

L.U.S.T.LINE



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

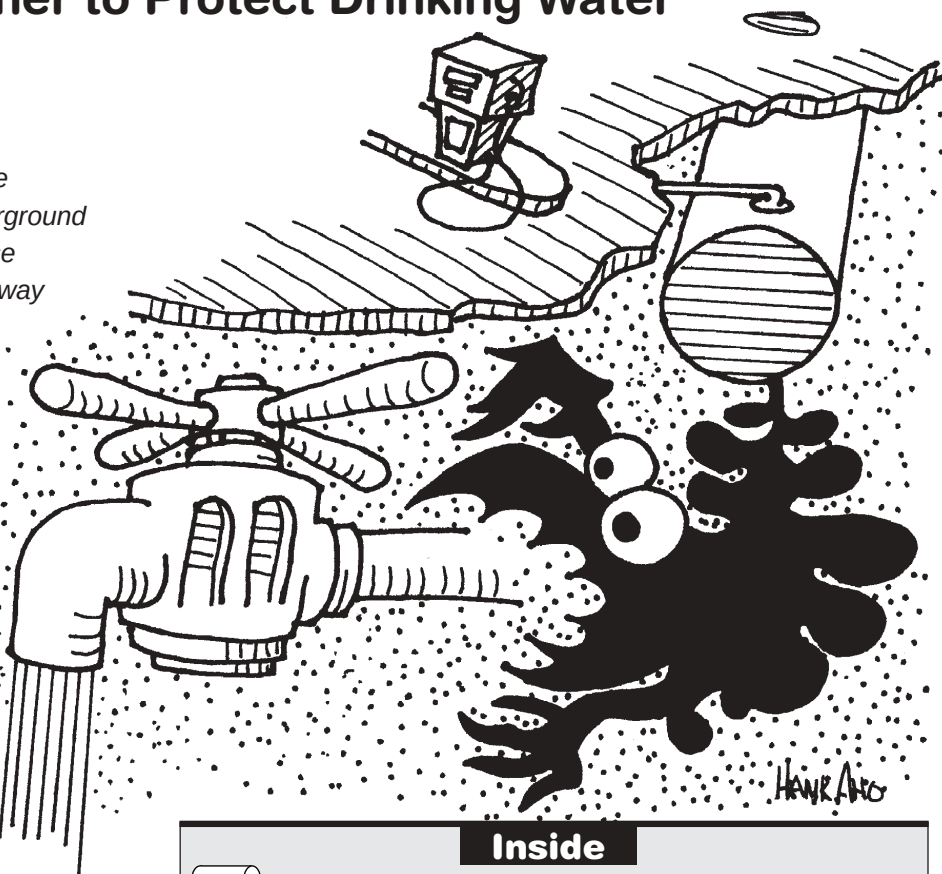
A Marriage Made in Groundwater

How State UST, LUST, and Source Water Programs Can Work Together to Protect Drinking Water

by Kara Sergeant

Despite our success in reducing the magnitude of releases from underground storage tank (UST) systems, these systems still leak, and gasoline still finds its way into people's drinking water. Recognizing the importance of protecting our groundwater drinking water sources, Congress sought to strengthen the federal UST/LUST program by including new UST compliance provisions in the 2005 Energy Policy Act (Title XV, Subtitle B). The new provisions represent the largest impact to the national UST/LUST program since its inception more than twenty years ago. Yet, while some of these provisions increase protection for drinking water sources, it is going to take more than the new state regulations to protect drinking water. And while I recognize that the state UST/LUST and drinking water program managers have their hands full, I'd like to challenge both entities to be as proactive as possible in their approach to protecting drinking water by going beyond the federal standards, by working with each other, and by educating both tank owner/operators and municipal officials.

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Two Sides of the Same Coin

Tank programs have enough to worry about—compliance, enforcement, cleanup, reimbursement—so why should a state UST program have to take on the added job of being proactive about protecting drinking water? For one thing, more than half of the people in the United States get their drinking water from groundwater sources, and, unfortunately, contamination from leaking tanks often finds its way into these sources. Thus, with their limited resources, it makes sense for both state programs to work together to become more effective at protecting drinking water.

Drinking water protection cannot rely on water treatment alone; instead, most states adopt a multi-barrier approach that includes preventing contamination from occurring in the first place. All public water systems in the country have completed source water assessment

reports (SWAPs), which identify each public water supply, its potential contamination threats, and how susceptible it is to those threats. Once states reviewed their SWAP reports and analyzed the major threats, USTs emerged as a major potential threat nationwide.

Protecting drinking water is not a new concept to UST/LUST programs. In fact, many state UST/LUST programs have been working with their drinking water program for years. But for others, it took a national initiative to open the lines of communication with their drinking water program, especially when the program was located in a different agency.

In 2004, the U.S. EPA Office of Underground Storage Tanks (OUST) made a commitment to protect drinking water by cosigning two memos with the Office of Ground Water and Drinking Water and holding collaborative state and regional meetings on the subject. Both memos are available on the OUST website (<http://epa.gov/oust/swanust.htm>) and are essential reading. They contain several tips for states interested in working with their drinking water program.

The two Energy Policy Act provisions that will have the biggest impact on drinking water protection are minimum three-year inspections and secondary containment. According to the Act, states will need to inspect all stations at least every three years to ensure that tank systems are being operated and maintained properly to prevent system failures and contamination.

The secondary containment provisions (as opposed to the financial responsibility alternative that a few states will adopt) will apply to almost all new UST facilities and facilities where tank systems are replaced. These provisions are specifically meant to protect drinking water sources. And lest we forget, UST facilities themselves are drinking water sources. They require potable water for everyday functions, whether it is the employee restroom or a convenience store. UST facilities are either connected to a community water system, whose pipes cross the property to connect the facility, or they have an onsite potable well. For states that do not

already have secondary containment in one form or another, this new requirement will add another layer of protection to groundwater supplies.

How Can States Improve the Drinking Water/UST Connection?

For states that already meet the three-year UST inspection frequency requirement, one strategy for improving the drinking water/UST connection is to target UST facilities in more susceptible areas for more frequent inspections. Ask your drinking water program for a list of sensitive source water areas or those most at risk for UST contamination. They will have this information from SWAP reports or can create it from GIS layers.

For example, as with many states, Massachusetts and Arkansas UST and Drinking Water programs are located in different agencies, yet they work together to prioritize UST inspections in source protection areas. One state is in the process of arranging to tap the Drinking Water State Revolving Fund to fund an additional inspector position for the tanks program. This person will focus on inspections in source protection areas. This is a great way to increase staff on limited resources.

Both Clark Conklin, Chief Deputy of the Nebraska State Fire Fuels Division, and Jack Daniel, Administrator of Nebraska Health and Human Services, paid a visit to their governor to make the case for adopting the secondary containment option for the state's USTs. According to Conklin, Daniel also made a strong case for the importance of the UST program to drinking water protection.

Many tank and drinking water programs share information through their GIS. Oftentimes it is a matter of overlaying several GIS layers to locate tanks in source protection areas. GIS is also a great tool for prioritizing cleanups. However, not all tanks are located on GIS layers—addresses are not always maintained electronically, new tanks have not been entered, the addresses are wrong, or the drinking water program has a completely different database system. To correct these problems it takes additional resources to update the information.



L.U.S.T.Line

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Examples of how Utah, Minnesota, and New York share GIS location information and the challenges associated with these efforts can be found on the National Tanks Conference website (<http://www.neiwpcc.org/tanks07/archives.asp>). For instance, Minnesota is improving spatial data accuracy, and Utah is pursuing a digitalization project for source water data.

Both U.S. EPA OUST and the Office of Ground Water and Drinking Water realize the importance of GIS as a tool for protecting drinking water. EPA is piloting a Drinking Water Mapping Application (DWMA) with several states and tribes to map tanks and source water data through a secure web-based mapping and database technology.

Spread the Word

Outreach is a prime area for state UST and source water program collaboration. It is important to target outreach to tank owners, municipal officials, and others. Municipal officials have a great deal of influence over source water through planning and other land-use decisions they make that can impact source water.

The New England Interstate Water Pollution Control Commission (NEIWPCC) has published a guide for municipal officials titled *Protecting Drinking Water Sources in Your Community: Tools for Municipal Officials*. (www.neiwpcc.org/sourcewater-outreach) The guide features a whole chapter dedicated to USTs, which includes case studies and detailed strategies for action.

To educate UST system owners and operators about the importance of source protection and how their business can protect the source, states can include a drinking water section when developing their operator-training program (another Energy Policy Act requirement). It is an easy way to reach UST owner/operators and encourage them to improve their practices.

UST programs can also work with their drinking water program to create specific outreach materials to hand out during UST system inspections. For example, the Louisiana Department of Environmental Quality (LDEQ) has staff who serve on Drinking Water Protection Teams

that work with communities on a parish or watershed level to involve local officials, water system operators, community planners, businesses, citizens, students, and others in the effort to protect drinking water.

These teams are working to help establish Drinking Water Protection Committees in each Louisiana community targeted by the program. These committees are comprised of volunteers who want to participate in continuing public education and drinking water protection actions in their own community. LDEQ has created a two-page fact sheet titled *Best Management Practices for Underground Storage Tanks to Prevent Drinking Water Contamination*, which is distributed by the local parishes directly to UST owner/operators in their area (<http://www.deq.louisiana.gov/>).

I'd like to challenge both entities [state UST/LUST and drinking water programs] to be as proactive as possible in their approach to protecting drinking water by going beyond the federal standards, by working with each other, and by educating both tank owner/operators and municipal officials.

TNC Pilot Program

What happens when a gas station is a public water supplier? More and more existing gas stations are expanding their business with mini-mart/convenience store operations to increase their profit margin. Oftentimes, this means that companies sell food and beverages that are prepared onsite. As discussed earlier, to provide potable water or prepare beverages such as coffee, facilities must either be hooked up to the local public drinking water supply or use an onsite well. It is not known how many gas stations operate onsite wells.

The problem is that most UST facility owner/operators don't know that this expansion means their well is now considered a transient non-community public water supply

(TNC). If the gas station supplies the water to 25 or more people per day (direct or indirect consumption), then it is required to meet certain state criteria to ensure that its water quality is adequate. States require that public water supplies be operated by a certified operator, who is responsible for having the well tested and sending the results to the state drinking water department. These tests indicate if there are any water quality problems. There have been instances of contamination that prompted a need to bring more attention to this issue. (See LUSTLine #47 "Sugar? Cream? MtBE? It's Time to Close the Gap Between Water Supply and UST Programs.")

NEIWPCC received U.S. EPA funding to initiate a pilot program in the New England states and New York that can be transferable to the rest of the states. NEIWPCC will develop and distribute a workbook, slides, fact sheets, and training materials that tank owners and operators can use to comply with state drinking water regulations. Upon successful completion of this pilot program, NEIWPCC intends to develop and distribute this material and training efforts to other regions of the country as funding allows.

LUST- Drinking Water Coordination Also Critical

Coordination between state source water and LUST cleanup programs is also critical. Illinois, for example, recently passed a regulatory amendment requiring the identification of potable water wells in relation to LUST cleanup sites. The Arkansas Department of Health and Human Services and the Arkansas Department of Environmental Quality (ADEQ) signed a Memorandum of Agreement that includes sharing locational data on reported leaks and spill and cleanup projects.

To understand how many state LUST programs are interacting with their drinking water programs, NEIWPCC's latest LUST survey, *State Experiences with Petroleum and Hazardous Substance Releases at LUST Sites, Heating Oil Tanks, and Out of Service Tanks*, includes several drinking water-related questions. Preliminary results indicate that most states have some level of interaction between

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■ USTs and Source Water from page 3

UST/LUST programs and Drinking Water Programs with regard to sharing information about releases and analytical results and prioritizing cleanups in source water areas. The survey is still ongoing; preliminary results will be presented at the National Tanks Conference by Ellen Frye. The final results will be available on the NEIWPCC website in spring 2007.

So, How Do You Get Started?

Get in touch with your state source water contact. A list can be found at www.epa.gov/safewater or protectdrinkingwater.org. The latter is the website for the Source Protection Collaborative, a group of 15 national organizations committed to protecting drinking water. I urge you to check out this website as well as other websites mentioned in this article to answer any general and topic-specific questions you may have. There will also be a source protection session at the 2007 National Tanks Conference.

I challenge you to pursue at least one suggestion mentioned here, and if your state UST and drinking water programs have established a successful working relationship, please let me know about it so I can share your story at a future conference or in a LUSTLine article. ■

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Increasing Communication Between State Source Water & UST Programs

State UST/LUST and source water programs need to talk among themselves on a regular basis. If you are a state that needs to either establish communication with your drinking water program or strengthen an existing partnership, see the checklist below for ideas on questions to ask and answer to get started.

Tank Siting

- ✓ Who verifies that a proposed UST system is within the allowable distance from a water supply well?
- ✓ Are potential developers required to review the local source protection plan/SWAP report or complete an environmental assessment? These documents may contain more detailed information on the vulnerability of a water system that may not be clear of the state setback measurement.
- ✓ Is the drinking water program notified if an UST system is proposed near a water supply system or, at a minimum, before an approved well is installed?
- ✓ Are UST system owner/operators required to notify a downstream water supplier in the event of a spill?

Existing Tanks

- ✓ Are your UST/LUST program personnel aware of source protection areas—what they are and where they are?
- ✓ Does your program prioritize UST inspections in source protection areas?
- ✓ Do you notify the water program if an UST system in a source protection area is noncompliant? Some violations may be more relevant to protecting drinking water, such as poorly maintained spill buckets, rather than failing to keep records onsite.
- ✓ Do you use GPS to spatially reference tank sites?
- ✓ Do you make an effort to locate and remove or properly close all abandoned tanks?

Leaking Tank

- ✓ Do you inform your state drinking water program or a water supplier when there is a reported fuel spill in a source water protection area?
- ✓ Do you receive information from the water program, utilities, or other water supply sources concerning the detection of petroleum contaminants in public or private water supplies?
- ✓ Do you share monitoring well information (perhaps to see where a plume is traveling) with your state drinking water program?
- ✓ Does your program give cleanup priority to sites located in source water protection areas?

