

## Industry Alliance Study Examines ULSD Storage Corrosion

The Clean Diesel Fuel Alliance (CDFA), composed of individual companies and many trade associations (STI is a member), posted its report *“Corrosion in Systems Storing and Dispensing Ultra Low Sulfur Diesel (ULSD), Hypotheses Investigation”* on Monday, September 10, 2012. Eight alliance member companies funded the research project. Battelle was hired to advise on project set-up, conduct the actual research, analyze the data and write this final report.

The research project design included identification of retail fueling sites with corrosion issues and development of an inspection and sampling protocol to ensure uniform and thorough inspections of USTs.

*“Severe and rapid corrosion has been observed in systems storing and dispensing ultra low sulfur diesel (ULSD) since 2007. In addition, the corrosion is coating the majority of metallic equipment in both the wetted and unwetted portions of ULSD underground storage tanks (USTs). To investigate the problem in an objective manner, multiple stakeholders in the diesel industry, through the Clean Diesel Fuel Alliance (CDFA), funded this research project.”*



Figure 1: Vapor sampling

Fuel, water bottoms, vapor, bottom sediments and scrape samples were taken from six sites:

- One intended “clean site” as a control (the site, however, was found to have corrosion symptoms);
- Five sites that exhibited severe corrosion symptoms. The five sites with severe symptoms all had FRP tanks. Therefore, the sixth site was chosen specifically because it had an FRP tank.

Samples from the inspections were analyzed for genetic material and chemical characteristics.

Among other contaminants, acetic acid was found in all samples taken (fuel, water bottoms, vapor and corrosion scrapings). Acetobacter microorganisms and traces of ethanol were found in the majority of water bottom samples. Combined, the two are known to create acetic acid. Battelle has identified this as the most likely mechanism for the cause of the corrosion.

The report states, “The source of the ethanol is unknown; however, diesel fuel is often delivered in the same trucks as ethanol-blended gasoline. Also, ULSD USTs that have been converted from gasoline tank could have manifolded ventilation systems with gasoline tanks. Thus, it is possible that there be some cross contamination of ethanol into ULSD.”



Figure 2: Fuel sampling

After reviewing the report, the CDFA still has many unanswered questions. Formic acid and glycolic acid were also found in samples, along with several other elements that the group feels require explanation. It’s likely that research will continue.



Figure 3: Overfill limiter impaired

Since the sixth, control “clean site” was found to also have corrosion symptoms, many reviewers noted it is impossible to draw conclusions because we do not know what a clean site should look like. Battelle stated, “The intent was to compare and contrast the characteristics of the sites that have been affected to the characteristics of a site that has not been affected. This intent was adjusted to a comparison analysis of all six sites to each other, since severe corrosion was identified at all of the sites.” In addition, since all the sites investigated have fiberglass tanks, it’s not known if this is a problem associated only with FRP tanks. At the time sites were being chosen, no one offered any steel tank sites that exhibited this type of corrosion phenomenon.



Figure 4: Corrosion found on equipment at one site

Battelle concluded its report with this recommendation: “Battelle recommends continued research into this issue. The hypothesis derived in this study should be investigated with a larger and more diverse sample set and should use a longitudinal design (where sites would be sampled multiple times over a period of time). In particular, steel USTs and tanks without corrosion issues should be investigated. This study could not compare the findings to a non-symptomatic site, due to the difficulty finding one. Also, the source and magnitude of ethanol contamination should be determined.”

[Click here](#) for the complete Battelle report. Anne Marie Gregg of Battelle, who managed this project, will present the findings at the upcoming PEI conference in Las Vegas on Oct 8, 2012 at 10:30 am.