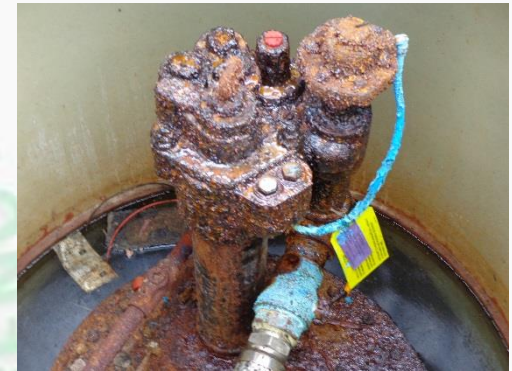




Corrosion in USTs

PA Storage Tank Advisory Committee

June 6, 2017



**Ryan Haerer, Release Prevention Division
EPA Office of Underground Storage Tanks**

Sump Corrosion in Gasoline



Photo courtesy: Florida DEP

E10 STP, unknown grade (Florida) – Feb. 2011



Photo courtesy: San Diego County - Dept. of Environmental Health (California)

91 octane STP (California) – August 2010



Photo courtesy: State of Tennessee, TDEC

Premium/E10 STP (Tennessee) – March 2010



Photo courtesy: State of Tennessee, TDEC

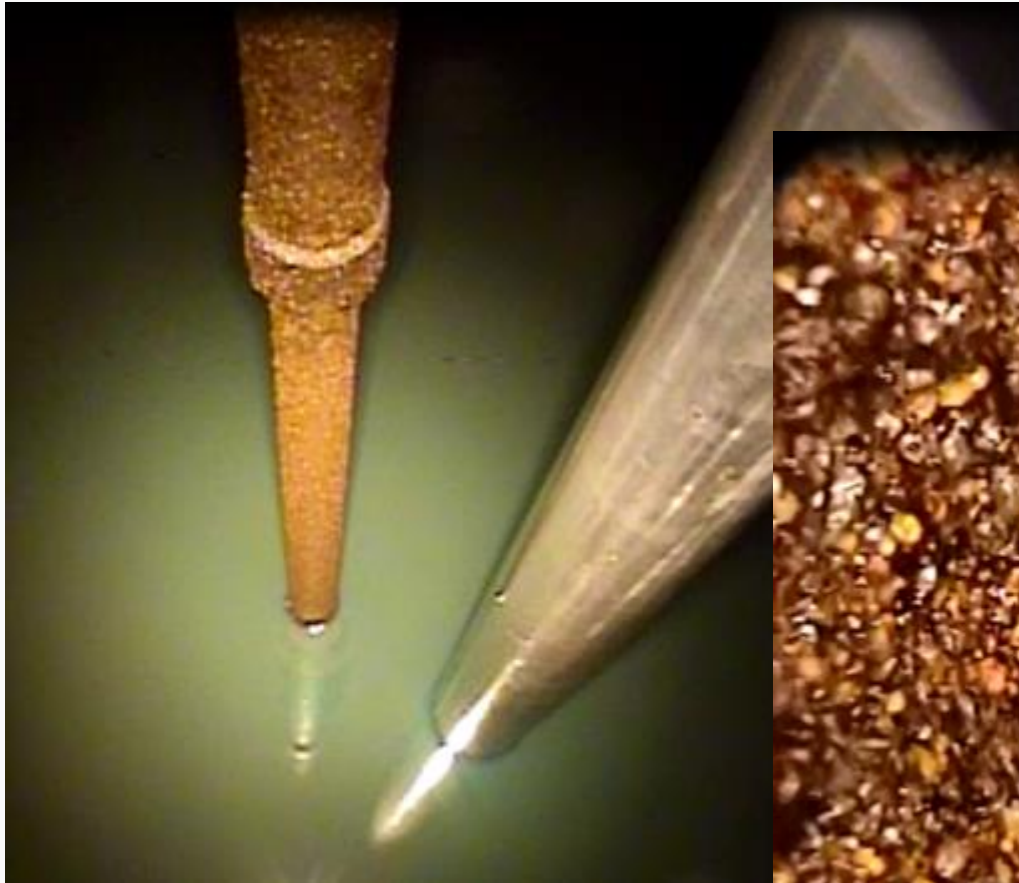
Premium/E10 STP (Tennessee) – August 2010

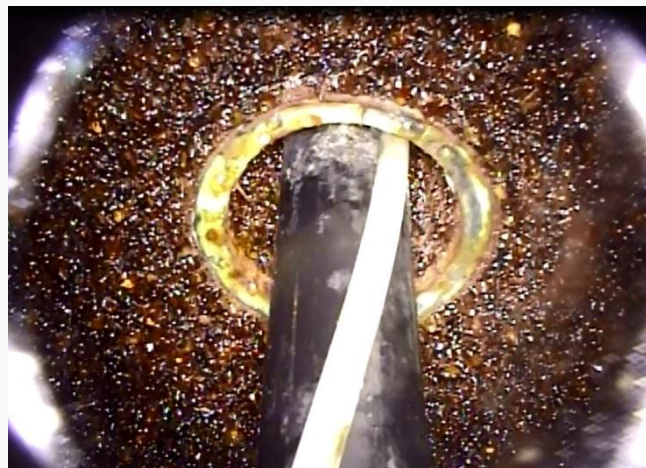
Same sump!





