AFCPCO NEWS

US Air Force Corrosion Prevention and Control Office Newsletter May 2023

2023 Air Force Corrosion Technical Interchange Meeting

The 2023 Corrosion Technical Interchange Meeting (CTIM) took place 7-9 March 2023 at the Museum of Aviation in Warner Robins, GA. It was a great opportunity to network with Depot, MAJCOM, Engineers, Field maintainers, Corrosion Managers, and OEMs.

AFCPCO wants to thank all participants for making this a successful event with 348 attendees, 44 vendor booths from 38 different companies.

AFCPCO is grateful for your feedback, we will make sure to address some of your requests for the next one.

Please mark your calendars for March 2024, we look forward to meeting everyone next year!

Figure 1. MSgt Jeremy Horstman, Rob Madsen and Jeffrey Grenfell addressing Wing Corrosion Managers concerns during the WCM forum at the CTIM.

Figure 2. Audience during Ms. Angie Tymofichuk's (Deputy Assistant Secretary of the Air Force) briefing.

In This Issue

Common Observations during Corrosion Surveys

- The use of 2K polyurethane aerosols outside of corrosion control facilities without proper personal protective equipment or engineering controls
  - ⇒ **Recommend:** Procurement of brush-style touch up kits for sections with no qualified paint facilities (e.g. AGE, armament, avionics and AMUs).
- Unauthorized scouring pads utilized on aerospace components in back shops
  - ⇒ **Recommend:** use of melamine pads (NSN 6850-01-525-7684)
- Use of unqualified wash soap and unknown dilution ratio
  - ⇒ **Recommend:** Use chemical tote to dilute soap IAW Tech Data -> saves money on soap and prevents damage to coating system
- **Support equipment**
  - Missing paint blocks on repainted equipment
    - ⇒ **Recommend:** Review TO 35-1-3, para 3.5.2.2 for guidance
  - Ineffective implementation of corrosion prevention and control touch-up program
    - ⇒ **Recommend:** Use of CPC on bare metal areas IAW TO 35-1-3, para 3.13

Prevent, Mitigate, Destroy Corrosion

Did you know?

1) AFCPCO will assist to review and validate corrosion control facilities requirements for air and space assets' in accordance with UFC 4-211-02.

2) **Liquid Oxygen (LOX) Carts**

- TO 35-1-3, states "All 50 to 400 gallon liquid oxygen tanks shall be painted SAE-AMS-STD-595, green, No. 14187, in accordance with MIL-STD-101C, AFI 91-203 and the equipment specific TO."
- LOX cylinder green polyurethane coating (color 14187)
  NSN 8010-01-583-4774

Any questions or concerns email us to afcorr@us.af.mil.

Figure 3. Liquid Oxygen cart painted using the correct green color (#14187) observed at Dyess AFB.

Understanding MIL-STD-889D

GALVANIC COMPATIBILITY OF ELECTRICALLY CONDUCTIVE MATERIALS

1) How is MIL-STD-889D different from previous versions?

The first difference is in the title, previously it was simply “Dissimilar Metals”. The new title considerably expands the reach and impact since it now includes all “Electrically Conductive Materials” – not just metals, but conductive sealants, gap fillers, primers, gaskets, etc.

Previous versions of MIL-STD-889 were based on a table of the galvanic potentials of different alloys. The galvanic potential merely tells you which material will be cathodic (more noble) and which anodic (galvanically corroding); the galvanic potential difference is only a rough indicator of corrosion severity.

MIL-STD-889D is a paradigm shift, moving away from galvanic potential to galvanic current. The galvanic corrosion rate between two materials now depends on the electrochemical reaction kinetics, which are quantitatively found in their electrochemical Polarization Curves (current-voltage characteristics).

MIL-STD-889D provides a matrix of the calculated corrosion rates between materials based on their polarization curves. It is quantitative, but what it tells you, strictly, is the galvanic corrosion rate at the interface between equal areas of two galvanically dissimilar materials under a thick layer of artificial seawater. It quantitatively compares the corrosion performance of different materials, coatings, and treatments.