Presentations from the 2007 National Tanks Conference on the NEIWPCC Website

Miss a session at the National Tanks Conference or want to share a presentation with a colleague? Presentations from the 19th Annual National Tanks Conference in San Antonio, Texas from March 5–7, 2007 will be available on the New England Interstate Water Pollution Control Commission website (www.neiwpcc.org/tanks07) following the conference. Presentations from previous years can also be located using the Archives function. Also, check back on the website to find out about the 2008 conference location and call-for-abstracts announcement. ■



It Should Never Have Happened

The Story of a 27,000-Gallon Gasoline Release in Jacksonville, Maryland, and Its Aftermath on This Rural Community

by Glen A. Thomas

On Friday, February 17, 2006, at 5:30 p.m., I received a call from Herbert M. Meade, Administrator of the Maryland Department of Environment (MDE) Oil Control Program. He advised me that the had just been notified by ExxonMobil that there was a gasoline leak reported from their corporate-owned and leased station in the center of Jacksonville. Mr. Meade said that the leak reported was significant, it had been going on for some time, and that MDE had personnel on site to begin their investigation and plan recovery efforts. Mr. Meade had contacted the community within hours of MDE learning of the situation.

"Does MDE have plans to notify residents in the immediate anticipated area of pollution?" I asked Mr. Meade. He replied that they did not have plans other than to expedite their investigation and begin recovery efforts. I asked for permission to visit the station, where an MDE engineer I had met a year earlier during an MtBE issue was on site.

When I arrived at the station an hour later, I was told that MDE had found significant standing gasoline product in numerous monitoring wells. Based on station records, anticipated fuel loss at that time was in the range of 25,000 gallons. The hydrogeology of the area indicated that much of the leaked fuel would migrate southwest from the station, along a stream fault and bed, and eventually to a major Baltimore City-owned reservoir.

That evening the Greater Jacksonville Association, Inc., (GJA) contacted its members in the target community, alerting them to the spill and asking that they notify neighbors. It was the beginning of a three-day holiday weekend. I remained in contact with MDE daily as their preliminary findings unfolded. What unfolded was one of the largest gasoline leaks in Maryland history, an event that will most certainly have a profound and lasting effect on the people in my community.



Exxon personnel performing release investigation actions at the Jacksonville Exxon station

Welcome to Jacksonville

Jacksonville is a rural community where development lies mostly within its residentially zoned boundaries and significant land areas continue to be agricultural or forested. A Community Plan to maintain the rural nature of our area was adopted as part of Baltimore County's Master Plan 2010. Maryland has a strong county government system, and local elected representation for Baltimore County rests with the county executive and a seven-member council. The Greater Jacksonville Association, Inc., is an umbrella community association that represents the homeowners and businesses in the entire area and includes several smaller neighborhood associations.

There are approximately 4,000 homes within the represented area, all reliant on private water supply wells and septic systems, with the exception of two smaller communities served by private community well supplies. One of those private wells was installed to serve homes

whose wells were contaminated years ago by a Nike missile base operational in the community during the Cold War.

Another significant pollution event in our area was from a now-closed Exxon station south of the town center. About 1,100 gallons of gasoline leaked into the environment in 1980, resulting in more than 12 years of recovery and remediation before MDE closed its oversight. Several properties remain undeveloped as a result of groundwater contamination from that leak.

Then, in December 2004, MDE reported to the community that it had detected significant MtBE leakage from a BP/Amoco station in the center of town. Several private wells in the commercial center of town were contaminated by the suspected release of gasoline vapor from underground storage systems. MDE required tank and line repairs at that station and heightened monitoring for all three existing gasoline stations in town.

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Photo courtesy of Maryland Department of the Environment

■ MD Gasoline Release *from page 5*

MDE provided GJA with routine updates on BP/Amoco monitoring activity. In light of that environmental oversight, Jacksonville thought it was safe to assume that no further underground environmental threats could impact our quality of life. In retrospect, that assumption was painfully naive.

What Happened?

We have since learned that around the second week of January 2006, a contractor performing routine maintenance in the sump of an UST system at the Exxon station installed a sump penetration fitting. At the time the tanks were installed at the Exxon station, the state's UST installation regulations dictated that there should be proper clearance for product lines within the proximity of the sump. However, the installation of tanks and lines did not meet those requirements, and the contractor's drill and screw penetrated the improperly placed unleaded product line located within inches of the sump.

Our understanding is that leak detection alarms were triggered at the time, and the tank in question was shut off. The alarms were ostensibly ignored and the shut-off was deactivated when a technician determined that there was no problem. Daily product logs began to reflect that what came close to three tanker trucks full of unleaded gasoline were disappearing. We also understand that there were several subsequent inquiries by ExxonMobil and/or the operator, but that no action was taken. The final reported fuel loss, which took place over almost five weeks, was 27,000 gallons. Clearly someone had to know there was a problem and that it was probably a LUST problem.

Ongoing MDE investigations as well as legal action, both by the state of Maryland, against the owner and operator, and by private law firms in two class-action suits on behalf of impacted property owners, affect our ability to gain full access to all records and investigation results.

We appreciate that the initial cause of the leak was a freak accident, but we also know that the breached line should not have been where it was and that someone was well

aware of the losses that went unreported to MDE for over a month. We also know what the impact has been on our community over the past year and that we will all be living with this travesty and its lingering consequences for years to come.

Community Reaction

Just prior to our regular membership meeting the Tuesday after the release was discovered, all the network news stations in Baltimore had picked up the story and had cameras and helicopters on site for the evening news. An hour later we were greeted at the local school by more than 250 alarmed residents. Through our contact with MDE, GJA was at least in a position to provide an ongoing source of community news and updates as the story unfolded.

Our next GJA meeting, in March 2006, was planned to bring representatives from MDE, including MDE Secretary Kendl Philbrick, ExxonMobil Global Remediation, the Baltimore County Department of Environmental Protection (DEPRM), state and county elected officials, and community health representatives from the University of Maryland School of Nursing before the community.

We found it necessary to move to a larger auditorium, as we had more than 750 concerned neighbors in attendance. The meeting went on for almost three hours. It included factual and scientific presentations from Exxon and the regulatory agencies, comments from political representatives, and questions from the audience. All four network news teams were there, feeding live to their evening news broadcasts. We did manage to keep the meeting civil and orderly in the face of clear and obvious anger, anxiety, contempt, and real fear about long-term health and well-being issues.

Immediate Investigation and Recovery

MDE began aggressive testing of private wells southwest of the leak and had Exxon begin the installation of monitoring and recovery wells at the station site and in the neighborhood located along the streambed downhill from the station. That was the obvious travel line for the fuel. Controversial parameters were set for

testing private wells. Initially, testing was to be only a half-mile out within the travel line quadrant from the leak. GJA pressed MDE to consider testing within a full half-mile radius from the spill as a prudent precaution. At the March GJA public meeting, Secretary Philbrick announced that MDE would expand the testing to the full half-mile radius we requested.

We were somewhat blessed by two uncontrollable natural factors. First, the gasoline product was apparently trapped, initially, in an unknown geological rock fault lying directly under the center of Jacksonville, in a northeast-to-southwest direction from the Exxon station. Second, we had had no real measurable rainfall from January through the end of March 2006.

Since the community was reliant on private wells, the drought was a problem with regard to groundwater levels, but the lack of rain helped contain the liquid gasoline within a tight area for some time. Exxon moved fast to drill over 100 recovery and monitoring wells and recovered just under 11,000 gallons of liquid product in the first few months.

However, the assumption about the direction the migrating product would take was quickly proven wrong; a well located at a local bank about 300 yards across the intersection to the northeast was found to have major contamination and was placed immediately on a portable water tank supply. That changed the assumptions and focus of recovery and remediation. In fact, the greatest concentration of all contamination and remediation efforts today is in the direction originally considered safe—to the northeast.

Ongoing Recovery and Remediation

There are now 275 monitoring and recovery wells within the center of Jacksonville. MDE has also ordered an additional 33 monitoring wells to be installed. They are located in four identifiable neighborhoods and the commercial center. This is in an area that encompasses about 200 residences and nearly the entire commercial center. It also includes an elementary school that is already on bottled water for issues related to plumbing in the school.

Exxon has purchased all of the remaining undeveloped properties in the town center and is leasing other property for the storage and operation of recovery and remediation equipment. The center of town has turned into a 24-hour industrial operation with soil-vapor-extraction (SVE) recovery equipment, ground-water extraction and treatment tanks, and bioremediation and incineration operations.

False SVE Recovery Detected

By midsummer, Exxon was reporting that it had recovered almost 12,000 gallons of equivalent gasoline through SVE. Combined with the liquid recovery, this was approaching full recovery of lost product. Under questioning from GJA, MDE had been reporting confidence in the formulas used for those calculations.

However, by this time, MDE requested a restatement of these calculations, and it was determined that the instrumentation Exxon was using to produce those calculations was improperly calibrated. Exxon eventually restated its SVE calculations as an estimate much lower than reported, with a margin of error of about 20 percent.

Nevertheless, given the geological circumstances and the lack of rainfall, we believe that a significant amount of liquid and constituent product has been recovered. No liquid has been recovered since about April 2006, and Exxon has also extracted almost nine million gallons of groundwater for treatment and extraction of fuel components. Of course, this water is coming out of our groundwater supply, which has concerned both MDE and local government officials. The contaminated water was initially being trucked to Delaware for treatment and discharge into the Delaware River. It is now being treated on site under MDE oversight and being discharged into two streams flowing to the Chesapeake watershed and the Loch Raven Reservoir.

Water Supply Task Force

Close to 200 residential properties have been directly or indirectly affected, including those on required private well water testing by Exxon; and those with monitoring/recovery

wells on their property or in the streets in front.

The commercial center has been impacted by concerns over the safety of water used in such places as grocery stores and restaurants. In addition to concerns over health and safety, there have been serious concerns over property values. In fact, GJA successfully intervened, through assistance from MDE, in several cases where property sale closings were in jeopardy.

Six properties have private well water supplies that have reached actionable levels for MtBE (20 ppm in Maryland). These properties have been offered filtration systems by Exxon under MDE requirements. Many other properties have water supplies with MtBE below action levels for private water supplies, or they have trace to significant levels of gasoline components in the monitoring wells on their property, but these contaminants have not yet been detected in their water supply wells. However, when people know that they had no MtBE in their water before this spill, whether their measurement is 0.1 ppm or 20 ppm, they can't help but feel ill-at-ease about having to live with the state action levels—the contaminant was not there before, and now it is.

We have established a task force of state, county, and community representatives to address the issues and determine the parameters of any potential replacement of lost private well water, either on individual

properties or on a larger scale, if required. MDE has recently asked ExxonMobil to participate in paying the cost of a feasibility study. This is a contingency plan so that options are measured in advance should catastrophic loss of water supply be realized. This possibility is itself controversial in an area that feels its rural nature and residential density are substantially protected by lack of public water, which could lead to denser development.

In some very significant respects, greater Jacksonville has changed forever. We have learned more than we needed to know about the fuel industry, LUSTs, governmental protection and representation, regulatory limits, and personal property vulnerability. The cleanup activity in our quiet town is pervasive, and we expect it to continue for many years to come. No one is suggesting anything less than another ten years.

This situation could have been prevented by adherence to established installation and maintenance requirements. It could have been confined and contained if alarms and warnings had been heeded when they first sounded. It could have been mitigated by proper management by ExxonMobil, the owner, and the lessee/operators. *It should never have happened.* ■

Glen A. Thomas is past president of The Greater Jacksonville Association, Inc. He can be reached at gat3806@aol.com.

Presentations from U.S. EPA Region 3's Ethanol Workshop Available on the Web

In response to a request by EPA Region 3 states, the Region organized an *Ethanol Workshop: Conversion from MtBE to Ethanol* in Hagerstown, Maryland, in October 2006. More than 60 UST regulators attended. The workshop was designed to provide a forum for states to share their experiences in addressing the changeover from MtBE to ethanol in gasolines and to understand what is necessary to ensure a transition that will be transparent to consumers. Industry and government experts were invited to speak on issues related to ethanol (E10, E85) remediation, compatibility, and insurance liability. Workshop presentations are available on http://www.epa.gov/reg3wcmd/ethanol_workshop.htm.

For more information, contact: Jack Hwang at U.S. EPA Region 3 (hwang.jack@epa.gov).

THE ARMY NATIONAL GUARD TACKLES PETROLEUM CONTAMINATION

Two Tales of What It Takes to Overcome the Obstacles

by June Taylor

Overcoming Oil Cleanup Challenges in Alaska's Tundra and Permafrost

And You Think You've Got Problems?

Consider the dilemma of Norm Straub, Compliance Manager for the Army National Guard in Alaska. On taking the job in 1996, he inherited a backlog of oil-contaminated sites spread over an area the size of New England. In developing a priority list, he found more. Almost all sites were the result of heating oil spills, usually from accidents, such as broken pipes or tank overfills. There have been some incidental spills related to jet or helicopter fuels. However, given that heating oil is the only source of heat in most of Alaska and that Alaska is very cold, there is a lot of heating oil use. (Only the southern part of the state has forests where wood can be cut for fuel. Village corporations generate electricity locally using diesel fuel, but it is too expensive to use for heating.)

Debra Caillouet, with the Alaska Department of Natural Resources, says, "Norm has gone through about 75 [Army Guard] sites in the state, many with some sort of heating oil leak, and set up a priority system for the worst spills with the most risk to the environment—specifically our tundra and permafrost ecosystems. Then he's worked hard to deal with the high costs and logistical hurdles we face up here by piggy-backing cleanup operations and equipment wherever possible."

And Oh What Hurdles!

"The pool of knowledgeable contractors and the pool of equipment are very limited," notes Straub. And there is competition among agencies and private companies for those resources. Assuming you can find the right equipment, getting it onto a site is another challenge. Except in southeastern Alaska, there are virtually no roads to villages. The way in and out is by boat or by plane. Both trans-

portation modes are routinely hampered by bad weather. Many remote villages only get barge deliveries in the three months of summer—they are ice-locked the rest of the year. Air transport is the most reliable, but expensive.

Now add the sensitivity of the tundra ecosystem. Contrary to what you might think, you don't want to work in the warm season. Heavy equipment would damage the tundra, create dark tire tracks that would absorb more heat and possibly melt the underlying permafrost. All military training in northern Alaska is done in the winter, when the ground is solid...and so is most of the Army Guard's soil remediation. Contaminated soil has to be airlifted or barged out—usually to Seattle for burning. (There is one rotary kiln in southeastern Alaska for burning petroleum-contaminated soil.)

But you can't leave a hole in the ground or, come summer, it will cause the aforementioned heat/melting problems. So Straub has to barge or airlift in backfill material—another item that is simply not available in the villages. Says Straub, "To save money we try to work it so we use the same containers that bring in the backfill material to take out the contaminated soil."