Corrosion in Diesel Since 2007







EPA Research on Diesel Corrosion


Videos



Sampling

- Vapor
- Fuel
- Water bottom



ULSD Site Inspection Field Form 

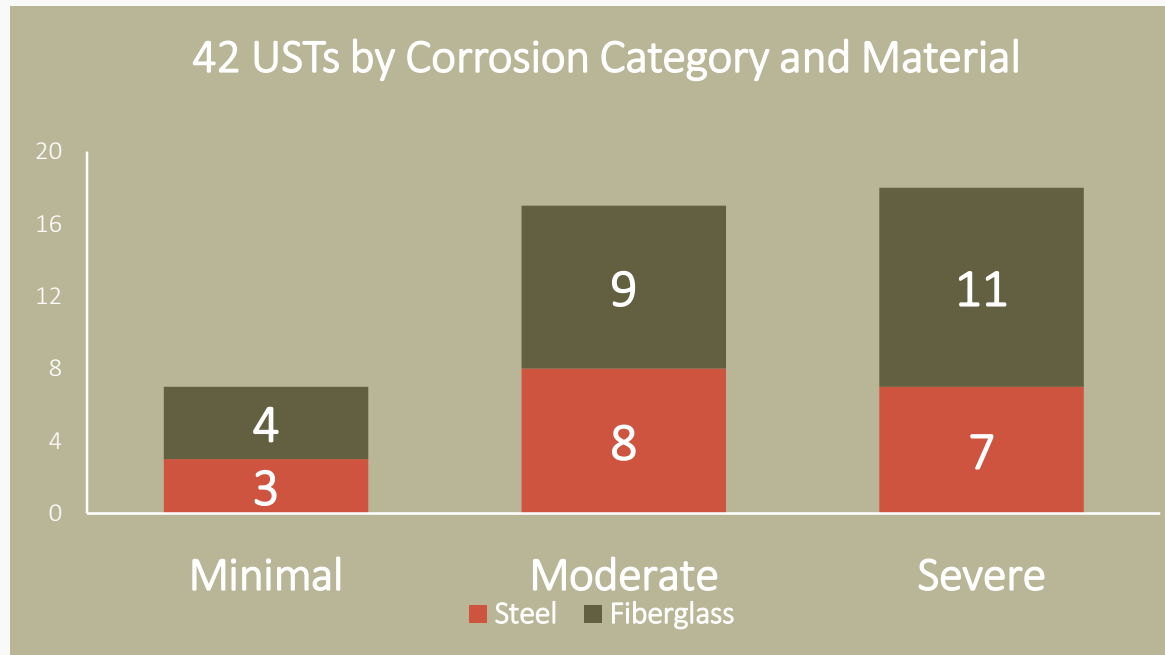
Site Name/ID#: _____ Date: _____
Address: _____ Time: _____
City: _____ ST: _____ Zip: _____ Technician: _____
Contact: _____ Phone: _____ Signature: _____

Tank and Piping Information and History				
Tank Identifier	Product		ULSD	
How Water Monitored?	ATG or Stick			
Tank Capacity (gals)	Tank Diameter (inches)			
Tank Material	Single/Double Wall			
Tank Year of Installation				
Tank Piping Manifolder?				
Overfill protection (type and observation)*				
STP Make/Model	= PHOTO			
STP Shaft Condition*	Minimal (<5%) or Moderate (5% to 50%) or Severe (>50%) = VDEO			
Riser Entry for Video				
Observations	Fill Pipe	ATG	STP	Other
Riser Condition	= PHOTO	= PHOTO	= PHOTO	= PHOTO
Cap/Adapter Condition	= PHOTO	= PHOTO	= PHOTO	= PHOTO
Other Visible Corrosion?				
Product Level*				
Water Bottom Level				
Dispenser Info	Dsp #	Dsp #	Dsp #	Dsp #

Background information



83% of USTs had moderate or severe corrosion



Note: EPA asked for sites with corrosion, so sample is biased. But less than 25 percent of the sample population was aware of corrosion before investigation.

