

FINITE ELEMENT ANALYSIS

MD&A Turbine-Generator Repair Facility

Mechanical Dynamics & Analysis leads the industry with computer engineered solutions for your turbine problems. Our in-house Finite Element Analysis (FEA) system allows us to accurately model turbine components—to determine the cause of the problem—as well as evaluate repair solutions. We typically evaluate the effects of operation on casings, rotors, blading, valves, horizontal joints and bolting.

Answers All Your Turbine Questions:

FEA is the key to MD&A's turnkey repair program. The results of an FEA quickly and accurately answer typical questions you may have regarding your turbine.

Remaining Life Analysis:

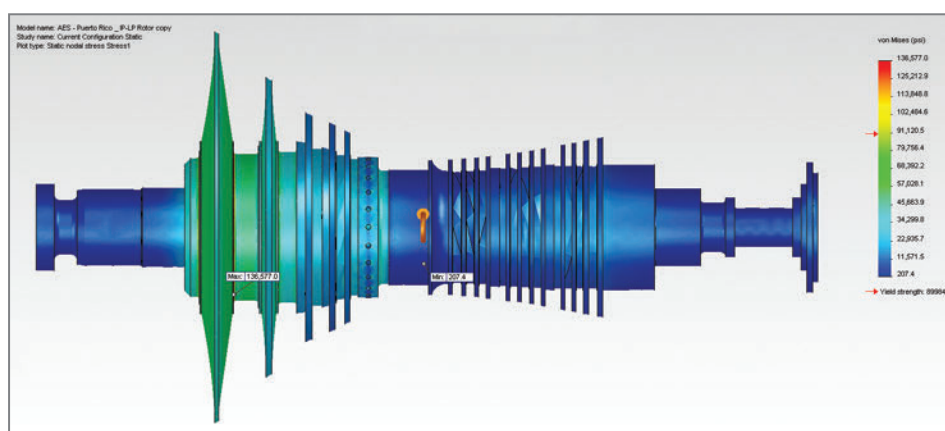
What is the remaining useful life of my turbine components?
How long will the repairs last?

Failure Analysis:

How and why did the component fail?

Design Analysis:

What design upgrades are feasible? Are there any weaknesses in the original design? How can we remove the distortion? What is the best stress relief cycle?



FEA Process

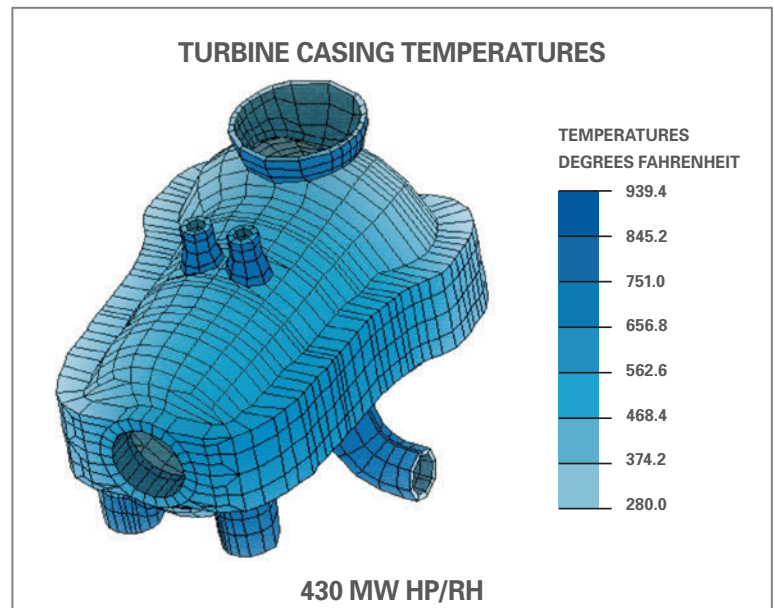
To perform an FEA, MD&A's engineers input basic dimensions of the component, material properties and operating data. In most cases, the turbine does not need to be disassembled. Calculations realistically include the effects of and changes in pressure, temperature, thermal expansion and other mechanical forces during operation. FEA models have ranged in size from a small bolt to a 200,000 lb. turbine casing.

FEA Results

An engineering review of the data output allows MD&A's engineers to answer all questions relating to remaining life, failure analysis and design analysis. With these answers, MD&A can then adapt its repair solutions to prevent reoccurrence of the problem. FEA also allows MD&A's engineers to evaluate potential improvements that may result from changes in operation. These hard facts remove the guesswork from solving turbine problems. By combining MD&A's state-of-the-art FEA and proven repair procedures... you get the best solution... guaranteed to keep your turbine on-line.

FEA Benefits

- Determines turbine causes of failures and prescribes corrective, cost-effective solutions.
- Accurately verifies turbine life expended to date and remaining life to assist in maintenance planning.
- Provides realistic modeling of component material properties and geometrical movement.
- Calculates turbine casing stresses, analyzes heat transfer.
- Projects stress levels in repairs and modifications before they are performed.
- Eliminates guesswork in solving turbine operation and maintenance problems.
- Assures that repairs are successful and helps to prevent problems from reoccurring.
- FEA can be purchased as part of MD&A's complete turnkey repair program or as a separate service.



MD&A TURBINE-GENERATOR REPAIR FACILITY

3804 Weber Road • St. Louis, MO 63125 • Ph: 314-880-3000 • Fax: 314-638-3473 • www.MDAturbines.com