Making the Very Best Use of Resources

Debra Caillouet gives credit to Straub for teaming with other agencies, such as the Air Force and Army Corps of Engineer ("Corps"), to make the best use of resources. "If the Air Force or Corps has a front-end loader or drill rig going into an area where we have a cleanup site, we'll use the same equipment," says Straub adding, "There will be round-the-clock shifts; the equipment is too precious to let it sit idle."

Straub's efforts to coordinate cleanup activities has helped save taxpayer money at numerous sites—for Federal Aviation Administration, Air force, and Corps as well as the National Guard. The Alaska Army National Guard's cleanup efforts have cost more than \$4 million thus far. Straub's process innovations resulted in an estimated cost savings of approximately 10 percent, representing more than \$464,000.

In addition to cleaning up existing contamination, Straub's office has pushed overall equipment upgrades and training improvements. All heating oil storage tanks are now pump activated, not gravity-fed, and soldier training now places an emphasis on spill prevention rather than cleanup. All this effort made Norm Straub an individual winner of both a National Guard Environmental Security Award (ESA) and a nominee for an Army-level award.

"We see environmental stewardship as a good investment," says Captain Nathlon Jackson, who oversees the Guard's ESAs. "We can't do our main job of training soldiers if we are shut down for environmental violations. Being proactive saves us time and money." The awards are a highlight of the annual National Environmental Workshop (NEW), which brings together all NGB environmental managers and specialists for training and information-sharing sessions.

"We have multiple interests in our environmental stewardship efforts," notes Colonel Jerry Walters, who leads the Guard's overall environmental program. "We are guardians of a lot of land in the U.S. with valuable natural areas as well as cultural resources. We have a responsibility to our soldiers, our local communities, and our country to do our best at both training and protecting the environment."

Diligence in Diesel Cleanup Yields Data on More Contamination

The Michigan National Guard Adapts Equipment to Save on Remediation Costs

Camp Grayling, located in central northern Michigan, is the largest military installation east of the Mississippi River. Its 147,000 acres also make it the nation's largest National Guard training site. The Camp is used year-round for training not only by the Guard, but also active and reserve components of the Army, Navy, Air Force, and Marine Corps. This includes tank maneuvers and small arms, mortar, tank, artillery, and multiple launch rocket system firings. Helicopter/helicopter door gunnery and anti-armor gunnery as well as fixed-wing aircraft air-to-ground munitions drops of up to 500 pounds are also conducted on the installation. All of this activity takes fuel.

In 1988, the rupture of a diesel-fuel line from three 50,000 gallon tanks at a bulk-fuel storage facility caused a plume of polluted groundwater near the Camp's airfield. Camp Grayling's Environmental Manager, John Hunt, a geologist, and the Guard's Environmental Compliance Specialist, Gary Hoffmaster, brought in a skilled contractor, MACTEC, to design a bioremediation system.

Peter Neithercut, the MACTEC project leader, installed two above-ground tanks for in situ bioremediation. Contaminated groundwater was pumped up, run through the tanks with a combination of fertilizer and bacteria culture to digest the hydrocarbons from the spill, and then reinjected upgradient. Petroleum, oils, and lubricant spills (POLs) are common on installations, and the Army has developed a special environmental center to address such issues. (See: <http://aec.army.mil/usaec/technology/cleanup05a.html>)

According to John Hunt, the system is closed-loop and similar to wastewater treatment. He says this form of remediation is a proven technique with no negative impacts to the environment. "The plume flows downgradient. By pumping from the downgradient end into the 'treatment system,' then reinjecting back upgradient we're controlling the

movement of the contaminated water and recirculating it through the system until it's clean," explains Hunt.

Uh-Oh!

After four years of running this system Camp Grayling's environmental team thought they had cleaned up the site. Hydrocarbon tests detected no contamination, and tests for benzene, toluene, ethyl benzene and xylene (BTEX), the volatile components commonly associated with petroleum products, also came up clean. "We thought we had it all clean," says Gary Hoffmaster, "then the state agency requested that we do a full volatile sample for chlorinated solvents." Those tests resulted in some bad news—350 parts per billion (ppb) of perchloroethylene (PCE)—an "acceptable" level is 5 ppb in groundwater. The tests also showed some degraded trichloroethylene (TCE). Both are neurotoxins and in high doses can cause cancer.

They knew these contaminants had to be from another source—PCE and TCE are solvents used for metal degreasing; PCE, often called "Perc," is also commonly used in dry cleaning. The discovery led to a new site investigation. Gary Huntington, the National Guard Bureau's Environmental Manager for the entire state of Michigan, points out that in addition to running soil probes on a 100-acre grid to identify the sources and extent of the contamination, they also talked to some old-timers to figure out what had gone on there in the past.

"We found out that back in the 1960s and into the 1980s the area had been used to clean artillery tanks, like the Abrams M1," says Huntington. "The guys would swab out the gun barrels with solvents, using a five-gallon bucket, and dump any extra on the ground." Needless to say,

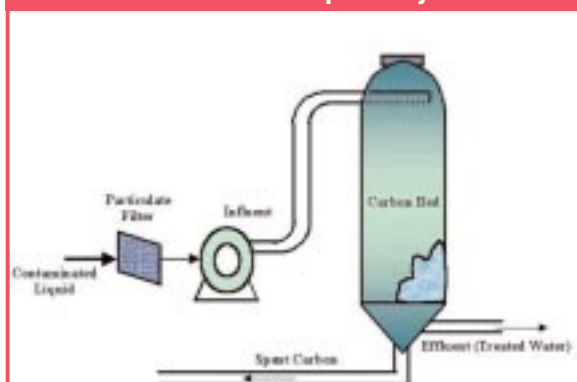
there was extensive contamination. "The key was finding where it was coming from," says Huntington, "then we basically reached into our tool box and came up with some better methods to treat it."

Contractor Peter Neithercut notes that PCE is not handled well by bioremediation, so they addressed the solvent sources with carbon absorption (see Figure 1) and air sparging. Because the plume had moved close to the property line, they added carbon adsorption to control any migration.



FIGURE 1

Typical Fixed Bed Carbon Adsorption System



Source: Federal Remediation Technology Roundtable:
<http://www.frtr.gov/matrix2/section4/4-47.html>

"The Michigan Department of Environmental Quality was adamant that we have active containment of the plume due to risks to nearby residences with shallow wells," says Neithercut. The system ended up solving the problem more quickly than they originally anticipated. "After only about five years we got the source areas down to 50 ppb in groundwater," says Huntington, "Finding the sources in the soil really helped knock it out." Camp Grayling's Army Guard environmental team expects to meet the 5 ppb cleanup requirement perhaps as early as 2011.

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■ Michigan National Guard from page 9

The original projections were 2018 to 2020.

Piggybacking for Efficiency

Meanwhile, in May of 1995 another spill—a mix of diesel and gasoline—was found in the base's "cantonment area." This is the base's mini city with barracks, stores, and offices—a fairly extensive area with some 700 buildings. Near Building #8 the Guard had six underground tanks, totaling 40,000 gallons of fuel storage. Somewhere in the underground system they had a leak. The Guard and its contractor, MACTEC, did a site investigation, removed the tanks, and initiated a cleanup. They replaced the underground system with two larger aboveground storage tanks—one for diesel, one for gas. These new tanks have internal secondary containment, and all piping is aboveground so it can be inspected.

MACTEC realized they could save the Guard money by taking the in situ bioremediation equipment used at the airfield diesel spill (described above) and retrofit it to treat the new spill. The soils and geo-

logy were different, and there were slight differences in the POLs. Neithercut points out that, often, when you use bioreactors you have natural soil bacteria that help you. But sand dunes are pretty sterile. So they had to introduce a different mix of bacteria and nutrients to activate the bioremediation. They ran the in situ bioremediation system for five years to get to acceptable "criteria" levels.

But, in Michigan, once you think you're finished—after reaching the acceptable "residential levels"—you have to monitor for at least four quarters. "They don't want the numbers to creep back up," says Neithercut. By the summer of 2006 they had eight quarters (a precautionary measure required by the state) at acceptable very low levels, so they filed for closure in September. "The cleanup has succeeded; you could put a nursery school here," says Neithercut.

The project was completed under the Michigan Army National Guard's Installation Restoration Plan (IRP), the military term for environmental cleanups. It was supported by a variety of state and federal contracting mechanisms. The Guard estimates that by adapting and reusing existing cleanup equipment, the environmen-

tal restoration team saved approximately \$75,000 and reduced the total cleanup time by about two years.

The four-man team that had the most to do with the projects was nominated for an Army Guard Environmental Security Award. The team included Gary Hoffmaster, John Hunt, Greg Huntington, and contractor, Peter Neithercut. It is somewhat unusual for a contractor to be nominated for a Department of Defense award. It speaks to MACTEC's successful long-term relationship with the Guard and the Guard's recognition of the importance of high-quality contractors in solving environmental problems.

Camp Grayling continues to be a major military training site while also being open to the public in some areas for recreation, including boating and fishing. It contains world-class trout and fly-fishing streams—clean waters that are being protected by a conscientious National Guard environmental team. ■

June Taylor is head of Environmental Communications, working on environmental and human health policy, outreach, and education. She can be reached at: taylorjune@aol.com.

Report on Route 66 Initiative Available on Region 9's Website

Region 9 has published *The Route 66 Partnership: Exploring Cleanup and Redevelopment Opportunities*, which can be seen at <http://www.epa.gov/region9/waste/brown/66/index.html>. The report describes the efforts of the Arizona Department of Environmental Quality, EPA Region 9, and their partners to revitalize the Arizona section of historic Route 66 by cleaning up and reusing the numerous old abandoned gas stations that plague it. Others may find this description of the partnership helpful in organizing similar aligned-site projects (e.g., by corridor, riverfront, neighborhood). (See also *LUSTLine* #54, "Arizona's Route 66 Initiative Tackles Forgotten Gas Stations on a Highway of History.") ■

EPA Issues Final SPCC Rule and Proposes Extending Deadline

In December 2006, U.S. EPA Administrator Stephen L. Johnson signed a final rule to amend the Spill Prevention, Control, and Countermeasure (SPCC) rule at 40 CFR part 112. Proposed in December 2005, the final rule amendments, effective February 26, 2007, streamline the requirements for the owners/operators of qualified facilities with aboveground oil storage capacities of 10,000 gallons or less and certain containers and equipment regulated under the rule.

The amendments include:

- Providing the option for owners and operators of facilities that store 10,000 gallons of oil or less and meet other qualifying criteria to self-certify their SPCC plans in lieu of review and certification by a professional engineer
- Exempting mobile refuelers that operate solely within a nontransportation facility (e.g., airports and rail yards) from the sized secondary-containment requirements for bulk oil storage containers
- Providing an alternative to the general secondary-containment requirement without a determination of "impracticability" for facilities that have particular types of oil-filled equipment
- Extending the SPCC compliance dates indefinitely for farms, until a new regulation is established.

In a separate rulemaking, EPA is proposing to extend the SPCC compliance deadline for all facilities (with the exception of farms), including bulk plants, from October 31, 2007, to July 1, 2009. The SPCC amendments are available at: www.epa.gov/oilspill/spcc_dec06.htm. ■

Wander LUST

by Patricia Ellis

A roving column by reporter Patricia Ellis, a hydrologist with the Delaware Department of Natural Resources and Environmental Control, Tank Management Branch. Pat served as a member of U.S. EPA's Blue Ribbon Panel on MtBE. She welcomes your comments and suggestions and can be reached at Patricia.Ellis@state.de.us.



The USTs and LUSTs of Biodiesel *Dr. Diesel's Perspicacious Vegetable Oil Prophecy*

The concept of using vegetable oil as a fuel dates back to 1895 when Dr. Rudolph Diesel developed the first diesel engine to run on vegetable oil. He demonstrated his engine at the World Exhibition in Paris in 1900 and described an experiment using peanut oil as fuel in his engine. In 1911, Rudolph Diesel stated: "The diesel engine can be fed with vegetable oils and would help considerably in the development of agriculture of the countries which use it." In 1912, Diesel said "the use of vegetable oils for engine fuels may seem insignificant today, but such fuels may become in the course of time as important as petroleum and the coal tar products of the present time." (1)

Diesel's engine was powered by peanut oil, though it was not strictly biodiesel, since it was not transesterified—conversion of one organic acid ester into another ester of that same acid (see below). But Diesel believed that in time, such oils might be as important as petroleum-based oils. Transesterification of a vegetable oil by Duffy and Patrick in 1853 had actually preceded the first diesel engines by several decades. (2)

The primary difference between a conventional automobile engine and a diesel engine lies in the way the fuel-air mixture is ignited. The first requires a spark plug to create an explosion in the cylinder. A diesel engine compresses the mixture in the cylinder until it heats sufficiently to explode on its own. The conven-

tional engine requires a lightweight fuel distilled from petroleum, whereas a diesel can run on a heavier derivative made from crude oil, coal tar, or vegetable oil.



Source: <http://www.federalsustainability.org/initiatives/biodiesel/biodieseltrg.htm>

What Is Biodiesel?

The technical definition of biodiesel is "a fuel composed of mono-alkyl esters of long fatty chain acids derived from vegetable oils or animal fats, designated as B100, and meeting the requirements of ASTM (American Society for Testing and Materials) D6751 specification." Biodiesel is a clean-burning, biodegradable, nontoxic alternative fuel product produced from renewable resources (animal fats and plant oils) that can be blended with petroleum diesel to create a biodiesel blend (BXX, where XX represents the percentage of biodiesel (i.e., B5 means 5% biodiesel, 95% petroleum diesel). Biodiesel is a processed fuel that can be used readily in diesel-engine vehicles, which distinguishes biodiesel from the straight vegetable oils (SVO) or waste vegetable oils (WVO) used as fuels in some modified diesel engines. The ASTM biodiesel blend-stock standard describes minimum standards for B100 biodiesel properties. The Department of Defense has specifications for B20 blends. A vote on an ASTM standard for B20 is scheduled for December 2006, with final approval expected by summer 2007. (3) It is important to understand that even though diesel is part of its name, pure biodiesel does not contain petroleum diesel or fossil fuel of any sort.

"The use of vegetable oils for engine fuels may seem insignificant today. But such oils may become in the course of time as important as the petroleum and coal tar products of the present time."

Rudolph Diesel, 1912

■ continued on page 12

■ Biodiesel from page 11

How Is Biodiesel Made?

