direction, state agencies must realize that preapproval in and of itself will not combat waste, abuse, and fraud. Some of the same perpetrators will be involved with the preapproval program.

Some truths regarding preapproval:

- Setting contractual maximums or unit rates for certain tasks should be viewed as a cost-control measure only. States must still utilize the post-audit process to ensure that (a) the work was actually performed, and (b) the work was performed in the number of hours the contractor claimed in his or her invoices and by the personnel and level of experience agreed upon. A common abuse of preapproval is when the contractor proposes a scope of work using senior personnel and substitutes junior staff for the assignment.
- In the ever-changing environmental technologies cleanup field, it seems contradictory to believe that the level of effort and costs associated with petroleum cleanup work can remain static while more efficient cleanup methods are developed. For states to realize the benefits of reduced costs associated with new technologies, post and concurrent audits can be utilized to gain this valuable information.
- Pay for Performance (PfP) is a powerful tool for controlling costs and accountability. Yet, it is also subject to abuse. The Florida PfP program allows for an audit of all records of the completed job. Since the PfP payment is based on results rather than activities, the job is much simpler and more conclusive to audit than work associated with traditional remedial reimbursement approaches. The audit assures that payments are made only for actual cleanups.

### Simply Put...

Fraud and abuse have driven many trust funds to the brink of insolvency. The public trust requires sound business practices, which include professional audits performed by qualified teams of certified public accountants and professional engineers/geologists. Post audits will deter abuse, target fraudulent claims, and allow the gathering of necessary data to encourage a dynamic program of cost control.

One of the most undercapitalized industries in the country is the environmental cleanup business. This naturally invites creative schemes to take advantage of the state funds. A relatively small expenditure for the sound business practice of audits has the potential to result in significant preservation of the integrity of the trust fund. ■

*Cynthia T. Williams has been an associate with the CPA firm of Barnes, VanVorst, Reposa, Gosnell, & Indowsky for five years. Her area of expertise has included audits of environmental cleanup claims and contractors for over nine years. She is also the President of Environmental Support Specialties, Inc., headquartered in Deerfield Beach, Florida, with regional offices in Boston, Massachusetts, and Atlanta, Georgia. The firm specializes in all aspects of state cleanup trust fund issues. In addition, Cindy is currently serving as Executive Director of the Southern Environmental Business Council, where she has also served on its Board of Directors for three years. For more information, contact Cindy in Deerfield Beach, Florida at: [cwilliams@envirosupport.com](mailto:cwilliams@envirosupport.com) or (954) 698-6111.*

*Robert S. Cohen, B.S., M.S., is a professional geologist specializing in LUST cost-containment issues. He is a consultant in both the public and private sectors. From the private sector in Florida, he proposed and implemented the Florida Department of Environmental Protection's (FDEP's) first Pay for Performance cleanup. As an advisor to the FDEP, Bob designed the PfP pilot program. Currently, he is conducting PfP workshops on behalf of the EPA Office of Underground Storage Tanks. For more information, contact Bob in Gainesville, Florida at: [bobcohen@ivs.edu](mailto:bobcohen@ivs.edu) or (352) 337-2600.*

# Major Oil Company Found Liable as UST Operator

## Indiana Supreme Court Picks Up Where Appeals Court Left Off

by Mary-Ellen Kendall

**I**n 1997, the Indiana Court of Appeals found two major oil companies liable as underground storage tank (UST) operators for a petroleum release that contaminated residential drinking water wells. (See a summary of this decision in LUSTLine #27.) This case, *Shell Oil Co. v. Meyer*, 687 N.E.2d 383 (Ind. App. 1997), was unique because it was the first time that a court had held a major oil company liable for a release that occurred at an independently owned gas station.

