VOLUME 7, ISSUE 1 DANTE SOLUTIONS, INC. NEWS JULY, 2018

DANTE TIMES

DANTE Solutions had a successful IFHTSE 2018 Conference in beautiful Spartanburg, SC on June 5-7 2018 and CHTE/ACRC meeting at Worcester Polytechnic Institute in Worcester, MA.

- DANTE staff gave 1 talk at IFHTSE on designing low pressure carburization schedules for high alloy steels using computer modeling. Click on this LINK to read the paper.
- DANTE Solutions also participated in the Residual Stress Workshop at IFHTSE, sharing their unique perspective and expertise on the subject.
- Kept current customers and collaborators updated with Dante's latest advancements in heat treatment modeling, and provided insights to future customers.

Quick News:

- Along with helping customers solve critical heat treating issues, DANTE is also involved in several industry focused research projects to help the heat treating industry further their understanding of complex issues:
  - Residual stress relaxation
  - LPC of high alloy steels
- Continue to develop a nitriding module for the DANTE software
- Continue to develop a precipitation model for carbide formation during carburizing and secondary hardening
- Charlie Li continues to educate the next generation of engineers in materials and manufacturing processes at Cleveland State University

DANTE Project Updates

DANTE Solutions, in collaboration with Atmosphere Engineering and Akron Steel Treating, designed an innovative gas quenching unit to minimize component distortion during the hardening process. The DANTE Controlled Gas Quenching (DCGQ) unit is capable of quenching single components following a time-temperature schedule designed for a specific component and steel alloy using the DANTE software.

Mechanical & Fatigue testing is currently underway to compare the DCGQ process to standard HPGQ of high alloy steels. The current steel under investigation is Ferrium C64.

Upcoming DANTE Solutions meeting

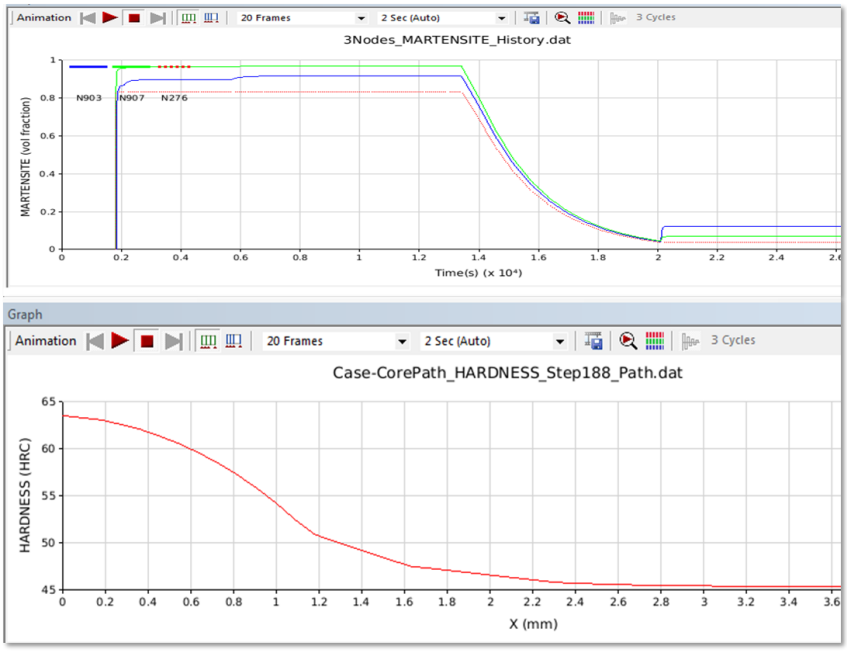
DANTE will attend ACRC / CHTE Joint Fall Meeting on December 4-5, 2018 at WPI / CHTE

DANTE Software Updates

DANTE Solutions continues to make improvements to the version of the DANTE software linking to ANSYS. The latest includes 2 post processing tools to help visualize the heat treating process.