A variety of oils can be used to produce biodiesel. These include:

- Virgin oil feedstock—rapeseed and soybean oils are most commonly used, though other crops such as mustard, palm oil, hemp, jatropha, and even algae show promise.
- Waste vegetable oil (WVO)
- Animal fats, including tallow, lard, yellow grease, and a byproduct from the production of Omega-3 fatty acids from fish oil.

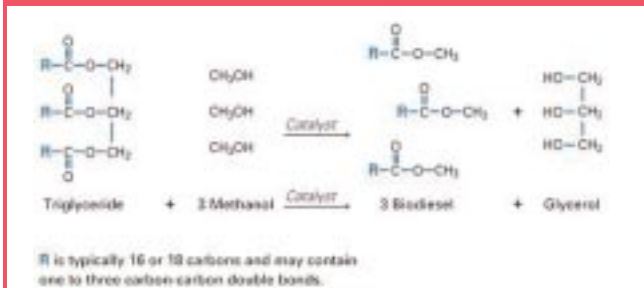
Biodiesel is typically produced by chemically reacting a vegetable oil or animal fats with an alcohol, such as ethanol or methanol, in the presence of a catalyst to yield mono-alkyl esters and glycerin. Methyl soyate, or soydiesel, made by reacting methanol with soybean oil, is the main form of biodiesel in the United States. Waste animal fats, used frying oil, peanuts, cottonseed, sunflower seed, and canola (a variant of rapeseed) are also potential feedstocks that are being investigated as a way to reduce biodiesel production costs.

Biodiesel is a mixture of fatty acid methyl esters. Vegetable oils, which chemically are triglycerides of fatty acids, are not good biodiesels. However, the oils can be combined with methanol in a process known as transesterification (see Figure 1) to produce a material with better properties. The resulting mixture of fatty acid methyl esters has chemical and physical properties similar to those of conventional diesel fuel.

Methanol is the most commonly used alcohol for biodiesel production, because it is the cheapest. Ethanol can be used to produce an ethyl-ester biodiesel and higher alcohols such as isopropanol and butanol have also been used. Using alcohols of higher molecular weights improves the cold-flow properties of the resulting ester, at the cost of a less efficient transesterification reaction. A byproduct of the transesterification process is the production of glycerol. A lipid transesterification production process is used to convert the base oil to the desired esters. Any free fatty acids (FFAs) in the base oil are either converted to soap and removed from

FIGURE 1

Transesterification of Vegetable Oil to Biodiesel



Source: http://www.chevron.com/products/prodserve/fuels/bulletin/diesel/L2_4_8_fs.htm

100 pounds of oil + 10 pounds of methanol = 100 pounds of biodiesel + 10 pounds of glycerol

(<http://www3.me.iastate.edu/biodiesel/Pages/biodiesel1.html>).

the process, or they are esterified (yielding more biodiesel) using an acid catalyst.

Biodiesel that has met the technical specifications of ASTM D 6751 ensures that the product has met standards involving complete reaction, removal of glycerin, removal of catalyst, removal of alcohol, absence of FFAs, and low sulfur content.

In Europe, there has been a thriving biodiesel industry for about 20 years. The fuel there is made from rapeseed oil; rapeseed is a plant in the mustard and turnip families. The European variety of rapeseed is not grown in the U.S. because of climatic differences, but the canola variety of the plant is grown in some parts of the U.S. Most biodiesel produced in the U.S. is made from a soybean feedstock. (4)

Chemical and Physical Properties of Biodiesel vis-à-vis Petroleum Diesel

Biodiesel properties are a direct function of the carbon chain length and the proportion of saturated versus unsaturated fatty acids in the fuel plus the presence of additives. This varies depending on the feedstock. Biodiesel made from feedstocks that contain highly saturated fatty acids (e.g., yellow grease, beef tallow, palm, and coconut oil) tend to exhibit high cloud and pour points, high cetane number, and better stability.

Cetane measures the tendency of diesel to autoignite and is comparable to the octane number of gasoline. Higher cetane fuels have shorter igni-

tion-delay periods than lower cetane fuels. Fuels with a cetane number lower than the engine's minimum requirements can cause rough engine operation and may make the engine more difficult to start. Biodiesel made from feedstocks with high polyunsaturated content (e.g., soy and sunflower) have low freezing points, lower cetane numbers, and poor stability. (5)

In general, biodiesel has a higher cetane number than typical petroleum diesel fuel. It also contains 11 percent oxygen by weight. The minimum flash point (a measure of fire safety) for biodiesel is higher than for diesel to ensure that any excess alcohol used in the manufacturing process has been removed. The viscosity of biodiesel tends to be higher than of typical diesel fuel.

Neat biodiesel (i.e., entirely derived from biological materials) has good lubricity properties and contains essentially no sulfur or aromatics in comparison with petroleum diesel. One of the problems with ultra-low sulfur diesel is its low lubricity. Adding 1 to 2 percent biodiesel to ultra-low sulfur petroleum diesel can improve lubricity significantly.

Neat biodiesel has a relatively high pour point, so it will tend to gel and/or form crystals more quickly than petroleum diesel in cold weather conditions. The temperature at which pure biodiesel starts to gel depends upon the mix of esters and, therefore, the feedstock oil used to make the biodiesel. Biodiesel produced from canola oil starts to gel at approximately -10°C, while biodiesel produced from tallow tends to gel at approximately +16°C.

A limited number of additives are available that will reduce the gel point of straight biodiesel. The additives reduce the tendency for the viscosity to increase as biodiesel is cooled and prevent cold temperature crystallization. For cold-weather use, biodiesel can also be blended with other fuel oil, such as #2 low sulfur diesel and #1 diesel/kerosene. (2)

Biodiesel is hydrophilic. Water can be a residual from processing, or may come from condensation in storage tanks. Water can reduce the heat of combustion of the fuel, which can result in smoking, less power, and difficulty starting engines. Water can also result in corrosion of fuel-system components and accelerated microbial growth, which can clog up fuel filters. Biodiesel that is stored in heated tanks can have microbial problems. Water in the fuel can cause ice crystals to form and accelerate gelling of the fuel.

Due to the enhanced solvency characteristic associated with methyl esters, neat biodiesel has a tendency to dissolve accumulated sediments in diesel storage and engine fuel tanks. This can result in clogged or burst fuel filters. While the problem is more common in higher percentage blends of biodiesel, it may also happen with B20 and lower blends, particularly with vehicles that haven't been exposed to the product before.

Minnesota has a biodiesel mandate that took effect in September 2005. The mandate was suspended three times during the first winter as officials investigated problems involving clogged fuel filters. Testing revealed a variety of production, storage, and delivery problems, including fuel with concentrations as high as 50 percent biodiesel that was sold as B20, and excessive levels of glycerin in the fuel that gelled in the cold weather. (6)

Toxicity of Biodiesel Fuels

Biodiesel is the first alternative fuel to have successfully completed the Tier I and Tier II Health Effects Testing requirements of Section 211(b) of the Clean Air Act Amendments of 1990. The first tier of health effects testing was conducted by the Southwest Research Institute and involved a detailed analysis of biodiesel emissions. Tier II was conducted by the Lovelace Respiratory Research Institute, where a 90-day subchronic study of biodiesel exhaust with specific health assessments was completed. Results of the testing concluded that biodiesel is nontoxic and biodegradable, posing no threat to human health. Please note that Section 211 testing is based on exposure by inhalation of biodiesel exhaust.

Comparing biodiesel emissions to petroleum diesel emissions, the findings include:

- The ozone (smog) forming potential of hydrocarbon exhaust emissions from biodiesel is 50 percent lower.
- The exhaust emissions of carbon monoxide (which contributes to the formation of smog and ozone) are 50 percent lower.
- The exhaust emissions of particulate matter from biodiesel are 30 percent lower.
- The exhaust emissions of sulfur oxides and sulfates (contributors to acid rain) from biodiesel are totally eliminated.
- The exhaust emissions of hydrocarbons (a contributing factor to localized formation of smog and ozone) are 95 percent lower.
- The exhaust emissions of aromatic compounds known as PAH and NPAH compounds (suspected carcinogens) are substantially reduced for biodiesel compared to diesel. Most PAHs were reduced by 75 to 85 percent. All NPAHs were reduced by at least 90 percent. (7)

Toxicity testing with rats, albino rabbits, daphnia magna, and rainbow trout has shown that biodiesel is considerably less toxic than diesel fuel but that one should still avoid ingesting biodiesel or getting it on the skin. (8)

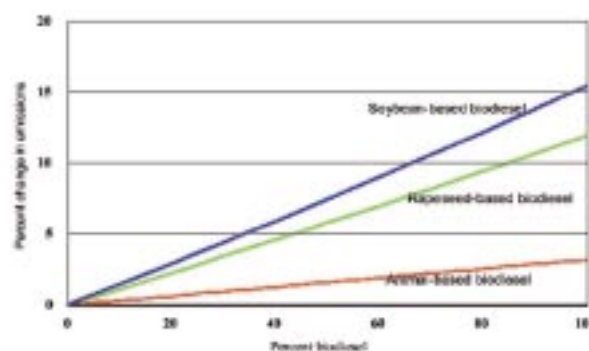
Air Emissions

A U.S. EPA assessment showed that, generally, increasing biodiesel-blend concentration reduces HC, CO, and particulate matter (PM) emissions, but increases NOx emissions. (9) Little information is available on emission characteristics of newer vehicles equipped for lower particulates. The chemical composition of the feed-

stock directly impacts the properties of the fuel and, consequently, the emissions associated with its use.

The EPA study discovered that biodiesel impacts on emissions varied depending on the type of biodiesel (e.g., soybean, rapeseed, animal fats) and on the type of conventional diesel to which the biodiesel was added. Biodiesel made from feedstocks that contain higher levels of unsaturated fatty acid chains (e.g., soy, canola) tend to produce higher NOx emissions than more saturated feedstock materials (e.g., tallow). (10) (See Figure 2.)

FIGURE 2
Feedstock Type and NOx Emissions



Source:
<http://www.federalsustainability.org/initiatives/biodiesel/biodieseltrg.htm>

TABLE 1

Tailpipe Emissions Percentage Difference: Biodiesel Compared to Petroleum Diesel

	B20	B100
Total PM	-6%	-30%
HC	-19%	-95%
CO	-10%	-50%
NOx	3%	13%
SOx	-20%	-100%
n-PAH	-18%	-90%
PAH – range	-10% to -17%	-50% to -85%
PAH – average	-13%	-80%

Source: National Biodiesel Board / USEPA Tier 1 Health and Environmental Effects Testing for Biofuels, "Final Report, March 1998."
<http://www.federalsustainability.org/initiatives/biodiesel/biodieseltrg.htm>

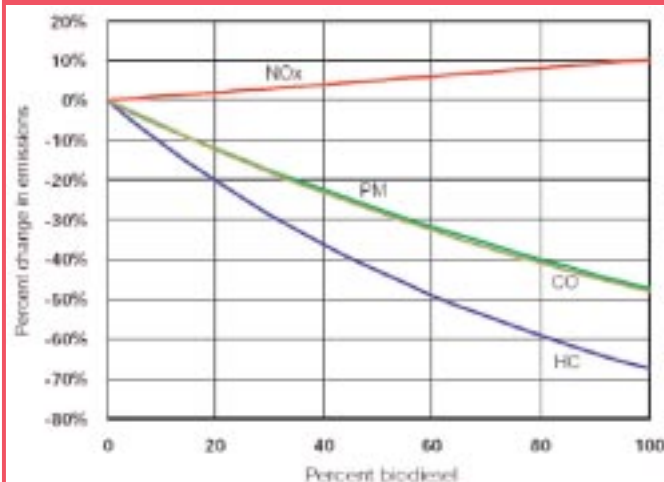
An EPA study comparing exhaust emissions of conventional diesel and biodiesel was not able to identify an unambiguous difference in exhaust CO₂ emissions between

■ continued on page 14

■ Biodiesel from page 13

the two fuels. The CO₂ benefits attributed to biodiesel are the result of the renewability of the biodiesel itself, not the comparative exhaust CO₂ emissions. (11) A study by the Department of Energy found that biodiesel production and use, in comparison with petroleum biodiesel, produces 78 percent less CO₂ emissions. (12)

FIGURE 3
Average Emission Impacts of Biodiesel for Heavy-Duty Highway Engines



Source: <http://www.epa.gov/otaq/models/analysis/biodsl/p02001.pdf>

Note: These data are for heavy-duty highway engines, which may or may not correlate to the emissions from nonroad engines or light-duty vehicles.

A recent development involving air emissions is a Texas Commission on Environmental Quality (TCEQ) decision to effectively ban biodiesel in the state's largest markets. According to the TCEQ, biodiesel does not meet stricter NO_x standards recently imposed on diesel and alternative fuels for the state's 110 smoggiest counties. The problem revolves around a 2002 U.S. EPA study that found that B20 blends emit 2 percent more NO_x emissions than the state standard. A National Renewable Energy Lab (NREL) study indicated that biodiesel appears to cause no change in NO_x emissions. For now, the ban is scheduled to take effect on December 31, 2006. (13)

BTU Differences

The energy content of neat biodiesel is 8 percent lower (on a gallon basis) compared with typical petroleum-derived #2 diesel, so some reduction in fuel economy and power can be expected with fuels containing

biodiesel. Biodiesel is predicted to reduce fuel economy by 1 to 2 percent for a 20-volume percent biodiesel blend. Users of B20 or lower blends in fleet demonstration tests generally report little noticeable reduction in vehicle performance and fuel economy. (14)

Compatibility with Vehicle Engines

Concerns have been raised regarding the impact of biodiesel blends on fuel-system component durability. Research has generally shown that B5 blends are compatible with materials and components tested. Highly oxidized B20 blends may cause operability problems. The lack of a consensus on an acceptable specification for oxidation has reportedly been a major stumbling block in the development of an ASTM standard for

finished blends of B20. Some manufacturers are approving the use of blends up to B20 in fleet vehicles, provided that the fuel meets U.S. military specifications, which require that the biodiesel fuel be used within six months of production to alleviate stability concerns.

The "World-Wide Fuel Charter" published by automobile manufacturers recommends against use of diesel fuel containing greater than 5 percent biodiesel by volume. This is based on concerns that vegetable-derived biodiesel has:

- High viscosity at low temperatures
- A hygroscopic tendency and consequent risk of corrosion due to high water content
- Potential compatibility issues associated with seals and composite materials of fuel systems in existing vehicles.

