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## **SALT-FOG TESTING OF ECK ON PAINTED AND UNPAINTED ALUMINUM SUBSTRATE USING STAINLESS STEEL HARDWARE**

### **INTRODUCTION**

There has been a long history of accelerated corrosion problems between dissimilar metals, especially those metals used in the making fire trucks and ambulances. The metals used for these applications are Aluminum (used for the bodies) and Stainless Steel (used for the fasteners). This combination has shown a high rate of fastener corrosion and paint failure in the field due to the conductivity of the dissimilar metals allowing for an increase in electrochemical reactions and in increase in cathode cells causing galvanic corrosion.

In this experiment, the interest is seeing if ECK will control galvanic corrosion because of its ability to prohibit electrolytic corrosion between dissimilar metals.

### **EXPERIMENTAL**

#### **Materials and Samples**

The panels used in this experiment were 6" X 8" X 1/8" polished aluminum. Half of each panel was painted with two-component alkyd modified paint and the other half of the panel was in its natural state, leaving two 3" X 8" test areas for each panel. Each test area of the panels was fitted with Stainless Steel hinges using three separate hardware types. The three hardware types were: 3/16" Stainless Steel bolt and wing nut; 1/4" Stainless Steel screw; and 1/4" Stainless Steel bolt. Three of the panels fitted with hardware used not protection. Three of the panels fitted with hardware used ECK.

#### **Instrumental Methods**

All the panels mentioned above were exposed according to the American Standards Testing Method (ASTM B117) Standard Test Method of Salt Spray (Fog) Testing. The testing apparatus was a Singleton Salt-Fog Cabinet – Model 21. All the panels were exposed at the same time for a continuous 400 hours. The panels were then taken out of the salt spray cabinet, washed with water, the fasteners loosened, and the hardware and panels were evaluated.



## RESULTS

### Panel #1 (Natural – no ECK)

PAINTED – Some rust was found on the hinge. Some rust was found on the screw.

Could not remove wing nut bolt.

UNPAINTED - Substrate was heavily corroded. Some rust was found on the hinge.

Some rust was found on the bolt and screw.

### Panel #2 (prepared with ECK)

PAINTED – No corrosion of hinge or fasteners. Could remove wing nut by hand.

UNPAINTED – No corrosion of hinge or fasteners. Could remove wing nut by hand.

No corrosion of substrate where ECK had remained between the hinge and substrate.

### Panel #3 (natural – no ECK)

PAINTED – Some rust was found around the screw holes of the hinge. Some rust was found on the screw.

UNPAINTED - Substrate was heavily corroded. Some rust was found around the screw holes of the hinge. Rust was found on the bolt, screw and wing nut assembly.

### Panel #4 (natural – no ECK)

PAINTED – Some rust was found around the screw holes of the hinge. Some rust was found on the screw.

UNPAINTED - Substrate was heavily corroded. Some rust was found around the screw holes of the hinge. Rust was found on the bolt, screw and wing nut assembly.

### Panel #5 (prepared with ECK)

PAINTED – No corrosion of hinge or fasteners. Could remove wing nut by hand.

UNPAINTED – No corrosion of hinge or fasteners. Could remove wing nut by hand.

No corrosion to the majority of substrate where ECK had remained between the hinge and substrate.

### Panel #6 (prepared with ECK)

PAINTED – No corrosion of hinge or fasteners. Could remove wing nut by hand.

UNPAINTED – No corrosion of hinge. The bolt had a small amount of corrosion. Could remove wing nut by hand. No corrosion to the majority of the substrate where ECK had remained between the hinge and substrate.

## **CONCLUSIONS**

ECK drastically reduced or stopped the galvanic corrosion of the Stainless Steel hinge and Stainless Steel fastener hardware in conjunction with an Aluminum substrate (painted or unpainted). When applied properly with a thick enough film thickness, as seen by the unpainted corrosion results between Aluminum and Stainless Steel, ECK will drastically reduce or stop the galvanic corrosion between dissimilar metals. ECK gave additional properties of acting like an Anti-Seize agent on the screw, nut and wing nut assembly fasteners.