The court found Shell Oil Company and Union Oil Company liable as UST operators under Indiana's Underground Storage Tank Act ("USTA"), awarded the landowners with contaminated wells \$2.7 million plus attorney's fees, and allocated the damages between Shell Oil (70%) and Union Oil (30%). The oil companies appealed the case to the Indiana Supreme Court, which issued its decision at the end of 1998 (*Shell Oil Co. v. Meyer*, No. 79S04-09801-CV-043COU [Ind. Dec. 30, 1998].)

### First, Some Background

The appeals court's decision summarized the history of USTs in the United States and described the changes that occurred immediately before the industry became subject to the federal UST regulation in 1988. Before the regulation, it was standard practice for oil companies to retain ownership of USTs and to maintain control over the station's appearance and products.

The preregulation USTs were constructed of bare steel, which corroded over time and caused petroleum releases. The oil companies were aware of the potential liability for releases to occur and began implementing leak prevention technology in the mid-1980s. By installing corrosion-resistant UST systems and training employees to prevent, detect, and respond to releases, the oil companies were able to reduce their exposure as responsible parties for future environmental problems.

Another method that the oil companies used to insulate themselves from future liability was to sell existing USTs to independent station owners for \$1 per tank. The appeals court recognized that the sale of an UST to an independent station owner effectively transferred liability in most cases, but it carved out an exception in any case where the oil companies retained the authority to control a facility, whether or not they actually exercised that authority.

For example, if an oil company supplied product to an independent and required the station to display the company's brand or logo on signs and employee uniforms, the court said the company was an UST operator based on the definition of "operator" in the federal UST regulation. As an operator, the oil company remained liable for releases from USTs it no longer owned. The court reasoned that the major oil companies were liable because:

A business should bear its own costs, burdens, and expenses of operation, and these should be distributed by means of the price of the resulting product and not shifted, particularly, to small neighboring property owners for them to bear alone. We can understand no sensible or reasonable principle of law for shifting such expense or loss to persons who are not involved in such business ventures for profit. (*Shell Oil* at 387.)

### To Be an "Operator"

As noted earlier, in the lower court decision, operator liability for USTs was imposed on major oil companies if they had the authority to control a facility, whether or not they exercised that authority. The Supreme Court rejected that rationale but still found one of the companies, Shell Oil, liable for the groundwater contamination resulting from the release from the

USTs at the gas station that was owned by Mr. Smith.

The Supreme Court disagreed with the trial court's conclusion that, because the oil companies retained the ability to control the USTs through their franchise distribution system, the companies were liable as UST operators. The court held that operator liability did not exist unless the oil companies did something in addition to supplying gasoline to the distribution system.

The additional activities had to be directly related to the daily operation of the USTs. The court said that operator liability depends on: (1) what constituted the daily operation of the tanks, (2) who did these things, (3) in what capacity that person was

***Because the independent station operator was responsible for at least two of the daily activities, he was deemed an UST operator, liable for releases from those USTs.***

acting, and (4) who was responsible for that person's actions in that capacity. When applying this test, the questions must be answered in light of the industry standards at the time.

The court noted that prior to the introduction of more sophisticated pollution prevention systems in the late 1980s, two of the major activities associated with UST operation were filling the UST and "sticking" the tank to determine product levels. In this case, the independent station operator (Mr. Smith) was a commissioned driver for Shell Oil from 1946 to 1963. As part of his responsibilities, he was required to fill the tank and to monitor the product levels by sticking the tank.

The definition of the term "operator" in the federal and state statute is sufficiently broad to permit more than one person to be an operator of a

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## ■ Major Oil Company Found Liable from page 25

tank. The court said that the law did not require that a person perform all of the daily activities necessary to operate an UST before operator liability would be imposed. Because the independent station operator was responsible for at least two of the daily activities, he was deemed an UST operator, liable for releases from those USTs.

The court extended operator liability to Shell Oil, because the driver was acting on Shell Oil's behalf in dispensing the gas and measuring the contents of the tanks. "This aspect of operating the tanks was an integral part of Smith's role as a 'commissioned agent' for Shell. He could not carry out his role for Shell without also performing these functions that are part of the operation of the tanks."

