MEASUREMENT INFORMED SIMULATION IMPROVES CORROSION RISK ASSESSMENT

BEASY
INNOVATIVE SOLUTIONS

ACUITY
corrosion technology

MILITARY AIRCRAFT OFTEN OPERATE IN HARSH, SALT-LADEN ENVIRONMENTS

WHY DO WE NEED A GALVANIC MANAGEMENT TECHNOLOGY?

Aircraft operations often result in exposure to harsh, salt-laden environments and high corrosivity events. Although robust designs, materials, sealants, and corrosion protective coatings are used, corrosion is still a persistent maintenance concern that increases costs, reduces aircraft utilization, and presents a structural integrity risk.

Furthermore, the substitution of REACH regulated substances used for corrosion protection presents risk of increased corrosion, stress corrosion cracking (SCC), and corrosion fatigue (CF) of critical components. Most corrosion damage initiates at galvanic interfaces where dissimilar materials are used in the design of structural joints.

To address these challenges, advanced simulation tools to predict galvanic corrosion severity and environment assisted cracking of multi-material structures have been established.

These simulation tools utilize material property data and environmental parameters for prognostic assessments that have been validated using novel corrosion and coating performance measurements.

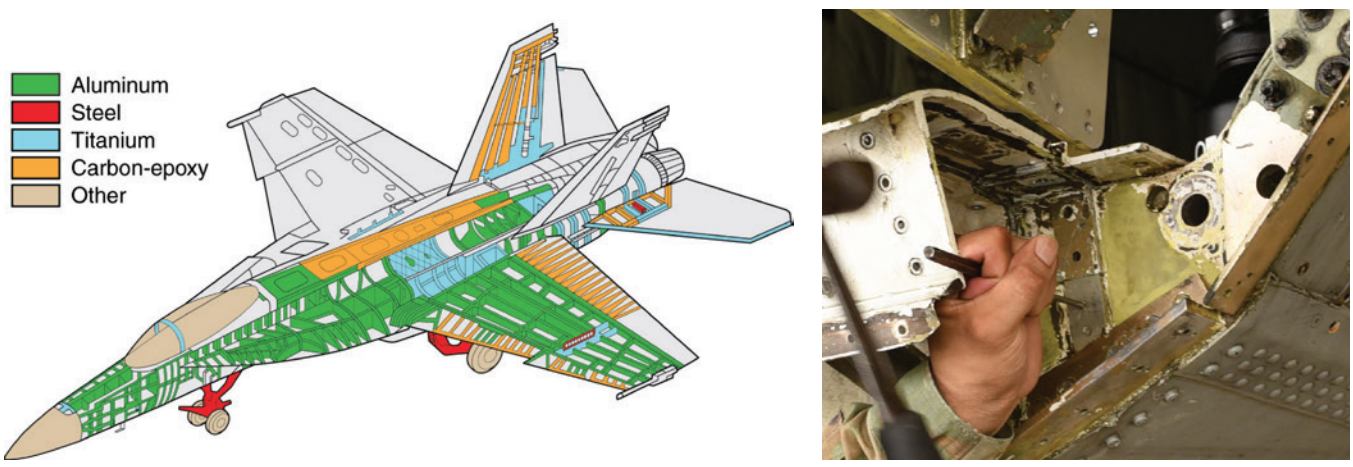


Figure 1: Dissimilar metal aircraft joints are prone to corrosion damage

TACKLING CORROSION RISK: AN INTEGRATED SOLUTION

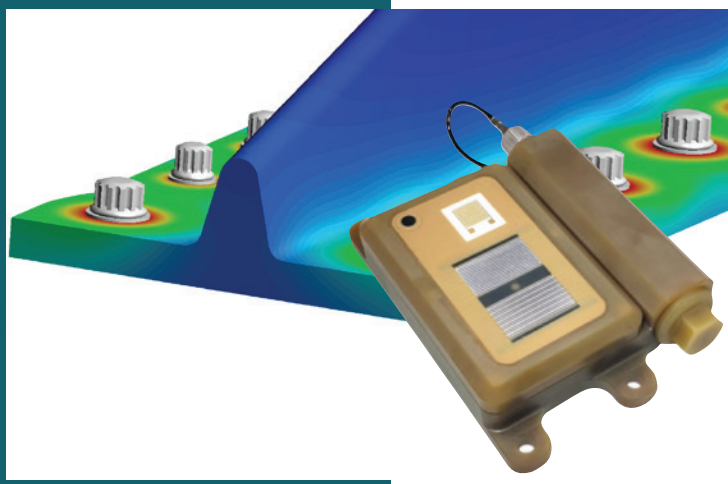
BEASY and Acuity™ have collectively developed new solutions to improve corrosion risk assessment.

