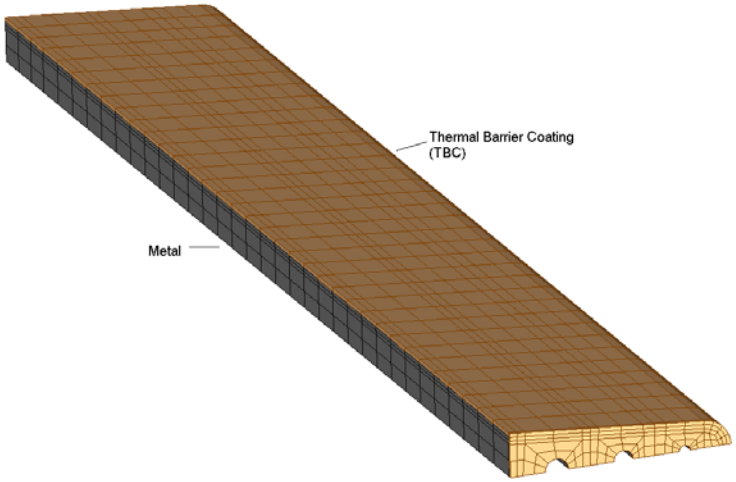
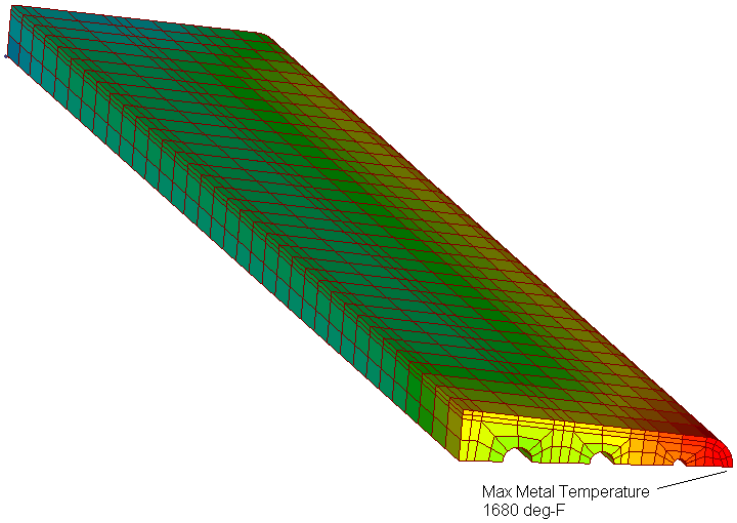
Mechanical Case Study (J. C. Banks Construction, LLC – W501F IGT Turbine Blade)





Julio C. Banks from J. C. Banks Construction LLC worked on a steam turbine blade project for a client that urgently needed a thermo-structural analysis completed in a matter of three (3) days.

The client fabricated approximately 49 turbine blades of an Industrial Gas Turbine (IGT) without the consent of the power plant owner. The trailing-edge cooling holes of the first-stage turbine of a power generation turboshaft engine were to be reduced by approximately 20% in the aftermarket model as compared to the OEM design, but the owner refused to take the modified-blades order unless it was substantiated with a thermo-structural analysis.

The area reduction was required so that future refurbishment could proceed with a minimization of the trailing cooling path inadvertent destruction. The adverse effect of the area reduction was estimated to be approximately 300 degrees Fahrenheit increase of wall temperature. Furthermore, the yield strength was predicted to be reduced by 5%.

Julio used FEMAP and NEi Nastran for this project. He was able to quickly produce the geometry using hex elements and define steady-state convection boundary conditions simulating real world coolant flow over the turbine blade. The analysis proved that a 20% reduction in coolant cross-sectional flow area results in a corresponding coolant flow which also produces an increase of 300 degrees Fahrenheit metal temperature directly under the TBC (Thermal Barrier Coating). The analysis results showed a 5% decrease in yield strength of the material, which is considered negligible for the temperature range specified from the OEM. These conditions and the aftermarket modification were in the end accepted by the power plant owner.

The heat transfer analysis within NEi Nastran proved to be an invaluable tool when time was of the essence, and peace of mind as well as precise results were desired. Having used the software for over 14 years, Julio believes that “NEi Nastran is a truly reliable software allowing him to make a commitment to his aftermarket consulting client.”

NEi Software, Inc. is aggressively focused on commitment to the customer. Detailed documentation, customized on-site training, and comprehensive technical support ensures that you will see immediate return on your investment.

For more information about our company or our products, please contact:

Headquarters:

NEi Software, Inc.
5555 Garden Grove Blvd., Suite 300
Westminster, CA 92683-1886
USA
Phone: +1.714.899.1220
Fax: +1.714.899.1369
Email: info@neisoftware.com
Website: www.NEiSoftware.com

Europe:

NEi Software EMEA Office
The Old Barrel Store
Draymans Lane, Marlow
Buckinghamshire, SL7 2FF
United Kingdom
Phone: +44.0.1628.400.645
Fax: +44.0.1628.891.701
E-mail: emea@neisoftware.com
Website: www.NEiSoftware.com/emea

Asia:

NEi Software Asia Office
Shinjuku Park Tower
N30th Floor 3-7-1 Nishi-Shinjuku
Shinjuku-ku, Tokyo, 163-1030
Japan
Phone: +81.03.5326.3062
Fax: +81.03.5326.3001
E-mail: asia@neisoftware.com