But if you need to know the actual corrosion rate of a component in an assembly you must carry out a 3D computation based on the CAD file of the assembly. To simplify this effort CPCO is developing a Toolset which integrates corrosion data obtained from Corrosion Djinn and modeling capabilities provided by STAR-CCM+ with templated geometries constructed in Teamcenter (Figure 4). This approach provides the DoD with a widely deployable computational toolset that would give Material & Processes (M&P) and Corrosion Engineers the capability to quickly assess galvanic compatibility and corrosion risks and help accelerate implementation of sustainment solutions. Identifying corrosion problems early and assessing impacts from proposed solutions quickly ultimately would mitigate corrosion costs and lessen system availability impacts. The toolset allows the engineer to quickly assess corrosion risks due to material and geometry changes as well as changes to moisture film thickness (Figure 5).

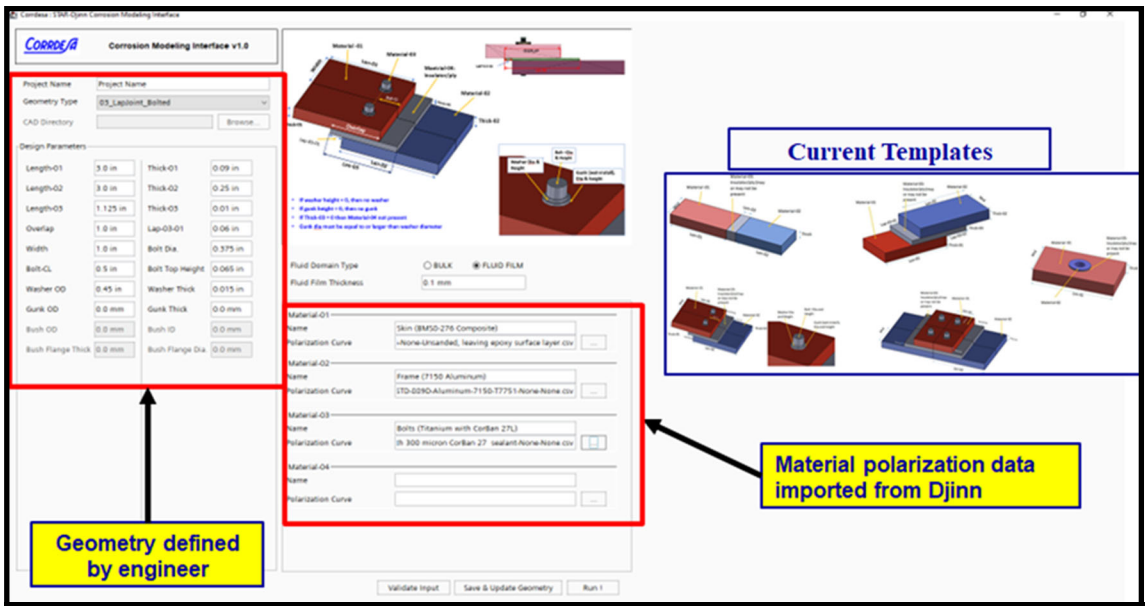

Figure 4. Predefined 3D templates within the Toolset used for galvanic compatibility assessments.

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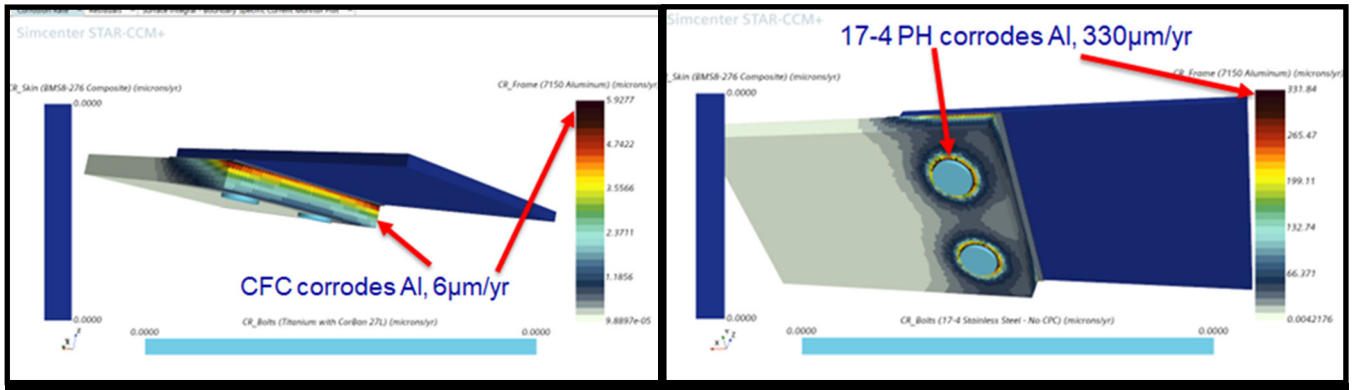

