

Corrosion Risks in Underground Storage Tanks Storing Diesel Fuel

Pennsylvania Department of Environmental Protection

Division of Storage Tanks

General

Releases from underground storage tank (UST) systems have historically been a leading cause of groundwater contamination in the United States. Groundwater contamination can pose health risks to local water users and require costly cleanup efforts and expensive drinking water replacement. In 2007, UST owners began reporting corrosion conditions that had been previously unseen, including corrosion of metal components in the upper vapor spaces inside USTs. In order to identify causes of and potential solutions to corrosion in USTs, the Environmental Protection Agency (EPA) conducted a study of USTs storing diesel fuel across the United States.

The Pennsylvania Department of Environmental Protection (PA DEP), Division of Storage Tanks hopes that by alerting UST owners of the study, potential releases as a result of UST system corrosion may be prevented.

Background: Corrosion in Diesel USTs

There are over 6,000 regulated USTs storing diesel fuel in Pennsylvania. However, the number of potentially affected tanks is significantly higher when counting aboveground storage tanks and unregulated USTs containing diesel fuel.

Corrosion in UST systems can lead to releases to the environment by:

- Causing failures in the shell of steel tanks and metal bungs, resulting in a release directly from the UST.
- Preventing proper functioning of UST system equipment by binding moving parts.
 - o Release detection equipment failure may lead to undetected leaks, resulting in more extensive contamination from a release.
 - o Overfill prevention equipment failure may result in a release due to overfilling the UST.

In Pennsylvania, UST system owners are required to participate in the Underground Storage Tank Indemnification Fund (USTIF). Even with USTIF coverage, remedial action to address a release to the environment can be costly to UST owners. Corrosion that does not cause a release may still result in higher operating costs due to the need for increased maintenance or the premature replacement of equipment.

Around 2007, owners began reporting new incidents of severe and rapid corrosion of internal metal components of USTs 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, corrosion risk in diesel fuel tanks was considered minor and, if it occurred, appeared in the lower, wetted portion of the tank.

Industry organizations and the 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 the 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. The 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, the EPA released the research results in a peer-reviewed report.

Observations from the 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 of those UST systems. The EPA's preliminary results show moderate or severe corrosion in 83 percent of the examined diesel fuel USTs. Less than 25 percent of UST owners involved in the research had reported knowledge of corrosion in their USTs prior to the EPA's research inspections. Corrosion in the upper vapor spaces inside USTs is a relatively new phenomenon and can cause equipment failure, preventing proper operation of UST system components such as release detection and overfill prevention equipment. In steel tanks, corrosion can also cause direct tank failure and releases to the environment.

At this point, the EPA's data does not suggest an epidemic of releases from UST systems storing diesel fuel. With the current data available, the EPA cannot project the actual percentage of USTs with advanced corrosion nationwide. However, if left unchecked, corrosion in USTs could contribute to a substantial number of new releases and increased instances of groundwater contamination.

Although research conducted to date has not been able to pinpoint a cause of the emerging corrosion issues, it appears microbiologically-influenced corrosion could be largely responsible. Many processes are occurring at the microscopic level in UST systems. 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 UST systems storing diesel.

While the EPA's research does not supply conclusive findings regarding the cause of corrosion, the number of tanks in the EPA's 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 in UST systems storing diesel fuel. The research results and subsequent discussions have also provided 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 the EPA is supporting by providing input and access to data collected during their research.

Recommendations

Since studies to date have not definitively confirmed the root cause of the corrosion, there is no widely-accepted solution to the problem. The PA DEP recommends that owners of UST systems storing diesel fuel take extra steps to evaluate those systems for the presence of corrosion. The PA DEP supports actions above and beyond regulatory requirements, taken in the interest of due diligence to prevent releases of regulated substances and potential threats to human health and the environment.

The PA DEP recommends UST owners check for corrosion in their UST systems storing diesel fuel by conducting a visual inspection of the UST system including:

- Fuel filters – owners reporting corrosion sometimes find sludge or particles, which may look like coffee grounds, clogging their fuel filters.
- UST system equipment visible from aboveground, inside of sumps and manways.

Initial diagnostic observations of UST equipment visible from the surface may not show corrosion even if it exists. Further evaluation may be necessary to positively determine the condition of the UST system. Owners interested in further evaluation of the extent of corrosion inside their UST systems should contact a PA DEP Certified Tank Handling Company who can conduct a more thorough inspection of UST systems for corrosion by:

- Removing and checking internal UST equipment for corrosion.
- Removing and checking internal UST equipment, such as overfill prevention equipment, release detection equipment, and automatic tank gauges for functionality.
- Visually inspecting the UST system interior using specially designed video cameras.
- Conducting tightness testing.

If corrosion is found, the affected equipment should be repaired or replaced as necessary to ensure proper functionality. Until the exact cause of corrosion in UST systems storing diesel fuel is determined, and a long term solution is identified, the PA DEP recommends owners remain vigilant of the UST systems. Regularly checks for and removal of water found in the bottom of tanks storing diesel fuel is widely recognized as a critical preventive method for reducing the risk of corrosion.

For More Information:

See EPA's corrosion in USTs storing diesel website: (<https://www.epa.gov/ust/alternative-fuels-and-underground-storage-tanks-usts#corrinternal>)

Contact PA DEP, Division of Storage Tanks: (717-772-5599)

Contact USTIF: (717-787-0763)

Applicable Industry Documents

Coordinating Research Council (CRC)

- *Report 672 - Preventive Maintenance Guide for Diesel Storage and Dispensing Systems* (<http://www.crao.org/reports/recentstudies2016/CRC%20672/CRC%20672.pdf>)
- *Report 667 - Diesel Fuel Storage and Handling Guide* (<http://www.crao.org/reports/recentstudies2014/CRC%20667/CRC%20667.pdf>)

Clean Diesel Fuel Alliance

- *Guidance for Underground Storage Tank Management at ULSD Dispensing Facilities* (http://www.clean-diesel.org/pdf/GuidanceforUndergroundStorageTankManagement_FINAL.pdf)

Steel Tank Institute

- *R111 Storage Tank Maintenance Standard* (<http://www.steeltank.com/Portals/0/Shop%20Fab/R111%20with%20updated%20cover.pdf>)

American Society for Testing and Materials

- *ASTM D6469 Standard Guide for Microbial Contamination in Fuels and Fuel Systems* (<http://www.astm.org/Standards/D6469.htm>) [Note: this document is publicly available but must be purchased]