



Corrosion Engineering: Challenges in a Spaceport Environment

Internship Abstract

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Summary

The overarching theme of this internship at NASA's Kennedy Space Center (KSC) was corrosion engineering and control, a subset of materials engineering located under the NE-L4 branch. KSC, as a costal launch facility, is subjected to incredibly corrosive conditions in the form of high salt content from the nearby ocean, high temperatures and humidity, and frequent storms/hurricanes. As such, corrosion control is a vital part of operations here at KSC.

Projects

Corrosion Control Database

The largest project of this internship was the creation of a Corrosion Control Database. This database is a massive aggregate of results from KSC corrosion test reports dating back to the 1970s. Once finalized, it will be a complete and easily searchable database with the corrosion control effectiveness of hundreds of coatings, alloys, and protection techniques. This database will be invaluable to anyone at NASA or commercial space companies dealing with corrosion issues.

To accomplish this goal, a database template was created in Excel, and records from dozens of KSC research and evaluation reports were data-mined and transferred into the excel sheet. This was then given to a NASA IT team, who are currently working on creating a live database accessible from the internet.

Corrosion Website

A secondary project was a revamping of KSC's Corrosion Laboratory website. The current website is very outdated in terms of its structure, pictures, and information. It is in critical need of a major update. This was accomplished by inspecting the website and reviewing every page and link on the site, and making notes of outdated pictures and information. Several of the

articles were rewritten and condensed, and the website structure was overhauled. These updates and edits are being passed onto the NASA website team, who will perform the revisions.

Corrosion Studies

A third aspect of this internship was assisting the M&P team in running corrosion studies. Running these studies included understanding the background science and need for the testing, initial setup and maintenance, and photographically documenting test samples before, during, and after testing.

- **Stress Corrosion Cracking (SCC) Study**
 - Stress corrosion cracking is the development of cracks in metals exposed to corrosive environments. In this study, SCC test samples of 304 steel and Al 7075 were created and exposed them to low levels of tension. They were then placed in a salt spray chamber for 1000 hours. The samples were monitored the samples weekly, taking photographs, and performed a final inspection of the samples once the testing was complete. No evidence of SCC was seen.
- **Galvanic Coupling Study**
 - Galvanic coupling is when two dissimilar metals come into contact with an electrolyte solution (such as saltwater), which leads to debilitating corrosion. To study this phenomena, steel bolts were stripped of their protective coatings, then forced into contact with zinc plated steel panels. These panels were then deployed in a seawater immersion tank, seawater spray apparatus, and on a beach for atmospheric exposure. The samples are continuously monitored for corrosion, and the study is currently ongoing.
- **Immersed Coatings for recovery vehicles**
 - Currently, there is very limited data on the performance of common protective coatings in submerged seawater environments. In this study, several flat and welded (to simulate real world conditions) panels were coated with common protective coatings. After documentation, these panels were placed in a sea water immersion tank and a salt water spray apparatus. This study is ongoing, and the panels are being continuously monitored.