A VEXTEC CASE STUDY: **Accelerated Testing of Aerospace Structures for Corrosion Evaluation**

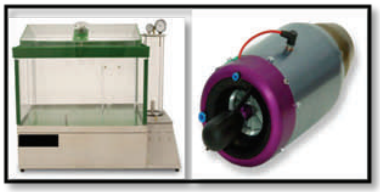

Figure 1: Left is a conventional "static" test chamber. Right is VEXTEC's dynamic small turbine test engine used in the corrosion test stand configuration.

OVERVIEW

The cost of corrosion in the United States is estimated at nearly $300 billion according to CorrDefense, the DoD's consortium on corrosion prevention and control. This is a costly problem for both military and commercial industries; however, current testing methods still inadequately represent field conditions and can be overly time consuming ranging from 4 months of lab tests on specimens to 5 years of corrosion sensor testing on fielded aircraft structures.

The most common lab testing procedures rely on submitting a static test coupon or material specimen to a corrosive environment in an enclosed structure. These tests fail to recreate the dynamic environments encountered by real world airframe structures such as high velocity airstream, extreme high temperatures, and applied dynamic stress. Furthermore, these tests often rely on artificial defect initiation methods to initiate and accelerate corrosion propagation.

Other methods rely on the use of corrosion sensors placed on operating structures, which are able to address the effects of real operating environments on materials and coatings; however, these in-service tests can be very costly and take up to five years to complete. This extensive time to collect usable data often yields results too late in the structure or components life cycle.

THE SOLUTION

Alternatively, VEXTEC's small turbine engine testing services are cost effective and proven matching temperatures and the complex operational characteristics true to the real world environment that aerospace structures are subject to everyday. Materials can be submitted to the forces and environment similar to an actual full-scale operating structure. Through the use of small turbine testing (figure 1), VEXTEC can produce operating data equivalent to 10 years of fielded service within a 90 day timeframe.

THE TEST CONFIGURATION

In a proof of concept test, VEXTEC demonstrated the small turbine's capability to achieve a representative operating environment for testing material specimens frequently used in aerospace structures with a salt fog contaminate. Results were obtained in under 50 hours of testing. The test stand configuration included a small turbine engine, a ram jet cooling system forward of the engine and a second cooling air system just forward of the test nozzle which housed the structure specimens.

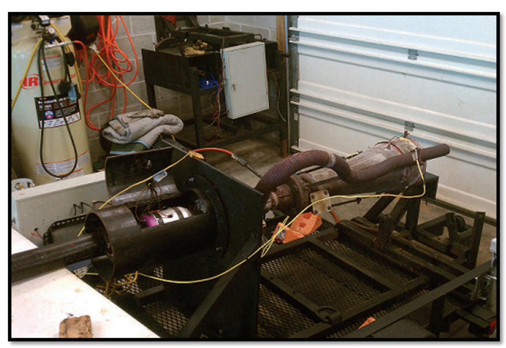

Figure 2: Actual test rig configuration used in salt fog corrosion test.

MORE>

THE TEST CONFIGURATION *(cont.)*

This configuration allowed for control of the temperature at various locations of the test rig which averaged 203.5° F and the solution flow rate was approximately 14.92 gallons per hour. Four different common aerospace structure materials were subjected to the salt fog contaminate in the test rig. They were Steel 4130 & Steel 4142, and Titanium 64 & Titanium Grade 2.

THE RESULTS

The test was conducted over a seven day period and the completed total test time of the specimens on the rig was 48 hours and 30 minutes. Figure 3 shows the pristine specimens before the test was performed. Figure 4 shows the four specimens at the conclusion of the test immediately before cleaning & inspection.

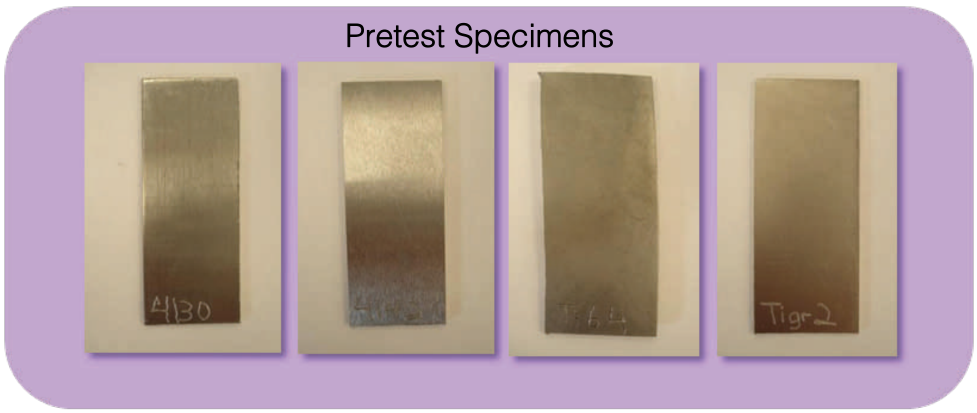

Figure 3:: Specimens pretest from left to right: Steel 4130, Steel 4142, Titanium 64, and Titanium Grade 2.

Figure 4: Specimens post test from left to right: Steel 4130, Steel 4142, Titanium 64, and Titanium Grade 2.

ABOUT VEXTEC

VEXTEC accurately, efficiently and economically predicts the performance, durability and true lifetime cost of a single component or an entire fleet—before they're ever built. Founded in 2000, VEXTEC has pioneered and patented innovations that create a computational framework that forms the foundation of its Virtual Life Management (VLM) technology. Forward thinking manufacturing companies in aerospace, heavy equipment, automotive, electronics, energy and medical implants are benefiting from VEXTEC's unique ability to predict product life cycle reliability and failure, and most importantly, their financial consequences. To learn more, visit www.vextec.com.