

# Five Fueling-System Components That Can Eliminate Water Intrusion

*Watertight UST equipment will eradicate the harm that can be caused by water-fouled motor fuels – By Ed Kammerer*



Water is many things: a colorless, odorless and tasteless substance; the most plentiful liquid on Earth; and one of the foundational building blocks of all human, animal and plant life. Simply put, no living, breathing organism can survive without water.

While water is critical to maintaining and sustaining life, on the flip side, water is also insidious. Ask anyone who's had an undetected crack in the foundation of a home and then had to battle through the challenges – and repair costs – created when water begins seeping into the basement after a heavy rain. These people are truly familiar with the definition of insidious – “proceeding in a gradual, subtle way, but with harmful effects” – and how water can be the embodiment of that definition.

Water can also be a burden for fuel retailers. Similar to its relationship with oil, water does not “play well” with motor fuels. Because of this confrontational relationship, excessive levels of water in gasoline and diesel possess the capability to compromise the fuel's composition and cause damage to fuel-storage systems and vehicles. And that's where water's insidiousness enters the picture again – originating from a spring storm, leaky pipe or general spill, and propelled by gravity, water will make its way where it's not wanted, finding every crack and crevice along the way.

## The Challenge

In June 2017, CheapCarInsurance.net, an online automobile-insurance quote aggregator, released the findings of a study it had commissioned. Titled “Gas Station Violations,”

the [study](#) offered a review of the results of gas-station inspections across multiple states in 2016. The study showed how many stations earned violations in a number of categories, including water and sediment intrusion into the fuels they were selling.

One of the main takeaways from the study was that in 2016, more than 20% of the violations involved the presence of elevated levels of water in the fuel. According to the U.S. Department of Labor's Bureau of Labor Statistics, there were [106,015 gasoline stations](#) in the United States at the end of 2016. If one in five was experiencing some form of water intrusion, that means that 21,203 of those stations were dispensing motor fuels with elevated levels of water.

But why, you might ask, is water intrusion such a hot-button topic today when gasoline and diesel have been used to power motor vehicles for more than 100 years? The Steel Tank Institute (STI) has the answer to that question in its [“How Water Enters a Storage System”](#) report. According to STI, there are three main reasons why there has been an increase in the risk for water intrusion and accumulation in the fuel-storage system, which consists mainly of underground storage tanks (USTs) and their related equipment and components. The reasons are:

**1) Changes in the distribution infrastructure:** More and more fuel is moving faster through the delivery network, from refinery to pipeline to bulk-storage rack to retail site. This accelerated distribution system leaves less time for water to settle to the bottom of storage vessels before it is moved

along to the next step in the delivery process. Additionally, a shift from a proprietary to a shared delivery infrastructure within the industry removes much of the control that individual producers and shippers had previously had over their product and delivery processes.

**2) Changes in fuel chemistry:** With additives like ethanol and biodiesel required to be mixed in with neat gasoline or diesel, fuel chemistry has changed. As such, these new fuel formulations 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 lead itself – that is a natural poison to the microbes that can grow in a moist environment, opening the door to increased microbial growth.

**3) Installation procedures:** Alterations in what are considered acceptable installation procedures – open vents, low fill areas, sloped tank installations, etc. – can result in a wider array of ways that water accumulation can occur.

In looking at these reasons, the one that stands out above the others is the second: Changes in fuel chemistry, specifically gasoline. Since the creation of the Clean Air Act in 1990, governmental regulations have mandated that ethanol at a 10% concentration, at least, be included in every gallon of gasoline that is sold in the U.S.

