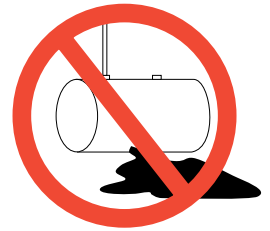


# L.U.S.T.LINE

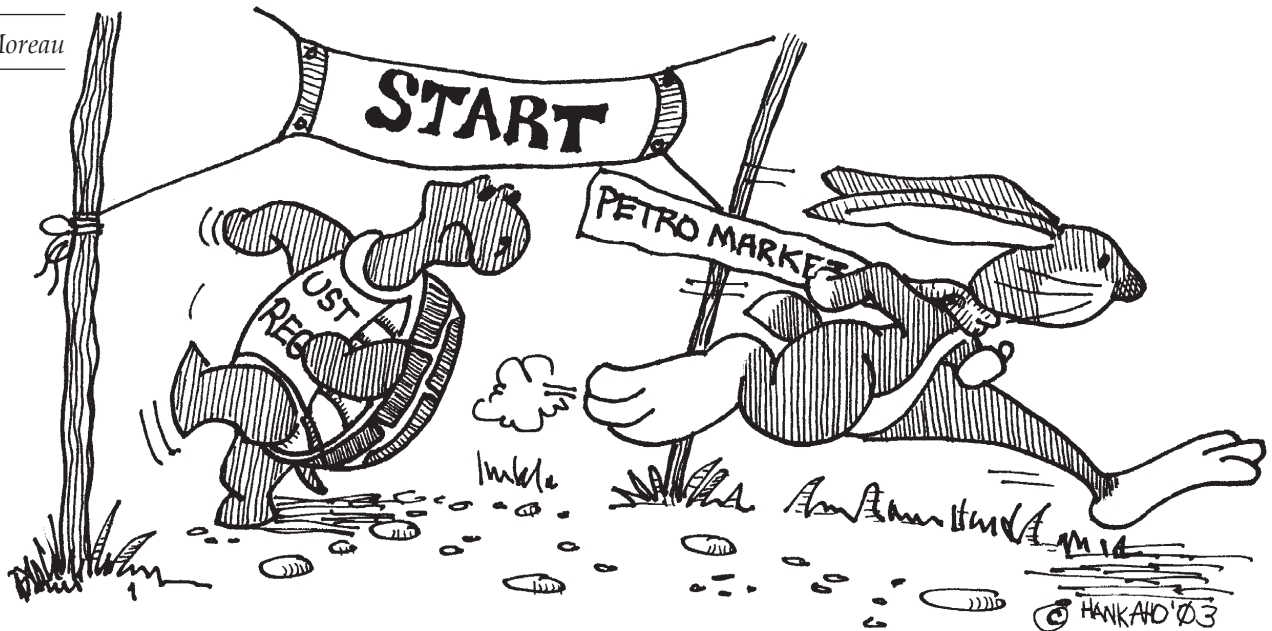
A Report On Federal & State Programs To Control Leaking Underground Storage Tanks



## THE TORTOISE AND THE HARE REVISITED

### Reaching the Goal Effectively and Efficiently: The Path Not Yet Taken

by Marcel Moreau



**W**e all know Aesop's fable of the boastful hare and the slow but persistent tortoise. We all know who wins the race and why. For the purposes of this article, I've recast the story and given the characters a more challenging and important goal than simply winning a race. I've morphed the hare into the petroleum marketing industry and the tortoise into the national UST regulatory program. Their goal is to protect human health and the environment, which is defined as reducing the number of petroleum releases from USTs to the absolute minimum. And I've made the story more politically correct by having the tortoise and the hare be part of the same team, struggling to reach the same goal. At issue in this story is how our players go about reaching their goal—how to keep the team members evenly matched so that they can more effectively and efficiently run the race.

■ continued on page 2

### Inside

- 6 Keeping the Tortoise in Shape
- 8 People and UST Systems
- 11 Overpressurization Problem Baffles Tank Owner
- 12 An Overview of MTBE and Other Oxygenates in Fuel
- 17 Do We Need to Worry About MTBE Acid Hydrolysis?
- 22 A Summary of the ASTSWMO Fuel Oxygenate Symposium
- 25 When RBCA is not RBCA
- 28 Q & A: Pay for Performance
- 29 Tank Systems in a Jam
- 31 UST-Related Explosions in Kentucky and Pennsylvania
- 32 Building a Better Internet Presence
- 34 EPA HQ Update
- 35 Should LUSTLine Go Electronic?