B100 may degrade some hoses, gaskets, seals, elastomers, glues, and

plastics with prolonged exposure. Natural or nitrile rubber compounds, polypropylene, polyvinyl, and Tygon materials are particularly vulnerable. Most elastomers used after 1993 are compatible with B100 (Viton/Teflon). Teflon, Viton, and Nylon may be used to update incompatible equipment. (15) The same issues go for metals as described in the section below on storage compatibility.

Biodiesel is a better solvent than petrodiesel and can break down deposits of residue in the fuel lines of vehicles that have previously run on petrodiesel. Fuel filters may become clogged with particulates if a quick transition to pure biodiesel is made, because biodiesel "cleans" the engine in the process. Therefore, it is recommended that the fuel filter be changed within 600 to 800 miles after first switching to a biodiesel blend. (6)

Compatibility with Fuel Storage Systems

The Petroleum Equipment Institute has a new website with an online database of ethanol- and biodiesel-compatible equipment. Manufacturers are responsible for providing lists of equipment, the particular fuels with which the equipment is compatible, and the verification process used to prove that the equipment is compatible with those fuels. For biodiesel, B5, B20, and B100 blends are included. (<http://www.pei.org/altfuels/ByFuel.asp>)

Many of the same compatibility issues apply to biodiesel as applied for ethanol blends. Biodiesel can act as a solvent in tanks, which may lead to clogged or burst filters. The greatest effect is shown at the higher levels of biodiesel. The same issues apply for gaskets, seals, and so on, as stated in the section above.

Most tanks designed to store diesel fuel will be adequate for storing B100. Acceptable storage tank materials include aluminum, steel, fluorinated polyethylene, fluorinated polypropylene, Teflon, and most fiberglasses.

Brass, bronze, copper, lead, tin, and zinc may accelerate the oxidation process of biodiesel, creating fuel insolubles, or gels and salts. Lead solders and zinc linings should be avoided, as should be copper pipes, brass regulators, and copper fittings.

Affected equipment should be replaced with stainless steel, carbon steel, or aluminum.

Biodiesel blends of 20 percent or less reduce the impact of metal compatibility issues and should have a lesser effect on other materials as well. When handling blends of B20 or less, normal monitoring of hoses and gaskets for leaks should be sufficient. With low-level blends such as B2, effects are virtually nonexistent. (16)

Biodegradation

There is little published information on the biodegradability of biodiesel. Researchers at the University of Idaho conducted studies in the mid-1990s using neat oil and biodiesel from a variety of feedstocks, including soy, canola, and rapeseed. Both methyl and ethyl esters were included. Number 2 diesel was used as a comparison in all the studies. Various blends, from 100 percent #2 diesel to 100 percent methyl ester and 100 percent ethyl ester were studied in the laboratory for biodegradability, both in soils and aquatic environments.

Two main methods were used for determining rate and degree of biodegradation. One method involved measuring the generation of CO₂ as evidence for biodegradation. The other method involved analysis of samples by gas chromatograph to determine biodegradation. Results showed that all of the biodiesel fuels were readily biodegradable in both soil and aquatic environments. (9) Predictions of biodegradability are based on laboratory studies. Results in the field may not be as rapid.

Tests sponsored by the Department of Agriculture found that biodiesel is "ten times less toxic than table salt and biodegrades as fast as dextrose (a test sugar)," and that biodiesel degrades about four times faster than petroleum diesel. (17)

A study by Speidel and Ahmed (18) examined the aerobic biodegradation potential of a number of alternative fuels. The ranking of biodegradation potential, from highest to lowest, was: E85, biodiesel (B100), B20, E-10, gasoline, and diesel.

Net Energy Content/Lifecycle Energy Balance

A Department of Energy study con-

cluded that for every unit of fossil energy used in the production of soy-based biodiesel, 3.2 units of energy are gained when the fuel is burned. (19) Pimentel and Patzek found that the energy balance is negative—energy input for production was 2 percent higher than energy contained in the fuel. (20) Other studies, such as a UC Davis report (21) and an Argonne National Laboratory Report (22), calculated positive energy balances of +133% and +236%, respectively. There are significant differences in assumptions, data, definitions, and methodologies among the various studies.

A recent paper in *Proceedings of the National Academy of Sciences of the United States of America* (23) on the environmental, economic, and energetic costs and benefits of biodiesel and ethanol biofuels stated that biodiesel yields 93 percent more energy than the energy invested in its production, whereas ethanol yields 25 percent more. Compared with ethanol, biodiesel yields just 1.0 percent, 8.3 percent, and 13 percent of the agricultural nitrogen, phosphorus, and pesticide pollutants, respectively, per net energy gain. Relative to the fossil fuels that they displace, greenhouse gas emissions are reduced by 12 percent by the production and combustion of ethanol and 41 percent by biodiesel. However, even dedicating all U.S. corn and soybean production to biofuels would meet only 12 percent of gasoline demand and 6 percent of diesel demand.

The debate over the energy balance of biodiesel is ongoing. The degree to which vegetable-based biodiesel can displace petroleum fuels is limited by both the availability of cropland that provides the vegetable source and by the availability of higher-value options for the use of the biodiesel feedstock inputs. Using traditional plants, most nations do not have sufficient arable land to produce biofuel for the nation's vehicles.

One study published by the Society of Automotive Engineers (24) showed that devoting all the available land in Europe to produce the rape seed methyl ester-based biodiesel would reduce crude oil demand by less than 3 percent. DOE projections show that if all existing and future feedstocks were devoted

to domestic biodiesel production, only about 7 percent of the on-road diesel demand could be met near-term (2015). (25)

How Much Biodiesel Can We Produce?

The feasibility of ramping up production to the huge levels required to power a significant percentage of national or world vehicles depends on feedstock yield efficiency. The highest-yield feedstock is algae, which can produce 250 times the amount per acre as soybeans.

Feedstock	US Gallons/Acre
Soybeans	40
Rapeseed	110
Mustard	140
Jatropha	175
Palm Oil	650
Algae	10,000

Source: <http://www.answers.com/topic/biodiesel>

In 2003, 73.4 million acres of soybeans were harvested in the U.S. Soybean yield is normally between 35 and 40 bushels per acre. If all of the soybeans in the U.S. were used to produce biodiesel, the yield would be about 2,936 million gallons. (26)

As of September 2006, there were 86 commercial biodiesel plants operating in the U.S., with an annual production capacity of 580.5 million gallons (These facilities are not necessarily producing at capacity). Many additional facilities are under construction or expanding their capacities.

According to the National Biodiesel Board, estimated U.S. biodiesel production was 75 million gallons in 2005. At 75 million gallons, current domestic biodiesel production constitutes less than 0.2 percent of on-road diesel demand. With a prediction of 30 percent growth in total highway diesel demand, the U.S. Department of Energy projects that domestic biodiesel production will meet no more than 7 percent of on-road diesel consumption. (11)

State and Federal Activity, Incentives, and Regulations

The National Biodiesel Board has compiled highlights of state legislative activity concerning biodiesel

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■ Biodiesel from page 15

passed through September 2006. This legislation includes incentives, use requirements, point of taxation clarification, authorization of studies, state fleet use requirements, and biodiesel promotion. (27) For example, recently-passed New York legislation included:

- A biofuel production tax credit of 15 cents per gallon after the first 40,000 gallons produced
- Elimination of all motor fuel taxes on alternative fuels
- Cost-share infrastructure grants for private-sector gas stations to install and/or convert pumps for B20 or E85
- A residential BioHeat fuel tax credit in residential heating applications
- Illegality of contracts prohibiting renewable fuels. (11)

Proposed regulations implementing the Renewable Fuels Standard of EPACT 2005, which requires an increase in the amount of renewable fuel (including ethanol and biodiesel) used in the U.S. to 7.5 billion gallons by the year 2012, would give refiners and other covered entities that blend biodiesel 1.5 times the base RFS credit. The adjusted credit is due to the high energy content of biodiesel. (28) Additional information about the legal requirements and incentives for federal agencies to use biodiesel can be found at <http://www.federsustainability.org/initiatives/biodiesel/biodieseltgr.htm>.

Availability of Diesel-Powered Vehicles

While biodiesel is a relative newcomer to the U.S., in Europe it has had widespread acceptance as a vehicle fuel (as well as a heating fuel in some countries) due to deliberate government tax policies that favor its use. In Germany, diesel engines power close to 40 percent of passenger cars, and there are more than 188 filling stations offering biodiesel at a price competitive with that of regular diesel due to large tax breaks and subsidies for alternative fuels. Germany, France, and Italy combined

produce nearly 18 times more biodiesel than the entire U.S. (29)

A number of vehicle manufacturers make cargo vans or trucks that use diesel fuel, but only a few cars or SUVs are currently being produced that are diesel-powered. These include certain Hummers, Jeep Liberty, two Mercedes-Benz models, and some models of Volkswagen Golf, Jetta, Beetle, and Touareg. Information is available from Ford and Volkswagen on their websites (30), which states that fuels containing up to 5 percent biodiesel can be used in their engines.

Ten percent of Volkswagen sales in North America are now diesels, and 25 percent of Jettas come with a diesel engine. Ford specifically mentions the World-Wide Fuel Charter recommendation and provides a list of unresolved technical concerns with using biodiesel concentrations higher than 5 percent. Every new diesel-powered Jeep Liberty made in Toledo, Ohio, is currently being shipped with B5 in its fuel tank, sourced from soybeans grown and refined in Ohio.

DaimlerChrysler currently sanctions the use of B20 in its 2007 Dodge Ram 2500 and 3500 diesel pickups for its military, government, and commercial fleet customers only—and only if they use B20, which meets military specifications. (31) Mercedes-Benz states that their diesel engines are “not engineered for biodiesel. Based on its design, the vehicle can, nonetheless, accept diesel fuel with a maximum 5 percent Biodiesel content. Any concentration higher than 5 percent will result in fuel system component damage, which would not be covered under the Manufacturers New Vehicle Limited Warranty.” (Personal communication, 12/1/06, from Mark S., Customer Relations, Mercedes-Benz USA LLC.) It is thought that more automakers will endorse the use of B20 when the ASTM B20 is standardized.

Cost Differences

Biodiesel generally costs more to manufacture than conventional petroleum diesel. The feedstock cost of the oil or grease used to make biodiesel is the largest component of its production cost. It takes 7.3

pounds of soybean oil, which costs 21 to 24 cents per pound, to produce a gallon of biodiesel. Feedstock costs alone, therefore, are at least \$1.50 per gallon of soy product. Fats and greases cost less and produce less expensive biodiesel, but their supply is more limited and localized.

In March 2006, the before-tax national average price of B100 was \$3.05/gallon; \$2.14 per gallon for B20; and \$1.93/gallon for B2. In comparison, #2 diesel fuel cost was \$1.91/gallon. If you compared the energy content of the various fuels, the difference in costs would be even greater because of the lower energy content of neat biodiesel and of biodiesel blends relative to #2 diesel. (11)

Contributing to the higher costs for biodiesel are increased costs for blending, climatic and marketing considerations, storage differences, and the possible requirement to heat the fuel in storage during winter months to prevent gelling.

If You Build It, Will They Come? If You Sell It, Will They Buy It?

Delaware recently entered the biodiesel-refining business with the opening of the Mid-Atlantic Biodiesel Company, LLC in Clayton, Delaware, in August 2006. The plant started up using soy oil as feedstock, but it can handle both virgin and used vegetable oils, and production could grow from 6 million gallons/year to about 15 million gallons/year. Two-thirds of Delaware farmers grow soybeans.

The plant purchased soybean oil, rather than crushing it in-house. Officials are looking at opportunities to develop additional local processing capability to support the plant. Mid-Atlantic has contracts with wholesalers for the plant's output. The plant received more than \$5.7 million in state and federal assistance through grants and loan guarantees. (32)

In a recent series of legislative hearings in Delaware concerned with establishing retail E85 dispensing facilities, one of the witnesses, Mark Greco, described his experiences with B20 sales. His company owns the only three facilities in the state to offer B20 soy diesel to the public. The

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A MESSAGE FROM CLIFF ROTHENSTEIN

Director, U.S. EPA Office of Underground Storage Tanks

The 2006 Finish Line

Looking back on 2006—at what we have accomplished in such a short time—it's truly remarkable. All of our partners nationwide who contributed to the program's success should feel a sense of great satisfaction

knowing that so much has been achieved. The passage of the Energy Policy Act of 2005 gave EPA and states new tools designed to prevent releases from UST systems. We had to redouble our efforts to implement the new provisions and deadlines laid out in the law. Over this past year, we developed a number of guidelines and strategies to help implement the provisions. Some of what we've accomplished includes publishing a new tribal strategy and issuing guidelines for delivery prohibition and secondary containment.

Exceeding Our Goals

Many thanks to our regional and state partners for helping us continue to make progress in cleaning up releases from UST systems. With your diligence and hard work the tanks program is moving forward and has exceeded our goals for the 2006 fiscal year in almost every area. Last year (FY 2006) we:

- Completed 14,493 cleanups—exceeding our national goal by 893
- Completed 43 cleanups in Indian Country—exceeding our national goal by 13
- Reported 1,639 releases, well below our historical average.

Nearly every year we have exceeded most of our national goals, which has greatly contributed to the long-term success of the UST program. Since the beginning of the program, we have cleaned up almost 75 percent of 350,813 reported releases.

I am pleased to say that in FY 2006, the Office of Management and Budget rated the UST program as one of the federal government's most successful programs. Without the hard work of our partners we would not have achieved this distinction.

We have also continued to make progress in bringing tank owners into compliance. Last year, 62 percent of all facilities were operating their UST systems properly. Although we fell slightly below our goal, this shortfall may be somewhat misleading. Some states are now targeting their inspections at previously uninspected facilities that are more likely to be out of compliance. Once all of the states are on their three-year inspection cycle, as the new Energy Policy Act requires, we expect compliance rates to improve.

And Now for 2007...

Judging by the amount of work ahead, 2007 promises to be just as fast-paced as 2006.

The New Year is barely under way and we have already issued two new grant guidelines for states:

- Financial responsibility and installer certification
- Public record.

We also issued, for public comment, draft grant guidelines for the state compliance report on government USTs. We expect to finalize those guidelines this spring. We also plan to issue draft inspection grant guidelines for public comment in the spring; the final guidelines will be available this summer.

The final and draft grant guidelines along with additional program information are available at: <http://www.epa.gov/oust>.

And finally, this August, we will submit our Tribal Report to Congress, focusing on the tanks program in Indian Country.

