

## Corrosion Protection for (3) Out-of-Service Storage Tanks on New Compacted, Fill Sand via Drip Tube IDS

### Project Specifics

Installation Dates  
February 2019

Environmental Conditions  
Warm, sunny, humid, light breeze.

Details  
Vessel Diameters: 21m  
Storage Product: Not Applicable  
Vessel Construction: Out-of-Service (Pre-Built)  
Foundation Details: Compacted Sand Foundation ~1m Depth and Concrete Ring Wall. Vessel is pre-built with plans to install and run ICCP. Liner is fused.

Inhibitor Delivery System (IDS)  
Drip Tube "Inhibitor Delivery System" (IDS)  
with IDS Monitoring Equipment

**Zerust Product(s) Used**  
Zerion<sup>®</sup> FVS-B15  
Dry Tube IDS PVC Pipes & Adapters



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### Project Specifics

A custom-designed corrosion mitigation solution was assembled and installed beneath the SSB surfaces of the steel floor plates for three (3) various tanks owned by the client and located at their refinery. This project was implemented through the client and third-party contractors.

The custom-designed IDS for corrosion mitigation included installation of a perforated Drip Tube IDS, through which a corrosion inhibitor slurry was injected. "Electrical Resistance" (ER) probes for monitoring of the life of the applied corrosion inhibitor compound were also installed.

This report shall provide analysis of the data collected from those units and suggestions for further activities (if any).

### Installation

A 300 gallon tote was used to perform the mixing. The injection was completed in batches of 200 gallons of water and four pails of inhibitor per batch. Only one of each of the pairs of injection ports were utilized.

We started at the center to focus a greater amount of slurry at this point. The outer portions of the tank (Left and Right) received a lower volume injection. The inhibitor slurry was injected prior to the completion of the tank's construction to protect the steel since ICCP will not be activated for quite sometime.

Due to permitting issues, the installation of ER Probes could not be completed during this visit. However, the crew was trained in both the installation of the probes and the taking of readings.

### Conclusion & Recommendations

Overall, the performance of the Zerust solution across each of the tanks for which ER probe data was provided is within acceptable parameters and, in fact, indicate a significantly higher (60%+ reduction in corrosion rates). The performance of the corrosion inhibitor has been evaluated through analysis of ER probe readings (taken by the client/contractor) supplied to Zerust Oil & Gas since implementation of the corrosion mitigation solution. ER probe readings were taken post-corrosion inhibitor application. For individual tank analysis of this data, please view the next page within this document.

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### Detailed Tank A Data Analysis

As previously noted, no ER probe data has yet been submitted at the time of this report. The Zerust Oil & Gas Drip Tube IDS pipes (including pipes for the installation of ER probes) were installed beneath Tank A in early October 2018 without Zerust Oil & Gas supervision. In mid-October 2018, Zerust Oil & Gas was notified that heavy rain fall had flooded the newly installed tank foundation, mixing rain water with the compacted sand. Lab reports were provided by a third-party contractor showing a higher level of contamination that was to be treated with an increased corrosion inhibitor slurry during the injection process. Prior to slurry injection, a visual inspection of the sand foundation was done by Zerust Oil & Gas and found to be mostly dry and in acceptable condition for corrosion inhibitor application. Corrosion inhibitor compound was applied as a slurry in February 2018 by the client/contractor. ER probes planned to be installed.

### Detailed Tank B Data Analysis

The Zerust Oil & Gas Drip Tube IDS pipes (including pipes for the installation of ER probes) were installed beneath Tank B in September 2018. In mid-October 2018, Zerust Oil & Gas was notified that heavy rain fall had flooded the newly installed tank foundation, mixing rain water with the compacted sand. Lab reports were provided showing a higher level of contamination that was to be treated with an increased corrosion inhibitor slurry during the injection process. Corrosion inhibitor compound was applied as a slurry in December 2018 by the client/contractor. At this time, one (1) ER probe was installed due to JSA and permit related issues/site constraints. Per communication with the client/contractor on 2/18/19, three (3) further ER probes shall be installed and data provided post-February 2019. ER probe data was submitted for analysis by the client/contractor 2/17/19.

### Detailed Tank C Data Analysis

The Zerust Oil & Gas Drip Tube IDS pipes (including pipes for the installation of ER probes) were installed beneath Tank C in September 2018. In mid-October 2018, Zerust Oil & Gas was notified that heavy rain fall had flooded the newly installed tank foundation, mixing rain water with the compacted sand. Lab reports were provided showing a higher level of contamination that was to be treated with an increased corrosion inhibitor slurry during the injection process. Corrosion inhibitor compound was applied as a slurry in December 2018 by the client/contractor. At this time, one (1) ER probe was installed due to JSA and permit related issues/site constraints. Per communication with the client/contractor on 2/18/19, three (3) further ER probes shall be installed and data provided post-February 2019. ER probe data was submitted for analysis by the client/contractor 2/17/19.



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### Data Analysis Results

The overall performance measured across the ER probe readings of all (3) tanks indicate good corrosion protection of the tank bottom. No remedial actions are suggested at this time. Zerust Oil & Gas suggests that data continue to be collected on a frequent basis and sent for analysis and inclusion in this report.

### Summary

All of the installed ER probes for which data was provided for analysis in this report indicate good corrosion protection of the tank bottoms for their specific tanks. No remedial actions are suggested at this time. A total of four (4) ER probes are suggested for installation beneath each of the targeted vessels.

Zerust Oil & Gas suggests that data continue to be collected on a frequent basis and sent for analysis and inclusion in this report. The ER probes currently installed are functioning well and their data show that the Zerust corrosion mitigation solution is working to ensure that there is a significant reduction in corrosion in the tank SSB spaces.