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Photographic Documentation of Equipment and Components Pulled from Removed USTs Used to Evaluate Trends in Interior Degradation and Corrosion for USTs Formerly Storing Biodiesel B98, Diesel (Clear and Dyed), Ethanol E99, and Regular E10 in Lawrence, Kansas.

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In a continuation of the work undertaken in the 2016 EPA Diesel Corrosion and Arizona Tank Scoping studies, another opportunity for the assessment of corrosion and tank degradation became available with the permanent closure during the summer of 2019 in Lawrence, Kansas, of five fiberglass underground storage tanks installed in 2007 to contain Biodiesel B98, Diesel (clear and dyed), Ethanol E99, and Regular E10 Unleaded Gasoline. Rather than documenting the interiors of tanks during internal video inspections, equipment was pulled from these USTs and photographed to document the occurrence and extent of degradation and corrosion. Using the Tank Grading Scale developed by the Arizona Department of Environmental Quality (ADEQ), degradation to the interiors of the fiberglass USTs ranged from "A – No Issues" to having "B – Minimal to Moderate Issues." Using criteria for evaluating corrosion on STP shafts developed in the 2016 EPA Diesel Corrosion Study, minimal to severe corrosion was observed on the STP shafts removed from the E99 and E10 USTs. Severe corrosion was observed on the STP shafts removed from the premium and diesel USTs. Varying degrees of degradation and corrosion occurred in contained STP sumps and on poppet/ball float valves, as well as automatic tank gauge (ATG) probes. Overall, trends in degredation and corrosion are not much different from what was observed during the Arizona Tank Scoping Study or the 2016 EPA Diesel Corrosion Study, but the Lawrence, Kansas, tank removal is significant in contributing to the understanding of degradation and corrosion trends apparent with E99 and B98, two outliers on the fuel storage continuum.

Disclaimer: The use of model, manufacturer or product names is for informational purposes only and does not imply any endorsement by U.S. EPA.



Table 1: History of substances stored in USTs installed at Zarco 66 #9 (KDHE ID 06430). Biodiesel B98 dispensing ceased between 2018 and 2019. B98 designates the diesel blend consisting of 98 percent biodiesel. E10, E85, and E99 designates gasoline fuel blends containing 10, 85, and 99 percent of ethanol.

Tank No.	Capacity in Gallons	Registration 9/24/2007	EPA Inspection 9/30/2013	KDHE Permitting 6/7/2018	Prior to Removal 5/9/2019
U004	10,000	Gas Ethanol E85	Gas Ethanol E99	Gas Ethanol E99	Gas Ethanol E99
U005	10,000	Gasoline Unleaded Regular E10	Gas Unleaded Regular E10	Gas Unleaded Regular E10	Gasoline Unleaded Regular E10
U006	10,000	Clear Diesel No. 2	Diesel Clear	Diesel Clear	Gasoline Unleaded Premium
U007	10,000	Biodiesel Clear	Biodiesel B98 Clear	Biodiesel Clear	Diesel Dyed Off Road
U008	10,000	Diesel Dyed Off Road	Diesel Dyed Off Road	Diesel Dyed Off Road	Clear Diesel

Figure 1: Photo showing equipment installed on vent lines. From left to right are a black canister holder containing a water-absorbent sock for Tank U004, a white vapor recovery system for Tank U005, and another black canister for Tank U007.

Photographic Documentation of Equipment and Components from Removed USTs Storing Biofuels

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U006: Severe

Corrosion



Corrosion







U006: B – Minimal to Moderate Issues



U008: B – Minimal to Moderate Issues









U007: B – Minimal to Moderate Issues



used for scale in most photographs.

Scott Zaremba Zarco USA Inc.

Figure 2: Minimal to severe corrosion occurred on submersible turbine pump (STP) shafts pulled from designated USTs. Corrosion rating criteria appearing in the 2016 EPA Diesel Corrosion Study were used to make these determinations

> U007: Severe U008: Severe Corrosion





U005: B – Minimal to Moderate Issues





Figure 3: Photographs of endcaps and barrels of designated, removed single-wall Containment Solutions USTs show a range of staining remaining behind after removers used detergent to clean out the sludge. The condition of these tanks ranged from "A - No Issues" to having "B - Minimal to Moderate Issues" using criteria developed for the 2018 Arizona Tank Scoping Study. Foot-long (30-centimeter) ruler

Ball Float Valves





U005: Light

ATG Probes





Figure 4: Heavier corrosion occurred on the ball float valve extractor and cages for the designated USTs installed to contain diesel fuels than the ones that contained Gas Ethanol E99 and Gasoline Unleaded E10. Proposed corrosion ratings for BFV are presented on this poster.









Figure 5: Varying degrees of light corrosion and staining occurred on the shafts and floats of automatic tank gauge (ATG) probes pulled from designated USTs. The ease with which floats moved up and down the probe shafts was not evaluated at the time the photographs were taken



Sump Corrosion

Tank U004: 2013





Tank U007: 2013

Tank U007: 2019



Figure 6: Pronounced corrosion of metallic components in contained STP sumps took place in designated USTs between 2007 and 2013. Treatment of the sumps reduced the rate of corrosion between the time of treatment and 2019. Tank U004 stored Gas Ethanol E99 throughout its service life. Storage in U005 switched from Biodiesel B98 clear to Diesel Dyed Off Road.

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Tank U007: 2019



Tank Removal



Figure 7a: UST removers installed shoring to keep the drive-thru coffee shop from collapsing into the excavation.



Figure 7b: From front to back, Tanks U008 U007, U006, U005, and U004 are exposed and ready for removal on 7/24/2019



Figure 7c: The track hoe has lifted Tank U004 from the tank excavation. Tank U003 (foreground) has had the endcaps removed