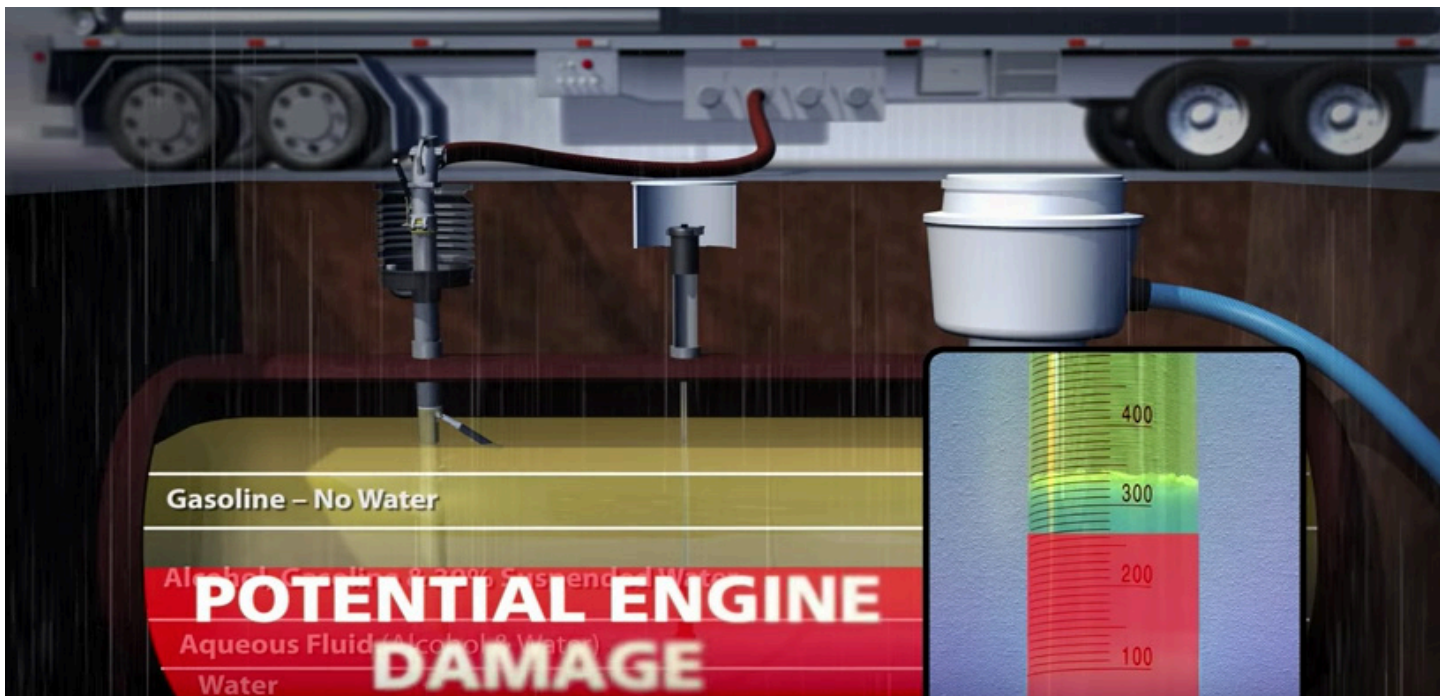
Ethanol, however, reacts differently with water than neat gasoline. For instance, water in a tank of neat gasoline sinks to the bottom because it has a higher specific gravity

than the fuel, enabling it to be removed before it could be dispensed into a vehicle. Ethanol, on the other hand, is what is known as a “hydrophilic compound,” meaning that it attracts water. This means that the water present in an ethanol-blended fuel will be absorbed by the ethanol, eventually resulting in a phenomena known as “phase separation.” When phase separation occurs, the UST will feature two distinct liquid layers: an ethanol-deprived, gasoline-only layer at the top and an ethanol/water-rich “cocktail” along the bottom.

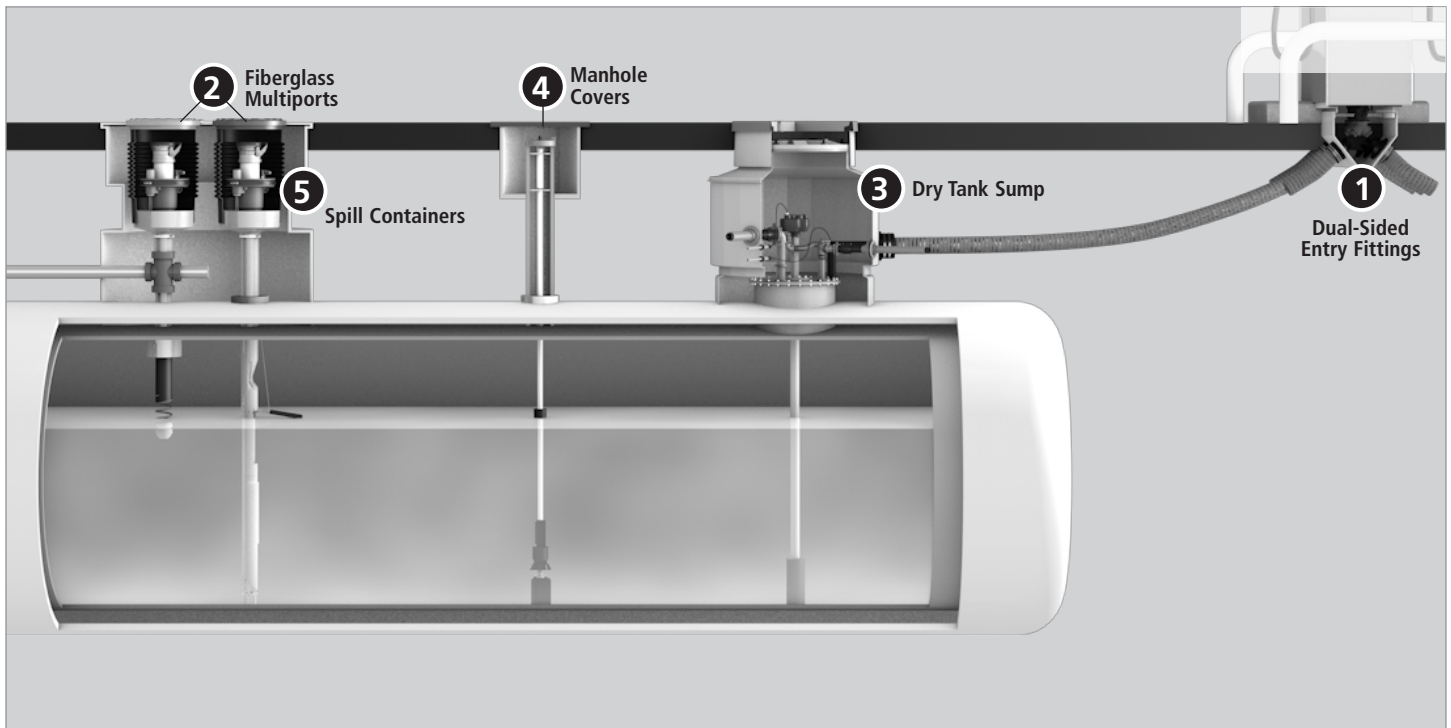
There are three negative effects when phase-separated fuel forms in a UST:

- 1) Damage to fuel-storage and -dispensing equipment
- 2) Damage to vehicle components such as fuel injectors and engines
- 3) 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

Retailers, who should install water-sensing filters on their fuel dispensers, will know if their USTs have reached a level of water intrusion that has resulted in the occurrence of phase separation. This occurs when the filter slows fuel flow to less than one gallon per minute (gpm). Drivers will know if phase-separated fuel has been introduced to their vehicles when knocking occurs or, in the worst-case scenario, when the engine will not run at all.



### Five of the most prominent components in the water-intrusion-prevention realm



With the reasons and effects of water intrusion identified, it's time to consider how water may enter a UST. In reality, there are innumerable ways that water can find its way into the UST, but some of the most common are:

- Fuel delivered with water already present
- Accumulated water in spill bucket leaks into UST
- Deliver cap not replaced properly
- 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 retailers must be aware that all of them have the capability to allow water to foul their fuel. Therefore, strict due diligence must be performed to ensure that none of these causes are allowed to occur or fester.

#### The Solution

Fortunately for fuel retailers, the companies that develop and manufacture USTs and the related equipment found in fuel-storage systems have taken great pains to create

components that feature a level of watertightness that can stop the flood of water intrusion.

Five of the most prominent components in the water-intrusion-prevention realm are:

- 1 Dual-sided entry fittings:** Provide double containment protection at the sump's entry-fitting connection, which prevents groundwater intrusion into the sump and keeps all of the fluid that is collected in the sump from entering the access pipe
- 2 Fiberglass multiports:** Lightweight construction eases handling and improves safety for the operator while providing watertight spill containment for UST fill pipes and vapor-recovery risers
- 3 Dry tank sumps:** Feature integrated factory-installed conduit ports and electrical wiring box, which eliminates the need for any drilling that can create tank-sump leak points. Also, have consistent wall thicknesses and smooth sealing surfaces inside and out for optimized entry-fitting watertightness.
- 4 Composite manhole covers:** Watertight, lightweight, non-bolted covers that have a flat gasket that helps guard against water intrusion
- 5 Spill containers:** Have a sealable design that prevents water from entering the UST, as well as 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

Retailers who introduces any or all of these components into their fuel-storage systems will greatly increase the chances that their USTs will not be subject to potentially harmful levels of water intrusion.

### Conclusion

Water has a mind of its own; it tries to go where it wants, and it will be successful if barriers are not put in place to arrest its movement. It's a fact of life that some amount of water will find its way into the USTs at retail-fueling sites. Knowing this, the task for retailers is identifying and implementing ways that will prevent the quantity of water intrusion from reaching a stage where it compromises the

performance of the fueling system and the customer's vehicle. Outfitting their fuel-storage systems with equipment that has been designed to be watertight is the best way for fuel retailers to be confident that the motor fuels they are selling are of the highest quality.

### About the Author:

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For more information on UST equipment that will help you eliminate water intrusion or to learn more about innovative UST equipment to prevent water intrusion and save you money, please contact your local, authorized OPW Distributor or call **OPW Customer Service at 1-800-422-2525**.