Gas Turbine Components Life Extension Clinic

Mechanical Dynamics & Analysis (MD&A) now offers gas turbine components life extension through its integration of PW Power Systems IGT division based in San Antonio, Texas.

We can extend the service life of parts whose OEM service limit has passed or whose configuration is no longer suitable to operate. Significant savings can be realized by opting for lower-cost repaired spares instead of new parts.

Elevated temperatures take a big toll on gas turbine components. Repair enhancements can extend a part's life by slowing its degradation and pushing out its usable service life.

Formerly PW Powers Systems' IGT division, the MD&A San Antonio Service Center experts have years of experience evaluating the life limiting factors for gas turbine vanes or blades. Such factors include cracks, corrosion, wall thickness, and material condition. Most cracks are located at the platform or shroud. Smaller percentages occur at the blade tip, the blade airfoil, or the root.

Platform degradation can be reduced in many ways: by operating in base load only (even though dispatch conditions may prevent that from being a practical solution), by pursuing a robust platform weld repair program, by undertaking TBC coating systems, and by making platform improvements.

Thermal mechanical fatigue cracks will eventually lead to platform failure. Design modifications often are required, incorporating a robust repair procedure. The life cycle enhancement process used by our experts exceeds OEM platform properties.

Our experts at the San Antonio Service Center combine years of experience with state-of-the-art equipment to deliver exactly the right solutions to you!

9FA 3RD STAGE BLADE EXTENDED TO 120,000 FFH

9FA 3rd stage blades were received by our San Antonio facility where they underwent detailed inspections, including microstructural assessment and high-temperature testing.

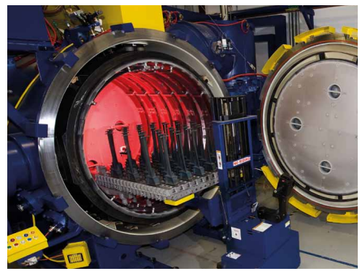
Observations indicated galling in root serrations and seal pin surfaces, as well as the presence of two distinct casting houses to produce the row of buckets.

Scope of work included a visual inspection, dimensional measurements, and an x-ray inspection. Also included were a microstructural assessment, high-temperature mechanical properties testing, assessment of material condition at multiple locations, heat treatment of specimens to demonstrate the effects of repairs, and high-temperature mechanical property testing performed post-heat treatment.

Inspections showed that the manufacturer's heat treatment did not achieve full solutioning. All blades also displayed a two-phase gamma prime structure within each grain, indicating that the previous repair heat treatments were not optimized to achieve a good structure. In addition, the blades had surface oxidation and depletion. Even so, the components all were deemed repairable.

Additional repair work included grit blasting and polishing the gas path surfaces to remove an oxide layer, a complete X-ray inspection, and HVOF coating and diffusion to reduce surface degradation.

Repair heat treatment was applied to several samples from the test blades. Our experts utilize a vacuum heat treat furnace, where we control the heating and cooling of metals to alter their physical and mechanical properties.



The test blades were evaluated to determine the material's response to the heat treatment. The material responded well to the heat treatment on the blades. The primary gamma transformed to a more cuboidal morphology, which provides for improved component creep life.

In conclusion, our experts evaluated each component in the as received condition and in the post repair heat treated condition. These third stage blades were evaluated and subsequently determined to be candidates for a Life Time Extension (LTE) repair.

Once established as candidates for Life Time Extension, our Experts employed repair practices to further extend the useable life of the components and the 9FA 3rd stage blades' lives were extended to 120,000 FFH.

V94.3A4 2ND STAGE BLADE EXTENDED TO 75,000 EOH

A V94.3A4 2nd Stage Turbine Blade set had 50,000 EOH and operated through two service intervals, along with one repair performed by the OEM at 25,000 EOH.

Our San Antonio service center experts performed testing and evaluation on the blade set to determine if the hardware is deemed repairable and serviceable for another interval, as well as, evaluation of the previous repairs.

One 2nd Stage Blade tested in the as received condition had an internal and external Coating Evaluation, along with a mechanical properties & metallurgical properties inspection.

The other 2nd Stage Blade was evaluated in the post heat-treat condition with a mechanical properties & metallurgical properties inspection, and then evaluation of metallurgical results. The heat-treated part was then evaluated for reparability.

Our experts performed a pre-weld heat treatment, post-weld heat treatment, and a diffusion or aging heat treat solution utilizing our vacuum heat treat furnace in our shop.

The external TBC appeared in good condition. However, the blade tip has significant oxidation. This is most likely due to the weld wire selected during the previous repair. All other inspections were normal.

One heat-treated blade's metallurgical properties were then evaluated and compared to the other blade in the as received condition. The evaluation confirmed that the heat treatment process will heal and improve the gamma prime structure.

Based on all the evaluation performed on the two 2nd Stage turbine blades, our experts considered that the full set is a viable candidate for life extension to 75,000 EOH.

The measurements of the blade tip cap indicated that there was sufficient material to perform a successful weld build up repair, so they removed most of the previous weld repair. Because of heavy oxidation on the blade tip, an oxidation resistant alloy was used. Our weld repair procedure has demonstrated to provide excellent oxidation resistance during operation.

A coating system consisting of a NiCoCrAlY applied by HVOF and a TBC top coat was applied with our propriety coating. The V94.3A4 2nd Stage Blades' lives were extended to operate to a total of 75,000 EOH.

Our San Antonio Service Center, or Gas Turbine Parts Service Facility, exemplifies best in service because of the deep experience in industrial gas turbine engineering and technology, repair techniques and equipment, and proven expertise on multiple frame gas components.

MD&A's available Gas Turbine services range from full turnkey major inspections, to rotor unstacking, gas turbine alignment, and control systems troubleshooting services.

MD&A is a global full-service OEM alternative for services, parts, and repairs. Call our MD&A Gas Turbine Services today at +1-518-399-3616 or visit our website ***www.mdaturbines.com***