5 Reasons Fuel-Site Water Intrusion Is Increasing

3 Ways Retailers Can Keep It From Happening

by Ed Kammerer

According to the U.S. Geological Survey, 71% of the Earth's surface is covered by water. The mission of fuel retailers is ensuring that not a single drop of that water invades the underground storage tank (UST) systems that they use to store and dispense their motor fuels (and of course, keep a single drop of fuel from entering the water on the earth…).

That is a daunting task and, quite frankly, easier said than done. That is because of water's insidiousness, or its ability to find its way into any crack, crevice or deformation in a fueling system and take up residence in the motor fuel, where it can cause—if it reaches a high enough percentage—irreparable damage. This creates a double-edged cost sword that hangs over the head of retailers: the cost of potential damage to vehicle fueling systems and retailer reputation if water-fouled fuel is dispensed, coupled with the cost to remove and replace waterlogged fuel.

Knowing that water intrusion is an ever-present threat, fuel retailers must take great pains to guarantee that their UST systems do not become susceptible to water invasion. Thankfully, the developers and manufacturers of the UST equipment that is used to store and dispense fuel have recognized the dangers of excessive water levels in fuel and have responded with a series of UST-equipment solutions that can make the harmful effects of water intrusion a thing of the past.

Why the Increase in Water Intrusion?

Theoretically, water intrusion has been a concern for fuel retailers since the first petroleum-product-powered vehicles began to take to the world's roads more than a century ago. However, in recent years there has been a documented increase in water-intrusion incidents. In fact, a June 2017 report by automobile insurance quote aggregator CheapCarInsurance.net noted that in 2016 as many as 20 percent of the 100,000-plus gasoline stations in the United States were victims of elevated water levels in their fuel.

But why is water intrusion—a century-old concern for fuel retailers—becoming a much more prevalent problem today? The Steel Tank Institute (STI) offers three possible explanations in its "How Water Enters A Storage System" report. The explanations are:

Changes in fuel chemistry:

With additives like ethanol and biodiesel required to be mixed in with neat gasoline or diesel, fuel chemistry has undergone a series of significant changes over the past 30 years. While these new fuel formulations reduce the level of harmful emissions that can be released to the atmosphere, they are more susceptible to water-caused moisture accumulation, separation and biodegradation. For example, today's lead-free fuels have removed the one fuel component—the actual lead itself—that is a natural poison to the microbes that will flourish in a moist environment, leading to an increased risk of higher levels of microbial growth.

Changes in the distribution infrastructure:

More and more fuel is moving faster and faster through the delivery network, from refinery to pipeline to bulk-storage rack to retail fueling facility. Today's hyper-speed distribution system allows less time for water to settle to the bottom of USTs before it is moved forward to the next stage in the delivery process. Additionally, a noteworthy shift from proprietary to shared delivery infrastructures within the industry eliminates much of the control that individual producers and shippers used to have over their product and delivery processes and schedules.

Installation procedures:

As fuel chemistry and distribution networks have evolved, so have the accepted installation methods that are used to get the UST system and its components into the ground. Some things such as open vents, low fill areas and sloped tank installations that were previously considered unacceptable construction techniques are now commonplace. The tradeoff is that there is now an expanded range of ways that water can invade the UST system.

In analyzing these probable reasons for increased water-intrusion instances, changes in fuel chemistry are the most significant. Specifically, the mandate in the 1990 Clean Air Act that all gasoline formulations sold in the U.S. consist of at least 10 percent ethanol has opened the door for water intrusion to become the current conundrum that is has for fuel retailers.

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Water that enters a UST storing gasoline that is laced with an ethanol component is susceptible to "phase separation," a condition that will cause the fuel to separate into two distinct layers: an ethanol-free, gasoline-only layer at the top and an ethanol/water-rich mixture along the bottom.