## ■ Tortoise and Hare from page 1

### The Hare

One of my favorite stories regarding service station construction is in a 1981 American Petroleum Institute publication titled *The Origin and Evolution of Gasoline Marketing*. The story tells how Shell Oil expanded in California in the early 1920s:

E.H. Sanders, who was assistant division manager of the Central division at the time, loves to tell how they invaded the San Jose-to-Santa Barbara territory, building eight depots (bulk plants) and a hundred service stations all in a matter of six weeks. Sanders and Claude Donaldson, the Central division's traffic manager, first rode the 260-mile stretch of road between the two towns and picked likely sites for depots and stations. They were followed closely by real estate men who, to save time and expense, leased rather than bought most of the desired sites. Then came the construction crews in

relays. First, crews to dig holes in the proposed service station lots and bury the underground storage tanks the station would need. Next, crews to pour the concrete foundation for the station, leaving bolt studs sticking out of the concrete. Meanwhile the crates containing the complete "A" station would be delivered. As soon as the concrete had hardened, a crew arrived to install the pumps and bolt the station in place, anchoring it to the foundation by means of the stud bolts protruding from the concrete. Then came the paint crew to apply a coat of red and yellow, and the station, once its storage tanks had been filled from the new depot, was in business "about ten days from start to finish."

This orgy of station construction would continue until World War II. In fact, 1939 was the peak year for the number of retail gasoline outlets in the country, when some 400,000 retail outlets were active. The downside of this huge number of facilities was that the average facility was pumping about 40,000 gallons of gasoline per year. By comparison, *National Petroleum News* recently estimated that there were 170,678 retail outlets active in the first quarter of 2002, with the average convenience store selling 1.3 million gallons per year. (Convenience stores represent 73 percent of the retail outlets in the U.S.)

Gasoline marketing continues to be a dynamic industry marked by rapid and continual change. The 1950s saw another construction boom that lasted through the 1960s, only to come to an abrupt halt with the oil embargoes and gasoline allocation and price controls of the 1970s. The 1970s also saw the introduction of unleaded fuel and the rise of self-service fueling. The 1980s saw the transition from the traditional service station, which offered vehicle maintenance and repair, to the convenience store model, which features cigarettes, soda, beer, and snacks along with the fuel.

The 1980s also saw the introduction of federal regulation of underground storage systems, although most of the tank upgrade and replacement activity took place in the 1990s, except for the major oil companies, which got started earlier. The 1990s also saw increasingly high-vol-

ume gasoline retailing facilities, culminating in the addition of gasoline to the products offered by "Big Box" retailers, such as Wal Mart. The late 1990s also saw the consolidation of major oil companies and a continued decline in the total number of retail gasoline outlets.

While the pace of change in petroleum marketing is generally rapid, underground storage technology evolves much more slowly. This is easy to understand because petroleum marketing has always been an extremely cost- and customer-conscious industry, and not many customers buy fuel based on the type of storage system a facility has installed.

There have been three major generations of UST systems in the U.S.:

#### ■ First generation: 1910–1985

These storage systems consist of steel tanks with galvanized steel pipe and a suction pump (first manual, then electric) to deliver fuel. The bare-steel tank reigned at petroleum retailing facilities virtually unchanged for 70 years, except for size and the change from riveted to welded construction. Galvanized piping had a similarly long life.

#### ■ Second generation: 1965–Present

These storage systems consist of fiberglass and corrosion-protected steel tanks with fiberglass pipe and submersible pumps. Though fiberglass and factory-engineered corrosion-protected steel tanks have been available since 1965 and 1969, respectively, their market penetration was relatively small until the federal interim prohibition, in effect, forbade the installation of bare-steel tanks after May 1985.

#### ■ Third generation: 1985–Present

The latest system feature is double-walled, corrosion-resistant tanks and double-walled piping (especially flexible pipe after 1990) with containment sumps and submersible pumps. Though double-walled tanks were developed in Europe in the mid 1960s, the technology was slow to cross the Atlantic because of cost.