### Or Not to Be an "Operator"

Conversely, the court did not find Union Oil to be an UST operator because it merely supplied gas to the independent station owner. Once the sale occurred, Union Oil did not control any other activities associated with the daily operation of the USTs.

The oil companies had argued that even if the independent station owner was liable as an operator, the liability could not be transferred to the oil company under established legal doctrines. The court disagreed and found that an independent contractor can create liability for a principal if: (1) the contract requires performance of intrinsically dangerous work; (2) a party is by law or contract charged with a specific duty; (3) the act will create a nuisance; (4) the act will probably cause injury to others unless due caution is taken to avoid the harm; or (5) the act to be performed is illegal.

In holding Shell Oil liable, the court said that putting an abnormally dangerous product into a tank that has the potential to, and does actually, leak would create a nuisance and cause injury to others. The court found that evidence presented at the trial indicated that the leak had occurred or was ongoing during the period that Smith was a commissioned agent for Shell Oil. Therefore, Shell Oil was liable for the entire \$2.7 million in damages plus attorneys' fees.

***This decision extends liability only if the supplier was also involved in some of the activities that are required to be performed in the daily operation of USTs.***

The rationale used by the court limits the applicability of the original decision. While the trial court's decision was very broad and encompassed any oil company that supplied product to an UST owner or operator, this decision extends liability only if the supplier was also involved in some of the activities that are required to be performed in the daily operation of USTs.

### There Is Still a Question

The court noted that the industry sought to limit liability for USTs beginning in the 1960s by introducing a jobber into the distribution chain:

Where the chain of responsibility between a refiner and the individual charged with the daily operation of the tank is interrupted by the existence of a jobber, at least on the facts in the record, there is no "control" or "responsibility" on the part of the Oil Company within the meaning of the Act simply by virtue of the refiner's ability to exert practical leverage over the jobber and independently owned station by refusing to sell to it.

Liability as an UST operator would apply to suppliers in any situation where there was no jobber in the chain of responsibility. While the Indiana Supreme Court's decision does limit the applicability of this decision, it will permit states to find petroleum suppliers liable in some instances. Once again, it is highly likely that this case will be appealed to the federal courts due to the precedent it sets and the amount of damages that have been assessed against Shell Oil as a result of this release. ■

*As the Financial Programs Manager for the Department of Environmental Quality, Mary-Ellen Kendall, J.D., M.B.A., is responsible for making liability and fund eligibility determinations for the Virginia UST Program.*

## ASTM Update

The American Society for Testing Materials (ASTM) Subcommittee E50.01 for Storage Tanks continues to be active on several fronts. Here are highlights of current activities:

- ASTM has introduced a new environmental training course on Remediation of Ground Water by Natural Attenuation (RNA). It will be offered in Atlanta (Feb. 23-24), Los Angeles (March 9-10), Washington D.C. (March 23-24), Chicago (April 13-14), and New York (May 18-19).
- Progress is continuing on the ASTM Standard Guide for Remedial Action Decisions. The next formal task group meeting is scheduled for April 21 in Seattle, Washington.
- Progress continues on the ASTM Standard Guide for Environmentally Sound Management of Tanks Systems Storing Hazardous Substances or Petroleum. The next formal meeting for this task group will be in Seattle on April 21.
- A draft has been prepared for the ASTM Standard Guide to Hydraulic Integrity Testing of Aboveground Storage Tank Bottoms in Petroleum Service. This draft should go out to subcommittee ballot in early spring.
- ASTM subcommittee E50.01 is exploring the possibility of establishing task groups to write standard guides for developing environmental monitoring plans and measuring cleanup performance. This will be discussed at the ASTM Committee Week meetings in Seattle on April 22.