Figure 2. Demonstrating how changing fastener material from Titanium to Stainless Steel and removing CPC on fasteners increases corrosion rate over 50X and changes primary corrosion location.

2) Why is this important to the USAF?

It is estimated that more than 80% of aircraft fatigue cracks, including both USAF and NAVAIR aircraft, are initiated at flaw sites caused by galvanic corrosion. Improving our understanding of galvanic compatibility of "Electrically Conductive Materials" – not just metals, but conductive sealants, gap fillers, primers, gaskets, etc., will result in reduced operating and sustainment cost and non-mission capable (NMC) hours due to corrosion, enhancing warfighter capacity.

The toolset capability has been demonstrated and presented at SAE International and DoD Corrosion Symposiums. CPCO is collaborating with Navy Research Labs (NRL) submitting a proposal to Office of Secretary of Defense (OSD) to fund further development and deployment of the toolset.

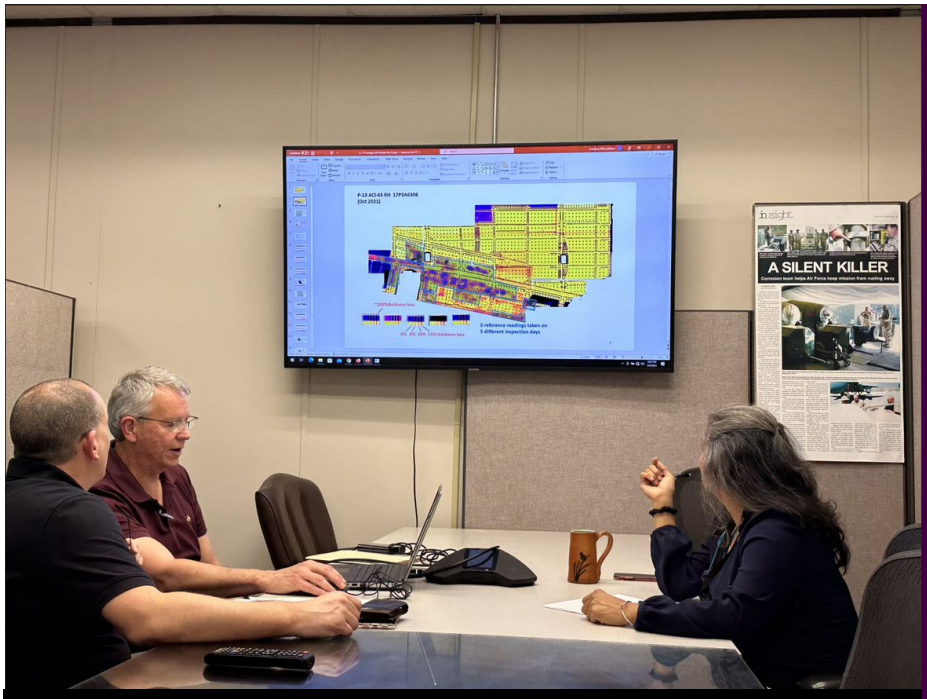

Figure 5. Dave Peth and Monali Patel (AFCPCO) demonstrating the corrosion modeling tool capabilities to a Navy Research Laboratory member.

Contact Us

Send us an email with any questions, concerns, or suggestions.

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Corrosion and material degradation never sleep!