The dates I cite are approximate, and both second- and third-generation systems are in common use today. Second-generation storage systems, which represent technology



### LUSTLine

Ellen Frye, *Editor*  
Ricki Pappo, *Layout*  
Marcel Moreau, *Technical Advisor*  
Patricia Ellis, Ph.D., *Technical Advisor*  
Ronald Poltak, *NEIWPCC Executive Director*  
Lynn DePont, *EPA Project Officer*

LUSTLine is a product of the New England Interstate Water Pollution Control Commission (NEIWPCC). It is produced through a cooperative agreement (#CT825782-01-0) between NEIWPCC and the U.S. Environmental Protection Agency.

LUSTLine is issued as a communication service for the Subtitle I RCRA Hazardous & Solid Waste Amendments rule promulgation process.

LUSTLine is produced to promote information exchange on UST/LUST issues. The opinions and information stated herein are those of the authors and do not necessarily reflect the opinions of NEIWPCC.

This publication may be copied. Please give credit to NEIWPCC.

NEIWPCC was established by an Act of Congress in 1947 and remains the oldest agency in the Northeast United States concerned with coordination of the multimedia environmental activities of the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont.

#### NEIWPCC

Boott Mills South, 100 Foot of John Street  
Lowell, MA 01852-1124  
Telephone: (978) 323-7929  
Fax: (978) 323-7919  
lustline@neiwpcc.org

 LUSTLine is printed on Recycled Paper

that is over 30 years old, are accepted by the federal rules, even for today's installations.

### The Tortoise

Storage system regulation is the tortoise in our fable. Environmentally based rules regarding underground storage began at local levels in the late '70s but rose rapidly to the federal level with the signing of the Subtitle I RCRA amendments, establishing a federal underground storage system regulatory program in November 1984. This resulted, after a four-year gestation period, in the promulgation of the federal tank regulations, which in turn established a 10-year program for upgrading the nation's storage systems.

While the introduction and signing of the 1984 RCRA amendment into law happened with lightning speed, the development of the regulations was deliberately slow in an attempt to create a defensible and workable rule. Since publication on September 23, 1988, the rules have remained remarkably stable. Except for a small change to the overfill prevention portion of the regulations in 1991, the federal UST rules have not moved a whisker. This came home to me as I reached for my taped-together, dog-eared copy of the Federal Register and realized that this 14-year old document is still perfectly viable as a reference for technical standards for UST systems today. Is this a good thing?

### The Revisit

Consistency has many proponents. "Slow and steady wins the race" is our tortoise's motto. Consistency is touted as a fundamental quality of good parenting. Consistency is important in the workplace so that workers and customers know what to expect. There is something to be said for consistency in regulations, for much the same reason as in parenting and in business. But consistency has its limits. The parenting techniques appropriate for a toddler will not work on a teenager. A company that has consistent policies but is consistently losing money would be wise to assess whether consistency with outmoded policies was contributing to the red ink. A carved-in-stone regulatory program that is operating in a fluid marketplace may

find that its effectiveness is eroding.

When the original tank rules were written, the focus was on updating existing UST technology. This was clearly appropriate because the dominant technologies for tanks and piping in use at the time were hopelessly outmoded. In recent years, however, the light has dawned on many in the UST world that technological issues must now take a back seat to operational issues.

It has slowly been recognized that the best of hardware will not function well unless, as Ray Powers of the Pennsylvania Department of Environmental Protection recently stated in an e-mail, it is installed properly, programmed correctly, well maintained, and effectively responded to when an alarm is triggered.

We have upgraded our hardware, but this has not entirely solved the problem because the rules did not look comprehensively at what would happen after the new hardware was installed. By and large, the rules placed the burden of defining the maintenance needs of leak-detection equipment on the equipment manufacturers themselves by requiring that equipment be maintained according to the manufacturers' specifications. Equipment manufacturers have tended to shy away from this responsibility, preferring to imply, if not overtly state, that their equipment is "maintenance free." With few exceptions (e.g., the annual testing of line-leak detectors and the triennial monitoring of CP systems), the original rules adopted the "bury it and forget it" attitude that was a substantial contributor to the UST problem in the first place.

While some technology-based issues are clearly still with us today, the weak link in today's strategy for protecting human health and the environment from leaking underground storage systems seems to be a human one (e.g., ignoring equipment maintenance and the burying of heads in the sand when leak-detection equipment alarms sound). But while the issues have evolved, the regulatory strategy for dealing with the issues has remained solidly chiseled in stone.