State and Tribal Partners

Recognizing the resource and timing challenges under the Energy Policy Act, we are also working closely with our state and tribal partners to help ensure that the new requirements are successfully carried out. As a commitment to our partnership, we worked with Association of State and Territorial Solid Waste Management Officials (ASTWMO) to help ensure state participation in our working groups, including our efforts to develop grant guidelines. Flexibility is built into the guidelines for states that demonstrate good faith in meeting program requirements. We are looking for an approach to the program that is tailored to the specific needs of the state—not a “one-size-fits-all” formula.

We look forward to continuing to work with our partners in Indian Country to strengthen the tribal UST programs. While we cannot approve tribal programs, we have worked very hard to fully integrate the tribes into the UST program. At our national conference this March in San Antonio, we will hold tribal sessions to continue our dialogue on key issues. And, we will continue to work with tribal governments throughout the year to focus on UST/LUST issues in Indian Country.

Beyond the Energy Policy Act—Program Priorities and Goals

In addition to the new requirements under the Energy Policy Act, the UST program aims to achieve several additional goals, which include cleaning up 13,000 confirmed releases next year and gaining a better understanding of the backlog of sites yet to be cleaned up. Other key priorities for FY 2007 will be: increasing facility inspections, improving compliance, and minimizing

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TALKS ON TRIBAL LANDS

The Gila River Indian Community and U.S. EPA Team Up to Activate Corrective Action at a Former Trading Post



by Chris Prokop

On September 7, 2006, the Gila River Indian Community (GRIC) and the U.S. Environmental Protection Agency (EPA) activated a cleanup system for addressing hydrocarbon-contaminated soil at the Arizona Traders LUST site. The soil-vapor extraction (SVE) cleanup system consists of a vacuum pump, piping, and SVE wells to remove hydrocarbon vapors from the soil. The system also includes treatment for the extracted soil vapor. The GRIC and EPA chose this remedial approach in order to address hydrocarbon contamination in the soil caused by gasoline leaks from two USTs used from 1963 until 1985 at the former Arizona Traders Trading Post.

Although activating the cleanup system was relatively simple, the support work provided by members of the GRIC and EPA for almost four years prior to this step was anything but simple. During this period, the GRIC and EPA worked closely during two phases of site characterization, an SVE pilot study, a feasibility study for evaluating various potential remedial alternatives, and final approval of the remedial plan for the site. At the end of what is expected to be a three-year remedial period, the land will be restored for productive reuse.

The Arizona Traders LUST Site

The Arizona Traders Trading Post was in operation for more than 20 years in Sacaton, Arizona, a town located about 30 miles southeast of Phoenix on the GRIC. The trading post provided essential commercial goods for the residents of Sacaton and fuel for their automobiles. It also met some of the social needs of the community.

After 1985, the trading post building fell into disrepair, was vandalized, and ultimately burned down in 1994. The only features of the trading post remaining after the fire were the concrete foundation and a section of the adobe wall at the rear of the building. Despite its location in the central part of Sacaton, the property was not an attractive redevelopment prospect due to the presence of buried USTs. In addition to the redevelopment issue, it was unknown if there was any soil and/or groundwater contamination from the UST system.

Residual hydrocarbon contamination of soil and groundwater was documented when GRIC's Department of Environmental Quality (GRIC-DEQ) removed the two USTs in 1998. This contamination, the result of many years of gasoline leaks from the USTs and piping, had gradually migrated through the soil to the underlying groundwater, currently about 80 feet below ground surface. Following the UST removals, discussions began between GRIC-DEQ and EPA on the best approach for addressing the contamination at the site. These discussions led to an innovative approach to funding the cleanup.

Determining Eligibility for the Federal LUST Trust Fund

Following the discussions between GRIC-DEQ and EPA, EPA began the process of determining the eligibility of the Arizona Traders site for funding under the federal LUST Trust Fund for conducting a site assessment and, potentially, corrective action. During this process, EPA obtained financial records from the UST owner/operator, who lives in the community, and then conducted an evaluation of the former operator's ability to pay for the site assessment and remedial work.

The evaluation indicated that the Arizona Traders site appeared eligi-

ble for funding under the LUST Trust Fund, and EPA Region 9 presented its findings to EPA headquarters. When EPA headquarters subsequently approved this request, the Arizona Traders site became the first federally funded, EPA-lead, LUST cleanup project in Region 9.

...And Then Came the Statement of Work

Following EPA's approval to spend federal LUST Trust Fund money at the Arizona Traders site, there was still a lot of work to be done to get the site assessment and corrective action off the ground. GRIC-DEQ and EPA worked closely on developing a statement of work (SOW) for site assessment and corrective action at the site by EPA's national LUST contractor, Bristol Environmental and Engineering Services Corporation (BEESC), a Native American-owned corporation. Extensive interagency discussions took place during the development of the SOW and during the review of BEESC's work plan for implementing the site assessment and corrective action.

The Site Assessment Begins

In April 2002, Phase I site assessment work began at the Arizona Traders site. The Phase II site assessment began in February 2004 and was completed in May. During these two phases of site assessment, 20 borings were drilled, 13 monitoring wells were installed, and over 100 soil and groundwater samples were collected and analyzed. Soil and groundwater samples were analyzed for volatile organic compounds (VOCs), total petroleum hydrocarbons (TPH), and lead. The four-inch-diameter monitoring wells were generally installed to a depth of about 100 feet, and 40-foot well screens were used to address the historical groundwater fluctuations at the site.

The Advantages of Using State-of-the-Art Technologies

At the direction of GRIC-DEQ and EPA, BEESC used a number of state-of-the-art approaches during the site assessment in order to improve our understanding of the hydrogeology and the extent of contamination in soil and groundwater. These included the use of a mobile laboratory for field-based analyses of soil and groundwater samples, a percussion hammer drill rig for drilling most of the borings, a rotary sonic drill rig for drilling a deep continuously sampled boring for detailed geologic characterization, and passive diffusion bag samplers (PDBs) to augment the low-flow groundwater sampling that was being conducted with submersible pumps.

Use of the mobile laboratory ensured that same-day analyses of soil and groundwater samples could be obtained, and that decisions could be made in the field with regard to subsequent boring locations and the placements of monitoring wells. This avoided the additional downtime and cost associated with remobilization for subsequent phases of site assessment.

Due to the extensive occurrence of river gravel deposits at the site, the conventional hollow-stem auger drilling that was initially used was quickly deemed ineffective as a result of poor subsurface penetration. Percussion hammer drilling was selected as the drilling method of choice shortly after the site assessment began. This drilling technique, which utilizes a diesel-powered pile hammer to drive double-walled casing into the ground, had no problem penetrating the cobbly geologic materials at the site. With a percussion hammer, a boring could be drilled and a well installed the same day.

A rotary sonic drill rig was also used for one deep boring at the site in order to obtain continuous core samples and precisely define the geologic units. With the rotary sonic drilling method, the drill stem and sampler barrel are vibrated vertically at frequencies between about 50 and 180 Hz (with rotation), and the sampler barrel generally advances by displacing rather than breaking the cobbles (as with the percussion hammer). Although slightly more expensive than the percussion hammer, the



Margaret R. Cook, Executive Director, GRIC-DEQ; Jennifer Allison-Ray, Lieutenant Governor, GRIC; Jeff Scott, Director, Waste Management Division, U.S. EPA Region 9; and Chris Prokop gather to activate the Arizona Traders LUST site cleanup system.

Photo courtesy of Steve Linder.

rotary sonic rig gave us the detailed geologic information necessary to characterize the site and design a remedial alternative.

PDBs are low-density polyethylene bags that are usually suspended in monitoring wells by polyethylene ropes. Contaminants in groundwater are collected by means of chemical diffusion through the walls of the PDBs. The PDBs are typically left in monitoring wells for about two weeks in order to ensure equilibrium between the deionized water within the PDBs and the surrounding groundwater in the wells.

GRIC-DEQ and EPA decided to use PDBs in the most contaminated monitoring well at the site (MW-13) to provide a second comparative method for assessing groundwater contamination and to evaluate the potential for contaminant stratification in the groundwater. The analytical data from the PDB sampling showed that hydrocarbon concentrations within the screened interval fluctuated somewhat with depth. The PDB analytical data also compared favorably with the analytical data for the groundwater sample collected with a submersible pump at this same well.

Results of the Site Assessment

The site assessment confirmed that soil and groundwater contamination were present at the Arizona Traders site. Although a number of hydrocarbon compounds were detected above EPA Region 9's Preliminary Reme-

dial Goals (PRGs) and EPA's Maximum Contaminant Levels (MCLs), the primary compound of concern at the site was benzene, a known human carcinogen.

The maximum benzene concentration in soil was 16 milligrams per kilogram (mg/kg), which was 25 times Region 9's 0.64 mg/kg PRG for benzene in residential settings. This soil sample was collected from a depth interval of 25-27 feet below ground surface. Based on the most recent groundwater sampling data for the site from August 2006, the maximum benzene concentration in groundwater was 900 micrograms per liter (µg/l). This concentration was 180 times EPA's 5 µg/l MCL for benzene.

The current depth to groundwater is approximately 80 feet, and groundwater generally flows to the west-northwest under a hydraulic gradient of approximately 0.002 foot per foot. A circular area that is about 70 feet in diameter, which includes the former locations of the USTs, roughly delineates the benzene contamination in soil above the benzene PRG. A 170-foot-long and 80-foot-wide oval area that also includes the former locations of the USTs roughly delineates the benzene contamination in groundwater above the benzene MCL.

Based on the documented hydrocarbon impacts to soil and groundwater at the site and the potential impacts to human health, GRIC-DEQ and EPA determined that corrective action was needed. Although SVE was a proven technology for addressing benzene

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and other VOC contamination in unsaturated soil, GRIC-DEQ and EPA elected to conduct a pilot study to assess the likely performance of SVE at the site.

Pilot Study to Assess SVE System Performance

The pilot study at the Arizona Traders LUST site was conducted in May 2004. The study involved extracting air from the soil above the water table by means of a vacuum pump, piping, and SVE wells; monitoring the air flow rates and vacuum levels in the SVE wells and multiple observation wells; monitoring the VOC concentrations within the SVE system and in ambient air; and treating the extracted vapors.

Based on the significant recovery of hydrocarbon mass by these SVE wells and the acceptable radius of influence of these wells, GRIC-DEQ and EPA determined that SVE was the appropriate remedy for the hydrocarbon contamination in unsaturated soil at the site. GRIC-DEQ and EPA also agreed that monitored natural attenuation (MNA) was the appropriate remedial alternative for the groundwater contamination at the site. This decision was based on the documented stability of the groundwater plume, direct and indirect chemical evidence of insitu biodegra-

dation of the dissolved hydrocarbons, and the fact that the GRIC's drinking water wells were not threatened by the groundwater plume.

The MNA cleanup will require ongoing groundwater monitoring until the cleanup goals are met. This monitoring data will be used to assess the stability of the contaminant plume in groundwater (i.e., whether the plume is stable, shrinking, or expanding), and the extent to which naturally occurring bacteria in the subsurface are biodegrading the hydrocarbons.

The Corrective Action Approval Process

Before implementing SVE and MNA at the site, GRIC-DEQ and EPA needed the approval of residents of District 3, the Natural Resources Standing Committee (NRC), and the Tribal Council. GRIC-DEQ and EPA worked closely on developing an announcement of the proposed remedy for the site that appeared in the Gila River Indian Newspaper. GRIC-DEQ then met with the NRC and the local community to discuss the benefits of implementing SVE and MNA at the site.

Following the NRC's recommendation to the Tribal Council that SVE and MNA were the appropriate remedial measures, EPA met with the Tribal Council on October 19, 2005, to determine the Council's reaction to the proposed remedial alternatives.

The Tribal Council fully supported implementation of both SVE and MNA at the site, which cleared the way for construction and activation of the SVE system in 2006. Remediation of the hydrocarbon contamination in soil with SVE is expected to take approximately three years, and remediation of the groundwater contamination with MNA is expected to take at least 10 years.

Paving the Way

The site assessment and corrective action process that has been implemented at the Arizona Traders site illustrates how an effective EPA-Tribal partnership can achieve a mutual environmental goal. The work conducted at the site has been of a very high standard, and the ultimate outcome of this effort will be a property restored for beneficial reuse. Our experience in developing this solution will help pave the way for approaching other similar cleanup situations on tribal lands. It should be noted that without the full support of numerous individuals within the GRIC, this positive outcome could not have been achieved. EPA Region 9 looks forward to working with the GRIC to complete the remediation at the site. ■

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■ Message from Cliff Rothenstein *from page 17*

the number of new releases. Also, the need to ensure equity in compliance and cleanups in Indian Country will continue to be important for us.

Last, but certainly not least, we will continue our efforts to revitalize communities for the 21st century by creating incentives through the petroleum brownfields program to clean up abandoned gas stations. I will encourage my staff and regional EPA program offices to continue to look for opportunities such as our Route 66 initiative. (See *LUSTLine* #53, "Arizona's Route 66 Initiative Tackles Forgotten Gas Stations on a Highway of History.") Last autumn, we presented a check to officials of the City of Flagstaff, Arizona, to help clean up old abandoned gas station sites along their portion of historic Route 66. This seed money gave a shot in the arm to a community anxious to clean up an eyesore and begin fostering revitalization and growth.

I would like to harness the energy and enthusiasm of Route 66 and showcase what they have created and market that to the rest of the country. We need every-

one's help to make this happen. We can transform these forgotten gas station sites, which decades ago were prime business locations, and help them to regain prominence within local communities.

Meeting with Our Partners

Finally, we ended the year on a high note with an Association of State and Territorial Solid Waste Management Officials (ASTSWMO) meeting held in our new Potomac Yard facilities. There were representatives from nearly all 50 states, and judging by the positive feedback we received from the participants, the meeting was not only productive, but very well received. The topics for discussion included inspections, secondary containment, financial responsibility, operator training, and other areas of the Energy Policy Act. Our partnership with ATSWMO and individual state programs has been very productive. This meeting worked to further our partnerships so that we will be better able to meet the challenges facing the tanks program in the coming year.

Thank you for your hard work. I look forward to continuing our success in 2007. ■

In the (Sort of) Aftermath of MtBE...