History Plot: Plot the time histories of any variable for any number of given nodes in the part.

Path Plot: Plot any variable over a given path within the part.



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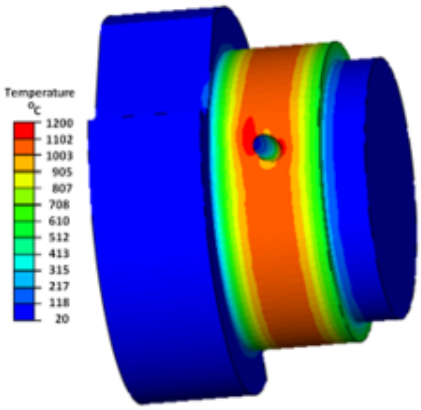
Since 1982 we have provided engineering services to the metalworking industries, and for over 30 years we have focused on thermal processing. Our range of services has expanded to include several software products, with our DANTE software being the premier package in the world for modeling heat treatment of ferrous parts. In recognition of this, we re-branded ourselves as Dante Solutions, Inc. in January, 2014.

While we use computer analysis tools for most of our work, we are much more than analysts using computer software tools. Our staff includes experts in mechanical and metallurgical engineering. Let us help you improve your heat treatment and deformation processes, use new materials, and develop new products.
For more information, contact us.

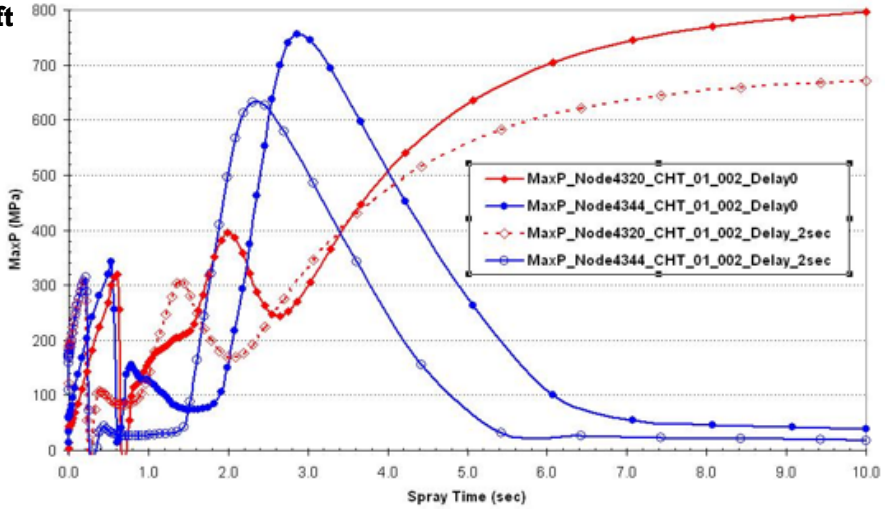
support@dante-solutions.com

Project Highlights

Induction Hardening of Crankshaft with Special Focus on the Oil Hole



Temperature Distribution Showing Nonuniform Temperature Around Oil Hole.



Comparison of Maximum Principal Stress at Two Locations Showing the Benefit of Quench Delay.

Problem Statement:

Cracking at oil holes on pin and main bearing sections of crankshafts during induction hardening occurs due to thermal stress during spray quenching. The problem arises due to the angle of the hole and the nonuniform mass distribution.

Process Description:

The nonuniform heating condition from an induction heating model is mapped into DANTE. Spray quenching is modeled and the resultant thermal stresses and phase changes are predicted. The process cycle and spray application were adjusted to reduce in-process stresses.

Solution:

A delay between the end of heating and the start of quenching was proposed based on modeling results showing the thermal diffusion into the core had a significant effect. An optimal time was then determined using the DANTE software and applied to the

Benefits:

Thanks to modeling, a process change solved the cracking problem that trial-and-error tests had failed to do!