### A Strategy for the Tortoise

As a result of the different paths taken by our hare and our tortoise, it

is not at all clear to me that our tortoise is doing its share to protect human health and the environment. Here is my short list of things that could be addressed in rule revisions to help our tortoise meet the challenge:

- **Address maintenance of installed hardware.** A few states have addressed this issue by requiring annual inspections of leak-detection, and in some cases, overfill-prevention hardware. A study that I conducted for the State of Maine a few years ago documented that checking operational status of hardware is a worthwhile endeavor—it was conservatively estimated that some 29 percent of facility inspections discovered significant problems with corrosion-protection, leak-detection, spill-containment, or overfill-prevention hardware.

The Maine study also revealed that merely inspecting the hardware is not enough. It found that 39 percent of tank owners failed to address deficiencies that were pointed out to them in the inspections. The inspection requirement must be accompanied by enforcement measures with sufficient teeth to get the problems fixed. (Maine subsequently enacted regulations to deny product deliveries to tanks with problems that are not corrected.)

- **Increase scrutiny of some UST technologies.** The Iowa tank lining study some years ago indicated that interior tank lining may have a substantially greater failure rate than U.S. EPA believed in 1988. (See "Iowa's Tank Lining Study," *LUSTLine Bulletin* #30.) Perhaps the initial lining inspection should be conducted after five years rather than the ten specified in the current rule.

Anecdotal evidence indicates that many retrofitted cathodic-protection systems are also not functioning as they should. Perhaps an annual monitoring frequency, rather than every three years, would be more appropriate. Given the large number of older steel storage systems still in service, should increased attention be focussed on internal corrosion?

California is learning that a very high percentage of installed tank and dispenser sumps, elements that are

■ *continued on page 4*



## ■ Tortoise and Hare *from page 3*

critical to the functioning of secondary containment systems, are not tight. It is not clear whether this is due to initial installation problems or the subsequent "aging" of the system. Either way, some periodic evaluation of the integrity of these components would seem to be critical to the effectiveness of secondary containment.

The long-term performance of flexible piping has also recently been called into question. (See "Flexible-Pipe Concerns Drive Home the Need for Tank-Owner Vigilance," *LUSTLine* #42.) It may be time to consider new measures, such as improved performance standards for flexible-piping technology or increased vigilance over existing installations to address these concerns.

- **Plug leak loopholes.** The existing rules do not include leak detection for submersible-pump manifolds or for dispensers. Yet field experience indicates that these components can be frequent sources of release. (See "Field Notes," *LUSTLine* #41.) With the exception of secondary containment, and in some cases statistical inventory reconciliation (SIR), no other commonly used method of leak detection is effective on these components. Another loophole is that the rules never considered the possible impact of vapor leaks from UST systems. California has recently documented that this type of leak is commonplace and will soon be requiring that UST systems be vapor tight. Is this an issue that should be considered nationally?

- **Improve regulatory compliance.** Whether such an effort consists of restructuring state cleanup funds (see "Square Operators, Round Tanks, and Regulatory Hammers: A Petroleum Marketer's Perspective," *LUSTLine* #42), developing some requirements for operator certification, or some other technique, market forces that encourage compliance should be brought to bear on the tank owner. Compliance with tank regulations must be strongly and directly linked to the tank owner's bottom line if the regulations are ever to be effective. It might also be worthwhile to review the rules from a "human engineering" perspective to find

ways to simplify compliance so that reliance on fallible humans can be minimized. (See "People and UST Systems" on page 8.)

- **Tighten leak-detection standards.** The present-day rules have petrified leak-detection technology by specifying generous leak-detection standards of 0.2 gallons per hour (gph) (1,752 gallons per year). While the official interpretation of the rule is that no leak is acceptable, the de facto use of the rule is that anything less than 0.2 gph is not a leak. Most volumetric leak-detection methods available today are capable of reaching accuracies of 0.1 gph. While this is still equivalent to 876 gallons per year, it is half the 0.2 gph leak rate that is the standard today.

Test reliability could be improved by calculating the probability of detection (Pd) and probability of false alarm (Pfa) for each volumetric test conducted, which would give a much better indication of the reliability of a specific test result. The limitations of various technologies should also be evaluated and spelled out by manufacturers or regulations. For example, inventory control, automatic tank gauges, statistical inventory reconciliation, and line-leak detectors decline in effectiveness as throughput increases, but the limits of their effectiveness have not been clearly specified. With the proliferation of very high-volume retail facilities, it is important that tank owners know ahead of time which leak-detection options will work for them.