Are Vapor Leaks Still Relevant?

by Gary Lynn

MtBE levels in New Hampshire gasoline stocks were dramatically reduced by early May 2006. Groundwater monitoring data is now available for approximately 100 active gas stations, and there is a downward trend in MtBE contamination levels in the wells located closest to the active USTs. This is the first sign of a reversal of the existing trend at New Hampshire sites where MtBE, TBA, and sometimes TAME contamination levels in groundwater have remained significantly above standards, while BTEX and other contaminant levels drop. The quick mitigation of MtBE groundwater contamination near active USTs confirms that the MtBE groundwater contamination was from ongoing leaks. With the reduction of MtBE in the gasoline supply and improving groundwater quality data, regulators are faced with the question of whether small ongoing leaks are still a major concern to our programs.

Since Congress eliminated the oxygen requirement for reformulated gas (RFG) in May 2006, the New Hampshire Department of Environmental Services (DES) has collected a limited amount of data on gasoline composition—19 samples. These samples contained 0 to 11 percent ethanol, 0 to 0.7 percent MtBE (MtBE concentrations highest in the premium grade), 0 to 0.1 percent TBA, 0 to 0.9 percent TAME, and 0 to 1.5 percent ETBE.

Reports on MtBE's demise were premature, inasmuch as we detected MtBE in 13 of the 19 samples. The MtBE content was *dramatically* reduced, however, and is likely to drop further after the implementation of additional MtBE bans in the Northeast in 2007. TAME was the next most commonly present oxygenate. ETBE was present in the summer but not in the late fall 2006 samples.

These results indicate that small leaks may still merit attention because MtBE and other ether compounds that behave like MtBE are still present. All of the ethers are present at much lower levels than the pre-May 2006 MtBE levels. These results suggest that any problems that will result from the ethers still present in gasoline should be no worse than those at sites where the gasoline release contained MtBE at octane-enhancement rather than RFG levels (a few percent versus over 10 percent).

Based on public water supply detection trends over time, MtBE contamination issues were significant but much less of a concern prior to the introduction of RFG into our state in 1995. However, indoor air problems resulting from vapor releases and groundwater contamination from other ether compounds remain a concern regardless of gasoline formulation.

For example, in October 2006, ongoing research detected a 5 ppm MtBE plume emanating from a large vapor release of the lower MtBE content gasoline. Based on these findings, a better understanding of small releases is still valuable to help ensure that future impacts are minimized and/or prevented.

What We Are Learning About Subsurface Vapor Releases

For subsurface vapor releases to occur, two elements must be in place. The tank system must be pressurized above ambient pressure, and leaks must be present at pressures below the pressure relief setting of the vent cap (3.5 inches of water). DES collected UST-system pressure data from a total of 13 gasoline service stations equipped with Stage I and II vapor recovery systems. All 13 stations exhibited positive pressure spikes for approximately 15 to 20 minutes when the tanks received deliveries of gasoline.

Stage I systems are designed to return excess pressure to the delivery



Tanks behave badly under pressure.

truck, rather than directly vent the displaced gasoline vapor to the atmosphere. Although the systems work well with respect to minimizing venting to the atmosphere, the tank systems build up positive pressures prior to returning vapors into the delivery tanker. This accumulation in pressure can result in subsurface releases of vapors if leaks in tank-top features are present.

DES confirmed the presence of Stage I hardware releases by collecting data at sites with soil vacuum extraction (SVE) systems with extraction points installed in or near tank-system gravel packs. A rise in influent concentrations was observed at several of these stations shortly after delivery. Observed PID readings and SVE flow rates were used to estimate that about 0.9 pounds of total mass of VOCs was released during one of the deliveries.

Based on DES's data, Stage I vapor releases are limited to releases during deliveries and from vapor growth (pressure that results from vapor recovery system air ingestion). The combination of lower post-MtBE ether concentrations as well as the lower volatility and higher groundwater standards for other ethers (TAME, ETBE, and DIPE), limits the post-MtBE transition vapor-release

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■ Aftermath of MtBE from page 21

threat to groundwater from stations solely equipped with Stage I vapor-recovery equipment.

DES reviewed the pressure data for the 13 gas stations and found that the Stage II vapor recovery systems routinely resulted in positive pressures in tanks. Although most systems operated at positive pressures, in some cases we encountered negative pressures. Negative pressures occur because of reductions in air to liquid ratios (A/L) over time due to blocked vapor-return lines or reductions in vacuum-pump efficiencies.

DES also evaluated available data on the potential for releases from Stage II systems. Statistically higher levels of MtBE groundwater contamination were observed at stations with vacuum-assisted vapor recovery. (See *LUSTLine* #47, "Tracking Troubling Vapor Releases in New Hampshire"). Vacuum-assisted vapor recovery is more likely to pressurize tanks because these systems typically operate at $A/L > 1$; the persistent positive pressures in tanks with a Stage II system operating at $A/L > 1$ result in larger releases than at a station equipped solely with Stage I hardware.

Finally, DES evaluated the extent of vapor leaks present at operating facilities. We inspected 21 operating service stations that were currently in compliance with UST program rules. We detected, on average, four leaks per station. Dry breaks, ATGs, threaded fittings, and gaskets were the most common source of leaks detected.

A Closer Look

DES decided to conduct additional research into vapor releases, based on our findings that conditions are present for vapor releases to be frequently present at active gas stations. The research effort was led by the University of New Hampshire, in partnership with DES and a large independent oil company. (Note: API and U.S. EPA also provided very valuable funding and technical assistance.) As part of this research, seven active gas stations were instrumented, and data was collected for nearly one year. The data collection included continuous monitoring of

tank temperatures, groundwater levels, tank internal pressure, and atmospheric pressure. We also conducted weekly monitoring of soil gas and groundwater quality in the monitoring well closest to the tanks.

The seven stations were divided into four categories:

- One control site
- Three stations where vapor leaks were addressed by a variety of inspection and repair programs
- One station with a low-cost SVE system and an extraction point in the gravel pack
- Two stations equipped with hardware to reduce tank system pressures (a Healy ORVR compatible nozzle system and a VST pressure management system similar to ones also produced by ARID and OPW).

No other changes were made to the operations of the stations. Data are still being collected, and the following results and findings may be modified over time as the data are fully analyzed.

Preliminary Findings

Four of the sites employed varying approaches to inspecting tanks and repairing leaks. The efficacy of these approaches was examined by reviewing: the continuous UST-pressure-monitoring data for new leaks, the soil-gas data, and groundwater-monitoring trend data. The pressure-monitoring data indicated that the leak repairs significantly increased internal UST pressures; however, there was no evidence that all of the existing leaks were located and/or successfully repaired.

If all leaks had been repaired, the USTs should have routinely reached pressures sufficient to crack the pressure-relief valve on the tanks. This was never observed and is consistent with the experience of Praxair and California on the need for tracers and other advanced leak-detection technologies to locate all leaks, so they can be repaired in a way that makes a tank system truly tight.

The second observed phenomenon was that new leaks occurred frequently—on the order of a new leak every two months. The new leaks were easily observable because the

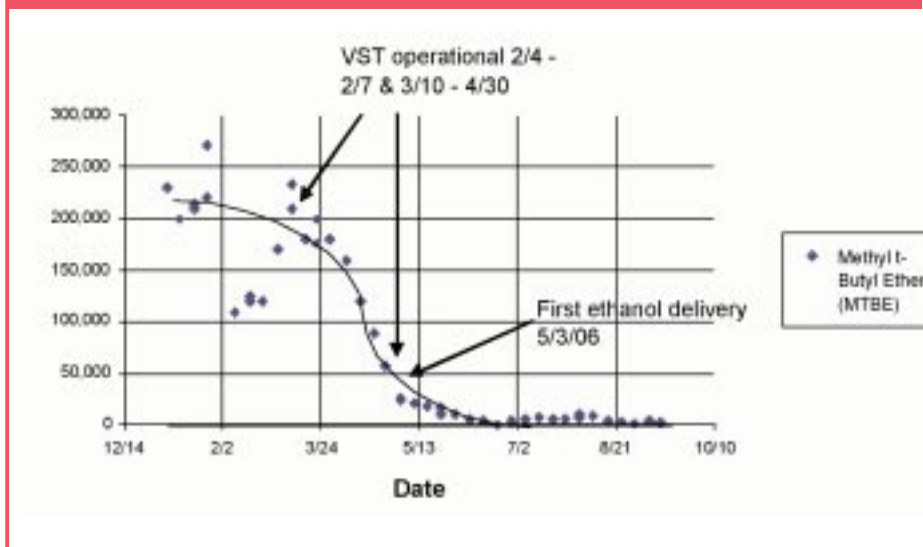
operating pressures in the tanks dropped rapidly. The new leaks frequently occurred after deliveries of product to the tanks. These data suggest that components that are physically manipulated during deliveries (e.g., dry breaks and fill caps) are the source of a significant number of leaks encountered. Dry breaks, in particular, are subject to intermittent leaks because sand and grit can prevent them from sealing properly. Once the material is dislodged, the dry break can seat properly.

During the experiment, soil-gas concentrations were collected during a pressure-decay test at one station. Elevated soil-gas contaminant levels were observed. Significant leaks were present at the station, and an entire cylinder of high-pressure nitrogen was used during the testing (over 1,000 gallons of volume at standard temperature and pressure). Based on our observations, the testing may have temporarily increased the leakage rate due to the high pressures used.

Groundwater quality and soil-gas contamination levels did not appear to improve significantly at any of the sites undergoing inspection and repair efforts. The repairs were probably not sufficient to significantly reduce the total mass of MtBE released as vapors. Although the pressures significantly increased in the tank systems, the combination of frequent reoccurrence of releases and the shift of releases from a few larger leaks to many smaller leaks likely occurred as pressures increased.

Since no significant release of excess pressure via the tank system vent was observed, conservation of mass supports the explanation that the overall subsurface vapor-release rate probably did not change much even though significant effort was expended on conventional inspection, pressure decay testing, and repair efforts.

The two pressure management sites behaved much differently than the inspection and repair sites. The Healy ORVR compatible nozzle reduces pressures by blocking vapor recovery from newer ORVR-equipped cars. This effectively reduces the overall effective $A/L < 1$ and results in negative pressures in the tank system. The negative pressures eliminate the driving forces for leaks. The

FIGURE 1 MtBE Contamination in Groundwater vs. Time

VST system reduces pressures by separating the UST vapors into air and gasoline components and then returning the gasoline to the tanks and exhausting the air to the atmosphere. The VST operates between pressure set points.

Both of these technologies immediately reduced tank system pressures and subsurface soil-gas concentrations. Over time, groundwater contaminant levels were reduced markedly. (See Figure 1.) Operationally, the Healy nozzle had a significant advantage when new leaks occurred: the leaks resulted in lower *negative* pressures and therefore soil-gas contaminant concentrations were not observed to rise when new leaks occurred.

Stay Vigilant!

Traditional inspection and repair programs did not successfully eliminate subsurface vapor releases because they did not detect all of the leaks and/or the leaks reoccurred too frequently. Pressure-management strategies (there are several technologies available) successfully addressed vapor releases.

Results available to date indicate that vapor leaks are difficult to eliminate in traditional Stage II tank systems without major program and hardware changes. As a result, problems will occur with gasoline constituents, such as MtBE, that are relatively volatile, poorly biodegradable, and very mobile.

Vapor releases may not be nearly as significant an issue, however,

when gasoline does not contain poorly biodegradable oxygenates (e.g., MtBE, TAME, EtBE, and TBA). Reduction in the total ether levels in gasoline will definitely have a salutary impact on groundwater plume strength vis à vis vapor releases. The optimist in me says take joy in the downward MtBE trends. The pes-

simist in me says that EtBE levels in gasoline can rise when events such as Katrina result in higher European imports. In truth, new troublesome additives could well be added to gasoline in the future. We must stay vigilant.

It would be very useful for policy/program development to compile existing data from states that have transitioned away from MtBE to evaluate the magnitude of the vapor-release issue in a post-MtBE environment. It would also be valuable to track gasoline composition over time so that states can interpret new contamination trends faster and more reliably. In any case, the data strongly indicate the need for careful review of the environmental properties of new gasoline additives prior to addition to the nation's gasoline supply, since in spite of our best efforts, leaks still do occur. ■

Gary Lynn is the Petroleum Remediation Section Manager of the New Hampshire DES. He can be reached at glynn@des.state.nh.us.

Sources of Publicly Available Fuel-Composition Data

On the nationwide level, there are few sources of publicly available fuel composition data. To meet requirements of the Clean Air Act (1990), U.S. EPA compiles industry-supplied survey results from reformulated gasoline areas and posts them to its website (<http://www.epa.gov/otaq/regs/fuels/rfg/properf/rfgperf.htm>). These data reflect requirements of the Act and report on benzene, aromatics, oxygen, oxygenates, and other parameters relevant to emissions. Data for conventional gasoline production and importation are also compiled and summarized. These data are not directly related to a state or specific location.

Industry collects data through a voluntary consortium currently managed by Northrup-Grumman in Bartlesville, Oklahoma (<http://pps.ms.northropgrumman.com/default.htm>). This data set dates back to the 1930s, but the number of samples, cities included, and measured parameters changes from time to time. Reports are available for sampling of gasoline (twice a year), diesel, jet fuels, and heating oils. The reports contain regional and state summaries of samples and include data for benzene, ethers, alcohols, and others.

The U.S. EPA Office of Research and Development samples gasoline from around the United States and analyzes for 300-plus chemical constituents. These data are drawn from fewer locations but include more detail than the other sources. (<http://www.epa.gov/athens/research/regsupport/gasoline.html>). ■

Field Notes

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

UST Industry Trends that Will Shape 2007 and Beyond

*I*t's cold outside across half the nation, but the spring thaw is right around the corner. To some, that means getting ready to play more golf or perhaps to replant the garden. To others, particularly those that either own, install and/or regulate underground tanks, that means thinking about installing and upgrading some more tanks systems. Since I can't break 100 and I only have bushes and trees around the house, I have no thoughts whatsoever to share with you on those first two subjects. So what you'll get instead are some fearless prognostications about the UST industry around the country.

Prediction #1: The vast majority of the states will select the secondary-containment option over the financial responsibility for manufacturers and installers alternative to comply with the Energy Act of 2005. As of this writing, we have heard from two states that will definitely go the financial responsibility route and about 30 that will opt for secondary containment. There are about a dozen states that we don't hear from on a regular basis, but I figure we would hear from them if they were considering FR for manufacturers/installers. That leaves six states that still seem to be wrestling with the decision. The regulators from those half dozen states are leaning toward the prevention option (i.e., secondary containment), but are feeling heavy pressure from tank owners to require the FR alternative. I'd wager that five of those six will go secondary containment, leaving three states with FR for the installers and manufacturers.