When phase separation occurs, the effects can be detrimental for the retailer:

- Damage to vehicle components, including fuel injectors and engines
- Damage to fuel-storage and fuel-dispensing equipment
- The creation of out-of-spec fuel that cannot be sold and must be removed from the UST and disposed of, oftentimes at considerable cost and inconvenience to the retailer
- Word-of-mouth damage from affected drivers regarding the retailer that can be hard to mitigate or overcome
- Potential liability for damage to customers' vehicles

With the identification of the reasons that the number of instances and levels of water intrusion have increased, it's time to consider the ways that water can enter a UST. Some of the most common are:

- Fuel delivered with water already present
- Deliver cap not replaced properly
- Accumulated water in spill bucket drains or leaks into UST
- Hole in vent cap or line
- UST leak that allows entry of groundwater
- Cracked, degraded or ill-fitting seals on the tank-sump lid
- Loose fittings or plugs
- Condensation caused by fuel-temperature swings

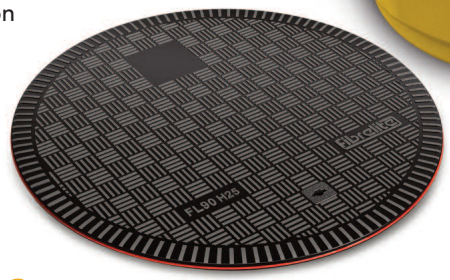
Some of these causes are easier to eliminate than others, but fuel-site operators should know that, if unchecked, all of them will lead to water-fouled fuel and the associated cleanup and replacement costs. Therefore, appropriate due diligence must be performed to ensure that none of these causes are allowed to occur or fester.

Waging War On Water Intrusion

As mentioned, the developers and manufacturers of the equipment and components that make up a UST system have created numerous ways that can contribute to halting the flood of unwanted water intrusion. In recent years, five notable solutions have been introduced to the market, all of them possessing the capability to optimize the prevention of water intrusion:

Composite Multiports with Watertight Lids and Covers:

These next-generation components offer corrosion-resistant construction that is engineered in conjunction with fiberglass containment sumps and specially designed covers, which provide watertight spill containment for UST fill pipes and vapor-recovery risers.



Composite Manhole Covers:

These watertight, lightweight, metal-free non-bolted covers feature a sealing gasket that adds an extra layer of protection against water intrusion.

Sealable Cover Spill Containers:

An integral "plumber's plug" sealable design prevents water from penetrating the spill container at the surface and entering the UST. Additionally, the design prohibits spilled products from entering the soil near the fill and vapor-return riser connections on USTs during normal tank-filling operation, or in the event of a tank-overfill occurrence.

No-Drill Dispenser Loop Sumps:

These are prefabricated sumps that eliminate improper entry-fitting installation and ensure proper pipe alignment. The shallow bury "loop" design keeps entry penetrations above the water table. Factory-installed dual-sided, rigid entry fittings provide double protection by sealing on the pipe inside and outside of the sump, which prevents groundwater intrusion into the sump and keeps all of the fluid that is collected in the sump from entering the access pipe. Rigid composite material eliminates entry-fitting degradation that can result in water intrusion.

No-Drill Tank Sumps:

These feature integrated factory-installed conduit ports and an electrical wiring junction box, which eliminates the need for any drilling that can create tank-sump leak points. Also, they have consistent wall thicknesses and smooth sealing surfaces inside and out for watertight entry-fitting security.

The overriding takeaway is that fuel retailers who introduce any or all of these components into their fuel-storage systems will significantly increase the likelihood that their USTs will not be subject to harmful and costly levels of water intrusion.

Conclusion

While it may be an erroneous extrapolation to assume that since water covers 71% of the Earth's surface that there's a 7-in-10 chance a fuel retailer will suffer water intrusion in his USTs, there is no questioning the severity of unchecked water invasion. Ranging from damage to the fuel site's UST system, the operator's reputation and the customer's vehicle, excessive water levels due to water intrusion in fuel—no matter the source—is a constant, and growing, concern for fuel retailers. To eliminate water intrusion and the harmful and costly effects that it can have on the operation of fuel-storage systems and the vehicles that receive damaged fuel, retailers should look into upgrading to any of the many different watertight UST storage-system components that have been made available to the market in recent years. ■

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