- **Revisit the spill-containment and overfill-prevention issue.** As I have described several times in *LUSTLine* (Bulletins #31, #21, #18), I do not believe that overfill prevention as it is currently practiced is safe, effective, or efficient. (See also "Field Notes" on page 11.) Surely something better can be promoted by redefining the regulatory criteria.

- **Update the rule to reflect knowledge and experience gained in the last 14 years.** Do we still really need groundwater and soil-vapor monitoring as leak-detection options? Should operating guidelines for SIR be specified? Should language regarding the 1998 deadline be changed to reflect that this date has passed? Should issues concerning the appropriate leak rate for testing line-

leak detectors be addressed? Can a sensor in a secondary-containment sump take the place of a line-leak detector? Should specific requirements be set for electronic line-leak detectors? These questions must be answered in a process that leads to an improved rule.

Rule revision is not a chore that many relish, but some states find that it is worth the effort. These states have evaluated the effectiveness of their regulations and have made adjustments accordingly numerous times. Florida's rules, originally enacted in 1984, were revised in 1992, 1994, 1996, and 1998. California's first rules went into effect in 1985. Since then, the technical rules have been modified in 1991, 1994, 1998, 2001, and 2002. Maine's first UST rules were adopted in 1986 and modified in 1987, 1990, 1991, 1996, and 2002. Why have these states made changes to their rules? (See "Keeping the Tortoise in Shape" on page 6 for their stories.)

### But If It Ain't Broke...

"But wait!" you say. "The data show that the number of new releases is dropping fast nationwide. The current rules are working just fine." (For the latest U.S. EPA data, see "Memo from Cliff Rothenstein to UST Regional Division Directors," December 23, 2002, *FY 2002 End-of-Year Activity Report*.)

OK, let's look at those statistics. (If you want to take a look, go to [www.epa.gov/oust](http://www.epa.gov/oust).) Yes, the data show a significant decline in the absolute number of new releases being reported to U.S. EPA. But you would expect that to be the case because the number of active UST systems has also decreased dramatically since 1988—from 2 million tanks in 1988 to 700,000 active USTs today. If we have truly been making progress in protecting human health and the environment, then there should be a measurable decline in the number of leak incidents *as a percentage of the remaining active UST population*.

Figure 1 is a plot of data taken from U.S. EPA semiannual reports from 1991 through 2002. Though the data are somewhat erratic, there does appear to have been a declining trend (based on the linear regression line) in the number of reported releases as

a percentage of the active facility population of from approximately 5 percent to around 2 percent. In other words, in 1991, the number of newly reported releases equaled about 5 percent of the active UST-facility population, while in 2002, the number of newly reported releases equaled about 2 percent of the active UST-facility population.

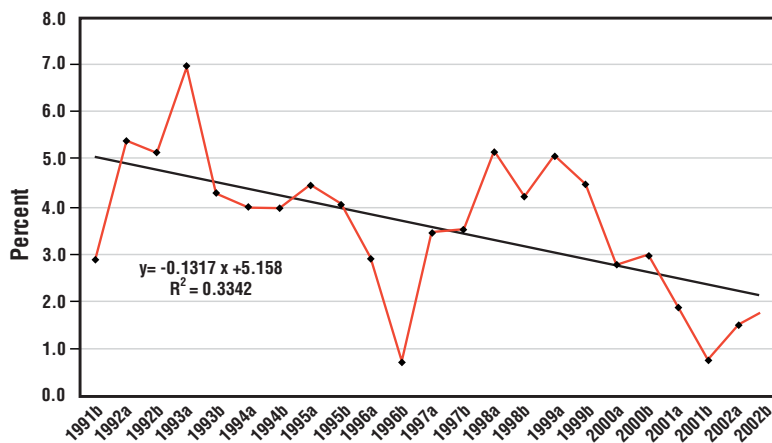
However, these data don't tell the whole story for two reasons. First, the data have a lot of scatter, and the trend is not a strong one. Second, because historically most leaks have been detected by storage system closure. Because the number of closures has been declining since 1993, the corresponding decline in reported releases may well be an artifact of the way releases are discovered rather than a true estimate of the actual rate of releases at active facilities today. (See Figure 2.) Of course, the ultimate answer would be to go out and test a random sample of the active UST population.