Prediction #2: The "mom-and-pop" station owners are back. The large integrated oil companies with complete departments staffed with lots of people whose sole responsibility is to figure out the UST rules and regulations, provide facts and figures on options, and make sure the company's environmental compliance stays on track will be a thing of the past. Consider these recent announcements:

- ConocoPhillips will soon divest all of its 830 company-owned retail outlets in the United States, which include its company-operated retail and dealer-operated sites.
- Shell is transitioning to a branded-wholesale strategy in all but nine core markets in the United States. We expect Shell to sell all its stations in Alaska, Dallas, Hawaii, Houston, Kansas City, New Orleans, Philadelphia/South New Jersey, Portland, and Sacramento in 2007.
- Other major oil companies have gone on record saying that they will continue to "reevaluate" their marketing strategy and "redeploy" their assets to provide maximum return to their shareholders.

The trend lately is that dealers, jobbers, and convenience store giants get first crack at picking up these stations. They tend to purchase the top locations and leave the second- and third-tier sites to individuals with \$100,000 to \$600,000 to spend on a convenience store offering gasoline and diesel. The new mom-and-pop businesspeople will run these marginally viable stations the best way they can but will not necessarily be in the

retail marketing and UST regulatory loop. Some will not speak English as a first language. Explaining new rules and regulations to these tank owners will be an increasing challenge for tank regulators and inspectors.

Prediction #3: Getting additional initiatives, rules, and regulations passed will become more difficult because of the changing nature of the retail-petroleum tank owner (see Prediction #2). Individuals who have one or two stations already own more than 60 percent of all convenience stores in the United States, and that percentage is going up annually.

For the most part, these stations have 1998-compliant tank systems. A great many tank owners, back then, invested in state-of-the-art systems that had all of the bells and whistles lots of money could buy. Of course we all know that there were a few others that spent the bare minimum to upgrade their systems—but to them, that was a lot of money as well. To require more money to be spent to upgrade "perfectly good systems" will meet with a lot of opposition, with mom-and-pop tank owners complaining that any additional "upgrade" expenditures will drive them out of business—and they probably aren't blowing smoke.

Prediction #4: The drive to increase the number of stations offering motor fuel with ethanol concentrations greater than 15 percent will stall in 2007 and the beginning of 2008. So will the introduction of any new and different blend of gasoline or diesel. The driving reason for this is the decision by Underwriters Laboratories (UL) to suspend the use of its mark on components for fuel-dispensing devices that specifically reference compatibility with alcohol-blended fuels that contain greater than 15 percent alcohol.

UL was prompted to take this action because research indicated that high concentrations of ethanol or other alcohols in blended fuels makes these fuels significantly more corrosive. UL believes that this may cause the fuel to chemically attack the materials used in fuel-dispensing components and cause them to fail. So, until we have regulatory officials and end-users out there who can be assured that their dispensers can hold E85 and other alcohol-based fuels without leaking, we will see nowhere near the percentage increase in E85 installations that we have since passage of the Energy Act of 2005.

Prediction #5: Although we will not see the same steady increase in stations dispensing E85 for a while (see

Field Notes continued

Prediction #4), that does not mean other factors aimed at increasing ethanol availability will not be at work. For example, there will be just about twice as many tanks storing ethanol at the distillery in 2007 because the amount of capacity currently under construction in the U.S. is roughly equal to the amount of capacity already in operation. And Congress will be proposing—and in my crystal ball, passing—new biofuels legislation in 2007. Signaling the aggressive push in the Senate for biofuels, a bipartisan

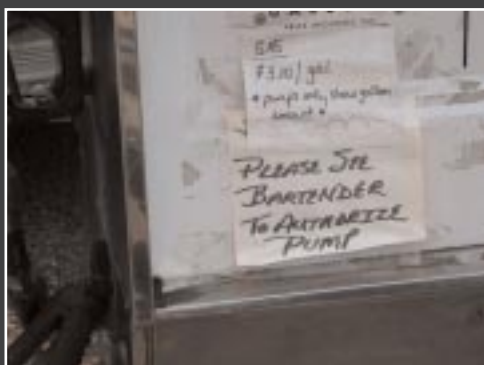
group introduced a bill on the first day of the 100th Congress to ramp up ethanol use in gasoline and to promote E85. The bill proposes a new renewable fuels standard that calls for 60 billion gallons of ethanol and biodiesel use in motor fuels by 2030. The bill would also require large oil companies still in the marketing business (see Prediction #1) to install E85 pumps at their stations, increasing by five percentage points annually over the next 10 years. ■

SNAPSHOTS FROM THE FIELD

A FORMER UST INSPECTOR'S PICTURE-PERFECT VACATION

Ben Thomas, formerly with the Alaska UST program, and now with Ben Thomas Associates in Washington State, took a trip last summer along the highways and byways of some state (that will remain nameless) out there in the Northwest of the U.S. of A. He shares his photo memories with us along with some insightful captions.

Does this facility ►
need employee UST
training or is a mixology
degree sufficient?



This cleverly placed nylon sleeve will guarantee that direct burial steel product pipe with never, ever, ever come in contact with earth and will, therefore, never, ever, ever rust. ▼



▲ Note the beautiful grain on this craftsman-style, custom-built plywood sump lid. Also note its water-tight seal to the sump walls.



◀ This installation contractor must have run out of concrete while pouring the form for this custom-made sump. Or was this intentional so the square lid would fit over the round sump?



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 NEIWPC.

FAQs from the NWGLDE

... All you ever wanted to know about leak detection, but were afraid to ask.

Leak-Detection Equipment and Alternative Fuels (e.g., E85 and Biodiesel Blends)

In this issue's FAQs from the National Work Group on Leak Detection Evaluations (NWGLDE), the Work Group discusses the effects that alternative fuels may have on leak-detection equipment performance and what we can infer from third-party evaluations. (Please Note: the views expressed in this column represent those of the work group and not necessarily those of any implementing agency.)

Q. Is leak-detection equipment compatible with alternative fuels?

A. Third-party evaluations are a useful tool to verify leak-detection equipment performance, but evaluation protocols do not require testing for long-term compatibility with any stored product. Because of this, the NWGLDE makes no representations as to the compatibility of leak-detection equipment with the product stored. (See "Disclaimer" at nwglde.org/disclaimer.) UST owners and regulators may wish to request supplemental test data from the manufacturers to determine long-term material compatibility. Refer to LUSTLine #52 (May 2006) for more information on materials compatibility with alternative fuels.

Q. Does the appearance of leak-detection equipment on the NWGLDE list mean that it will perform adequately with alternative fuels?

A. EPA Standard Protocols state that "Any commercial petroleum product of grade 2 or lighter may be used for testing... The choice of product is up to the evaluating organization." The majority of equipment on the NWGLDE list (other than sensors) was evaluated using diesel fuel, which is readily available and easier to work with than gasoline or ethanol-blend fuels. The "Applicability" sections in the NWGLDE listings include several other stored products that were not used in the evaluation but that the third-party evaluator and vendor claimed were acceptable for use with the equipment. The absence of a specific product does not necessarily mean that the equipment cannot perform adequately with that product. As stated in most "Applicability" sections, "Other liquids may be tested after consultation with the manufacturer."

There is leak-detection equipment currently listed by the NWGLDE that will not perform adequately with alternative fuels. Specifically, automatic tank gauges with capacitance probes will not work when used with ethanol fuels. In other cases, physical properties of alternative fuels that differ significantly from conventional gasoline or diesel may lead to degraded performance of certain leak-detection equipment. For example, test methods that rely

on the detection of water at the tank bottom may be less effective in ethanol blends, where water will homogenize with the stored product rather than settle into a separate layer. Some leak-detection equipment, such as simple float-based interstitial liquid sensors, should perform well with any product sufficiently dense to raise the float mechanism. In cases where the performance of a leak-detection method in alternative fuels is in question, it may be appropriate to request that the manufacturer supply supplemental test data to verify performance with the specific product that will be monitored.

NWGLDE listings provide a summary of third-party evaluation results and important information contained in the equipment manufacturer's installation and operating manuals. The NWGLDE list is a tool that can be used to better understand the capabilities and limitations of leak-detection equipment, but it is ultimately up to the regulatory agency to decide whether or not specific leak-detection equipment can be used within their jurisdiction.

About NWGLDE

The NWGLDE is an independent work group comprising 10 members including 9 state and 1 U.S. EPA members. This column provides answers to frequently asked questions (FAQs) the NWGLDE receives from regulators and people in the industry on leak detection. If you have questions for the group, please contact them at questions@nwglde.org.

NWGLDE's mission:

- Review leak-detection system evaluations to determine if each evaluation was performed in accordance with an acceptable leak-detection test method protocol and ensure that the leak-detection system meets U.S. EPA and/or other applicable regulatory performance standards.
- Review only draft and final leak-detection test method protocols submitted to the work group by a peer review committee to ensure they meet equivalency standards stated in the U.S. EPA standard test procedures.
- Make the results of such reviews available to interested parties.

■ Biodiesel from page 16

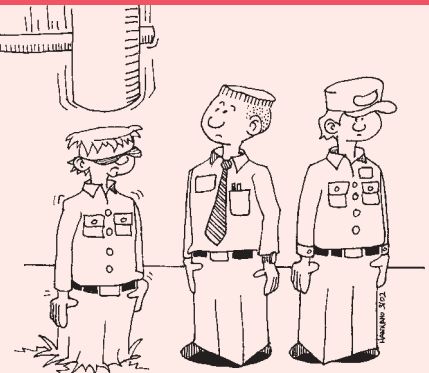
combined sales of B20 from the three stations average less than 3,000 gallons per month. If each installation cost \$50,000, and they make an average of 15 cents per gallon on 1,000 gallons per month, it will take 333 months (27 years, 9 months) to recoup his investment. How many "green" customers are willing to pay the cost differential for B20, if petroleum diesel is selling for 20 to 25 cents less per gallon? How do you create demand for a product that is more expensive than the alternative? Are subsidies and tax incentives the answer? ■

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Of Square Pegs and Round Tanks

A LUSTLine Story Worth Revisiting



Sometimes a story is just a bit ahead of its time, which is the case with Marcel Moreau's Tank-nically Speaking article "Of Square Pegs and Round Tanks or...What If Tank Operators Knew How to Operate Tanks?" published in *LUSTLine* #40, March 2002. This short article is very relevant to today's discussion of the mandatory operator training provision of the 2005 Energy Policy Act. For this reason, we have posted on the NEIWPCC website at www.neiwpcc.org. Check it out.

Updated List of Known UST Insurance Providers Available

The EPA Office of Underground Storage Tanks (OUST) *List of Known Insurance Providers for Underground Storage Tank Owners and Operators* has been updated and is available on the OUST website at <http://www.epa.gov/oust/pubs/inslist.htm>. The list supplies UST owners and operators with information on insurance providers that may be able to help them comply with financial responsibility requirements. This edition replaces all earlier editions. ■



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EPA Consent Agreement with Baltimore Company Covers 32 Maryland Facilities

In a consent agreement with U.S. EPA, the Carroll Independent Fuel Company has agreed to pay a \$284,156 civil penalty and complete a special environmental project to settle an EPA complaint involving USTs at 32 of its facilities in Maryland. EPA cited Carroll for a variety of UST violations, including failure to perform release detection, test the operation of the line-leak detectors annually, meet the new UST system performance standards for spill and overfill prevention, provide corrosion protection on the metal piping, investigate a suspected release, report a suspected release, and perform line tightness testing.

These alleged violations were documented through multifacility UST compliance audit reports submitted to EPA by Carroll's auditor after Carroll entered into a consent agreement and final order in June 30, 2003, to perform a compliance audit of its facilities.

"This has been a win-win situation because Carroll Independent Fuel Co. recognized that shortcomings existed within its system and

EPA Enforcement Actions

volunteered to perform a self-audit at its 70 facilities," said Donald S. Welsh, regional administrator for EPA's mid-Atlantic region.

As part of the settlement, Carroll Independent Fuel Co. has neither admitted nor denied liability for these violations. Carroll has also agreed to implement a \$447,000 supplemental environmental project, to be determined, that is intended to secure significant environmental or public health protections.

EPA Fines Euclid of Virginia, Inc. \$3.1 Million for UST Violations in Three States

A U.S. EPA Administrative Law Judge assessed a \$3.1 million penalty against Euclid of Virginia, Inc. for not taking required measures to detect and prevent leaks from USTs at 23 gas stations in Maryland, Virginia, and the District of Columbia. In a 118-page decision, Judge Carl C. Charneski imposed the largest penalty ever assessed by an EPA Administrative Law Judge for violations of any federal environmental statute. The judge ruled that Euclid failed to maintain required

leak-detection and control equipment and perform required leak-detection activities for 72 UST systems at 23 gas stations.

The judge found that, for certain facilities, Euclid failed to comply with corrosion-prevention standards, and to install or maintain equipment to prevent releases of gasoline due to the overfilling of tanks or other spills when tanks are being filled. The judge also ruled that Euclid did not maintain required financial assurances to respond and clean up potential fuel leaks or spills for its facilities in the District of Columbia.

The size of the penalty was due in part to the number of facilities and storage tanks and the extended period of violations. In addition, the penalty was justified by what the judge referred to as Euclid's "high degree of negligence" in allowing violations to continue despite numerous warnings.

Although the case was prosecuted by EPA, it was the result of close cooperation with the Maryland Department of the Environment, the Virginia Department of Environmental Quality, and the District of Columbia Department of the Environment. The full text of the decision is available at <http://www.epa.gov/oalj/orders/euclidof-va-id-110906.pdf>.

UTTU PUBLISHES FINAL ISSUE

Readers of the *Underground Tank Technology Update Newsletter* (UTTU) received word from Phil O'Leary, UTTU Project Director, that the publication would cease after the November/December 2006 issue. The University of Wisconsin-Madison and the U.S. EPA initiated UTTU in 1987 as a service to federal, state, and local officials and to others working in the soil, groundwater, and storage tank fields to help keep them current with the latest LUST remediation information and technologies. Over the 20-year period, the staff produced 120 issues in 20 volumes.

The UTTU website, <http://uttu.engr.wisc.edu>, contains pdf versions of all issues from 1998 to the present. The University will maintain the UTTU website for four years, through December of 2010.

Contributors to UTTU are invited to contact Ellen Frye, *LUSTLine* editor, at ellen.enosis@gmail.com if they have articles to propose for submittal to *LUSTLine*. We will do our best to help with filling the void left by the absence of UTTU.

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