*If you are interested in contributing to the development of these standards or would like more information on the above-mentioned ASTM activities, contact E50.01 subcommittee chair Dennis Rounds at (605) 773-3769 or e-mail at:*

*[Dennis.Rounds@state.sd.us](mailto:Dennis.Rounds@state.sd.us)*



# Results of Missouri PST Insurance Fund Survey

*For more information about this survey,  
contact Carol Eighmey at (573) 522-2352.*

**The Association of State and Territorial Solid Waste Management Officials (ASTSWMO) Tanks Subcommittee conducted an informal survey of the states regarding leak detection requirements for ASTs. Twenty-five states responded to the survey, providing a variety of approaches and comments to AST regulation ranging from strict leak detection and inventory control regulations (nine states), to AST regulation by the state fire marshal (five states), to no real AST regulation. For a copy of the survey, contact Steve Crimando at (202) 624-7883.**



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**We welcome your comments and suggestions on any of our articles.**

## Future Direction

Over the last two years, EPA has been looking to the future direction of the underground storage tank (UST) program. The Office of Underground Storage Tanks (OUST) has gathered feedback from various stakeholders, including many states, to determine the state of the UST program. It is clear from these responses that there is still quite a bit of work to do, particularly in nine key areas: UST systems evaluation, orphaned/ abandoned sites, aboveground storage tanks, program evaluation and measurements, resources, corrective action, operation and maintenance, legislative and regulatory changes, and 1998 requirements. Work has begun in many of these areas, including UST systems evaluation and UST system operation and maintenance.

## UST Systems Evaluation

Now that many thousands of UST systems are (or soon will be) equipped to meet the technical requirements, it is clear that we need to look more carefully at how

## EPA HQ UPDATE

well these various technical elements are working. One of OUST's new priorities will be to evaluate the performance and effectiveness of UST systems with respect to environmental protection. While anecdotal evidence suggests that UST system performance has improved many times over compared to a decade ago, a more comprehensive effort is needed to check real world performance in the field and over time and to identify areas where improvements may still be needed.

OUST is currently formulating plans to begin this evaluation. Initial efforts include: sponsoring a national leak detection performance study conducted by Dr. Thomas Young at the University of California, Davis; holding discussions at the national UST/LUST conference in March; and obtaining qualitative input from experienced people. Partnering with industry and state agencies will be essential to the success of this effort.

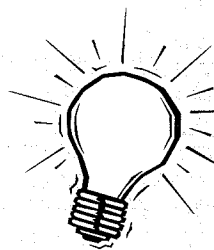
For more information about UST systems evaluation, contact David Wiley at [wiley.david@epa.gov](mailto:wiley.david@epa.gov).

## Operation and Maintenance

Another emerging priority for EPA is improving operation and maintenance (O&M) at UST facilities. First steps OUST will take include: gathering input on what aspects of UST facility operations need improvement and then determining how to improve them; holding discussions at the national UST conference and state fair in March; working with and learning from the Postal Service and other leaders in O&M; and gathering qualitative input from experienced people.

For more information about O&M, contact Paul Miller at: [miller.paul@epa.gov](mailto:miller.paul@epa.gov).

For more information about OUST's planning process, contact Bill Lienesch at: [lienesch.william@epa.gov](mailto:lienesch.william@epa.gov) or (703) 603-7162.



## We're Making LUSTLine More User Friendly

It took a while for it to dawn on us, but so many subscribers have told us that their *LUSTLine* collection serves as a useful reference, we finally realized that the bulletin should have a 3-hole punch for easy insertion into a looseleaf book. So, violá! Check it out.

The other thing we've sorely needed is a subject index, so readers can easily locate articles on a given topic, beginning with our first issue in August 1985. We are in the process of developing a *LUSTLine* Index. It will be completed shortly and arrive at your desk with your next issue. If you need one sooner, call NEIWPCC at (978) 323-7929 and they'll get one out to you as soon as it is available. ■

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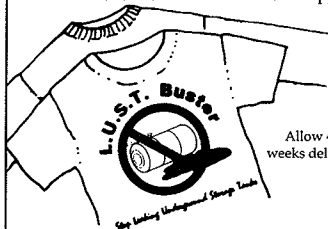
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