Red = steel Brown = Fiberglass (Total Population = 24 fiberglass, 18 steel)



Notice to owners about corrosion in USTs

Notice Of Corrosion Risks In Underground Storage Tanks Storing Diesel Fuel US Environmental Protection Agency, Office Of Underground Storage Tanks July 2016

EPA recommends that owners of underground storage tank (UST) systems storing diesel fuel check inside their tanks for corrosion, which research suggests is now appearing on equipment in most tank systems storing diesel fuel.

Summary

Observations from EPA's 2016 research, which examined 42 operational UST systems storing diesel fuel across the country, show a significant prevalence of corrosion of metal components inside those tanks. The preliminary results categorized 35 of 42 – or 83 percent – of the examined diesel fuel tanks exhibiting moderate or severe corrosion. Less than 25 percent of USTs involved in the research reported corrosion prior to the internal inspection. Corrosion in the upper vapor spaces inside USTs is a relatively new phenomenon and can cause equipment failure by preventing proper operation of release detection and prevention equipment. In steel tanks, corrosion can cause direct tank failure and releases to the environment. At this point, we do not think there is an epidemic of releases and we cannot project the actual percentage of USTs in a real world setting with advanced corrosion. But we are sufficiently concerned about potential releases that we think it prudent to alert tank owners of the problem and further investigate the issue. If left unchecked, there could be a substantial number of new UST releases, which have historically been a leading cause of groundwater contamination.

We estimate there are at least 100,000 federally regulated USTs storing diesel fuel. However, the number of potentially affected tanks is significantly higher when counting similar sized aboveground storage tanks and smaller unregulated USTs such as farm tanks and home heating oil tanks.

Since studies to date have not definitively confirmed the root cause of the corrosion, there is no widely-accepted solution to the problem. However, there are actions tank owners can take now to minimize the corrosion and the associated risks while stakeholders look for a solution.

Recommendation

EPA recommends UST owners check for corrosion in their tank systems storing diesel fuel; this applies to both systems with steel tanks and systems with fiberglass tanks. Owners reporting corrosion sometimes find sludge or particles, which may look like coffee grounds, clogging their fuel filters. EPA recommends all owners of UST systems storing diesel fuel conduct a visual inspection by checking in their filters and inside UST system access points even if they have not seen symptoms in the filter; severe corrosion may already be established before symptoms appear in the fuel filter and an owner becomes aware of a severe corrosion issue. Remember that this initial diagnostic observation of UST equipment visible from the surface may not show corrosion even if it exists in the UST system.

Owners should also contact UST servicing companies to further evaluate the extent of corrosion inside tanks. These companies can remove and check equipment for evidence of corrosion; they may also sometimes use a specially designed video camera to conduct a thorough visual inspection inside an UST system. If observations show corrosion, the company might remove more equipment and check to ensure all equipment is functioning properly. The company might suggest additional testing for the functionality of overflow prevention equipment, leak detection equipment, and automatic tank gauges. Testing the integrity of both single-walled and double-walled tanks for absolute tightness may also be warranted.

If owners or the servicing company finds corrosion, equipment should be repaired or replaced as necessary to ensure proper functionality. Until the exact cause of corrosion is determined and a long term solution is identified, EPA recommends owners

refer to several industry documents that suggest best currently available practices, technologies, or treatments available to minimize the risk of release of diesel fuel from tanks. Regularly checking for and removing water found in the bottom of tanks storing diesel fuel is widely recognized as a critical preventive method for reducing the risk of corrosion. Additional preventive practices may be beneficial.

- Examples Of Industry Maintenance Documents
- Coordinating Research Council – [Preventive Maintenance Guide for Diesel Storage and Dispensing Systems and Diesel Fuel Storage And Handling Guide](#)
 - Clean Diesel Fuel Alliance – [Guidance For Underground Storage Tank Maintenance At ULSD Dispensing Facilities](#)
 - Steel Tank Institute – [Recommended Practice For Storage Tank Maintenance P111 Revision](#)
 - ASTM D6469 (available for purchase) – [Standard Guide for Internal Corrosion in Fuels and Fuel Systems](#)

Background About Corrosion In Tanks Storing Diesel Fuel

Beginning around 2007, owners reported to servicing companies new incidents of severe and rapid corrosion of internal metal components of tanks storing diesel fuel. These reports usually described severe corrosion of equipment in upper portions of UST systems in the regions generally not submerged in fuel. Prior to 2007, a corrosion risk in diesel fuel tanks was considered minor and, if it occurred, appeared in the wetted, or lower, portion of the tank.