Though not exactly a random test because a large number of tank owners refused to participate in the study, 182 storage systems in California were tested using enhanced leak detection (a version of a Tracer test). (See the report at: [http://www.swrcb.ca.gov/cwphome/ust/docs/fbr/FBR\\_Final\\_Report.pdf](http://www.swrcb.ca.gov/cwphome/ust/docs/fbr/FBR_Final_Report.pdf).) The study found only one small liquid leak in a piping run but found that 61 percent of the systems tested had released detectable amounts of hydrocarbons along with the tracer compound via vapor releases, primarily from the top of the underground storage tank. But California is a state that requires annual inspections, and only 10 percent of the systems tested were entirely single-walled, so the leak status of California storage systems may not be representative of the national norm.

A Petroleum Equipment Institute (PEI) estimate of UST system performance, though clearly not quantitative, is considerably more pessimistic about UST-system releases. (See "Field Notes," LUSTLine #41.) The PEI members estimated that they would find a total of 47 leaking components inside 100 dispensers and 44 leaking components associated with 100 submersible pumps.

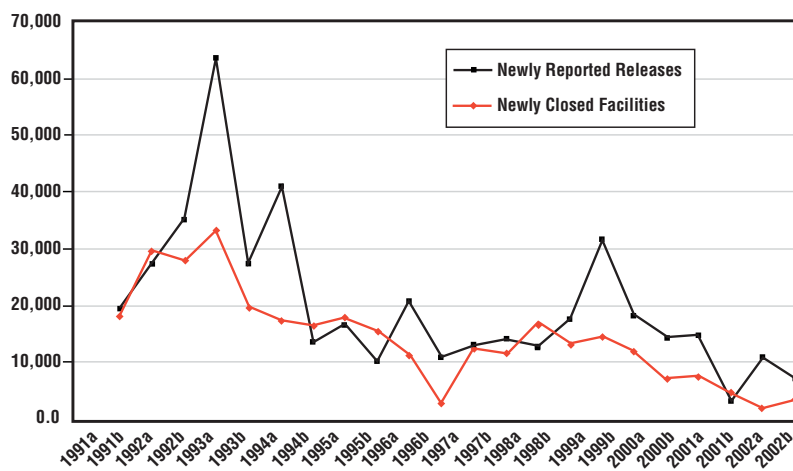
The point is we really don't know with any degree of certainty how today's UST systems are per-

**Figure 1** Trend of Newly Reported Releases Over Time



The "a" and "b" suffixes after the year indicate data points for the first and second halves of the federal fiscal year. The original EPA data indicate the number of active tanks. The active tank data were converted to a facility count by dividing by 2.86, the tank/facility ratio used in the preamble to the federal rule. The number of newly reported releases for each six-month interval was divided by the estimated number of active facilities for the same time interval and multiplied by 100 to arrive at each data point.

**Figure 2** Comparison of the Trends of Newly Closed Facilities and Newly Reported Releases Over Time



The "a" and "b" suffixes after the year indicate data points for the first and second halves of the federal fiscal year. The original EPA data indicate the number of newly closed tanks. The newly closed tank data were converted to a newly closed facility count by dividing by 2.86, the tank/facility ratio used in the preamble to the federal rule. Because most new releases are discovered via UST facility closure, the parallel trends in newly closed facilities and newly discovered releases over time may indicate that the reduction in releases discovered is more closely related to the reduction in the number of facility closures than the effectiveness of the UST program in reducing leaks.

forming. Without reliable data on the number of actively leaking UST systems and the nature of the leaks, we cannot know how far from the finish line our hare and tortoise presently are. Perhaps another area for rule revision is to put in place a mechanism that will generate the data we need to chart the team's progress.

Consistency has much to recommend it. But in a world where the only constant is change, consistency must not be confused with paralysis. Businesses must evolve to survive. Is this not true for regulations as well? I believe that regulations should con-

sistently adapt to the changing circumstances, knowledge, and experiences encountered on the path to achieving the regulatory goal. The tortoise, after all, did not win the race by standing still. ■

*Marcel Moreau is a nationally recognized petroleum storage specialist whose column, "Tank-nically Speaking," is a regular feature of LUSTLine. Marcel would welcome some interactive dialogue on "The Tortoise and the Hare Revisited." He can be reached at [marcel.moreau@juno.com](mailto:marcel.moreau@juno.com).*