Our innovative approach includes the synergistic use of environment and corrosivity measurements along with predictive simulation tools to help our customers better understand and mitigate the risk of corrosion related damage.

The goal is a more durable design with better in-service performance; as a result, maintenance costs are reduced, and asset availability improved. More accurate simulation models are achieved by data characterizing the electrolyte film on component surfaces and corrosion reactions taking place in different service environments.

Our combined technology and knowledge allow us to measure the environmental conditions, process the data to derive realistic simulation model inputs, and predict the spatial distribution of corrosion severity for a structural component.

COMBINING DYNAMIC MEASUREMENTS WITH PREDICTIVE SIMULATION CAN MITIGATE CORROSION RISK



ENVIRONMENT AND CORROSIVITY MONITORING

Acuity measurement systems have been developed and demonstrated for quantifying environmental conditions, corrosion damage, and coating degradation in laboratory tests, marine exposures, and on-aircraft evaluations.

Environmental severity is primarily dependent on contaminant deposition and moisture. Measurements of important environmental parameters are incorporated in Acuity corrosion and coating performance measurement devices that are compliant international standards[1].

[1] *ISO 22858, and AMPP TM21449*

These measurement systems also include electrochemical measurements of self-corrosion and galvanic corrosion rate using sensors fabricated from aerospace alloys and materials. By leveraging real-time electrochemical and environmental measurements, the Acuity devices can be used in the laboratory, at specific locations, and on-board assets to record key features and evolution of corrosion and coating degradation.

The knowledge gained from the measurements forms the basis for model development and validation that can be used to influence corrosion management.

MEASUREMENT OF COATING DETERIORATION

The Acuity devices are also capable of monitoring environmental conditions, barrier properties, and corrosion to track the progression of coating system failure.

Coating impedance is used to assess barrier properties of the coating system while self-corrosion and galvanic corrosion at a coating defect are used to quantify the inhibitor performance and resistance to blister formation and growth. Using Acuity measurements, the relationships and effect of environmental conditions with time on the progression and ultimate failure of coating systems are determined.

MEASUREMENT SYSTEMS CHARACTERIZE COATING LIFETIME OF CHROMATE AND REACH-COMPLIANT ALTERNATIVE COATING SYSTEMS

These measurement systems have been used to characterize coating lifetime of chromate and REACH-compliant alternative coating systems. These data support the use of environmental parameters for modeling coating protection performance for aerospace alloys and galvanic couples.

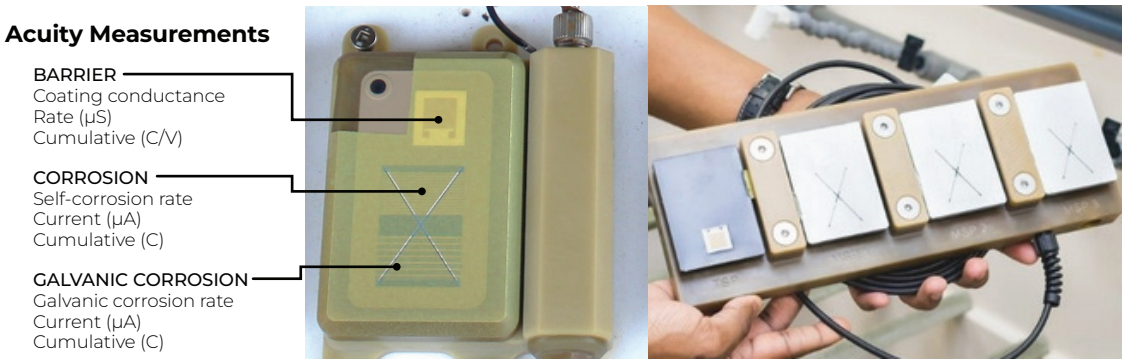


Figure 2: Acuity measurement systems have been used to characterize coating lifetime of chromate and REACH-compliant alternative coating systems

LEARN MORE ABOUT USING REAL-TIME ENVIRONMENTAL MEASUREMENTS TO IMPROVE YOUR CORROSION MODELING

TO ACCESS THE FULL PAPER, COMMENT OR EMAIL:

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Working together on the R&D front for a number of years BEASY & Acuity have developed a unique blend of expertise to solve some of the world's most challenging corrosion problems.

Uniting our complementary approaches, products, and knowledge, we enable our customers to dramatically improve the way they design and manage their assets.

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