Industry and EPA are working together to understand the corrosion issue and identify solutions. The [Clean Diesel Fuel Alliance](#), an organization represented by many industry members and supported by EPA, began researching the corrosion issue as reports became more numerous. In 2012, the Clean Diesel Fuel Alliance produced the first research results about this corrosion issue. EPA worked collaboratively with industry and other agencies to develop the second phase of research, which built on the knowledge and questions from the 2012 research. In July 2016, EPA released the research results in a peer-reviewed report.

Research to date has not been able to pinpoint a cause, but it appears microbiologically-influenced corrosion could be largely responsible. Many processes are occurring at the microscopic level in USTs, but several industry maintenance documents

suggest that taking action to address microbiologically-influenced corrosion is very effective at slowing and limiting negative impacts of corrosion in USTs storing diesel.

EPA's research does not supply conclusive findings regarding the cause of corrosion. Nonetheless, the number of tanks in our research; the diversity of tank type, operation, and maintenance practices; and nationwide locations of the 42 tanks examined provide an improved understanding of the probable extent and geographic spread of corrosion. The research results and subsequent discussions also give us a broader understanding of the risks to equipment integrity and functionality posed by corrosion. The [Coordinating Research Council](#) is now developing a third phase of research, which EPA is supporting by providing input and access to data collected during our research.

Risks Of Corrosion In Tanks Storing Diesel Fuel

Heavy corrosion could potentially prevent proper functioning of various release prevention equipment, which is required in all tanks. Equipment functions range from detecting UST system releases should they occur to minimizing the chance of overflowing tanks and releasing diesel fuel to the environment.

Corrosion also appears to present a risk to the integrity of tanks, especially in the bottom of metal tanks where water and sludge may accumulate. Corrosion of metal tank walls or metal bungs in fiberglass tanks could result in failure of that equipment and could cause a release of diesel fuel to the environment.

Owners are responsible for the costs of cleaning up releases to the environment when they occur, so it is important for owners to check their tanks for corrosion. Severe corrosion without a release may still result in higher costs due to the need for increased maintenance or the premature replacement of equipment. Owners should check for corrosion in addition to continuing to meet all applicable UST regulatory requirements.

For More Information

See EPA's [corrosion in USTs storing diesel website](#) or contact [UST implementing agencies](#).



Office of Underground Storage Tanks, Washington, D.C. 20460
www.epa.gov/ust

July 2016



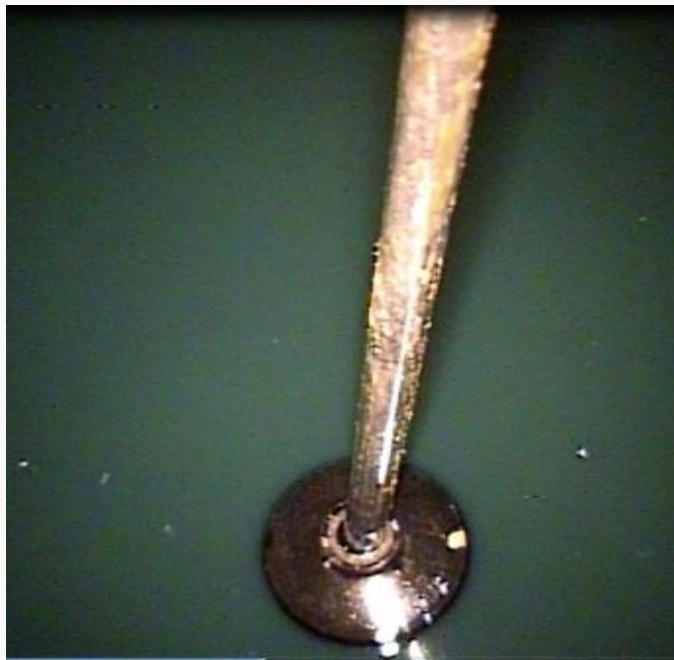
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July 2016



Corrosion Impacts UST Functionality

Release prevention equipment



Tank integrity



Fill pipes don't always tell the story





How to act now and for the future

Immediate mitigation options for tank operators

- Baseline checks of UST system
- Ensure strong maintenance
 - Monitoring water and microbial activity
 - Removing water or cleaning
- Technologies available
 - Filming amines
 - Nitrogen blanketing
 - Enhanced filtration

Longer term projects for industry collaboration

- Research continues
 - CRC
 - Fuels Institute
 - ASTM
- Standards
 - Water levels?
 - Enhanced monitoring through distribution?
 - Others?



Additional Information

- EPA Office of Underground Storage Tanks Website
<https://www.epa.gov/ust>
- EPA Office of Underground Storage Tanks Emerging Fuels Contact
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202-564-0762