Wishing Everyone Good Health

DANTE Solutions would like to wish everyone and their families health and well-being as the world continues to battle the COVID-19 pandemic. There is nothing more important during these troubling times than family. We would also like to thank all of the first responders and those on the front lines for their continued effort in helping to keep us safe and healthy.

We all need to be mindful of our neighbors and take care of each other during these trying times. DANTE Solutions has also been doing its part to help keep our employees, their families, and our community safe. We implemented a work from home policy for all DANTE employees that went into effect March 23rd. During that time, DANTE Solutions has remained open during normal business hours. We have continued to work on projects, support our customers, conduct DANTE training, and field new sales and consulting inquiries. We also offered existing customers temporary DANTE licenses to run the DANTE software on home computers.

Quick News:

- Congratulations to Dan Londrico and Stefan Habean. They graduated from the Mechanical Engineering Masters program at Cleveland State University.
- Congratulations to Jason Meyer for earning his Bachelor of Science in Mechanical Engineering from Cleveland State University.

From left to right: Dan Londrico, Jason Meyer, and Stefan Habean with their poster from the Heat Treat Society 2019 Conference. All three began at DANTE as interns, before transitioning to full-time employees. Dan started his internship in May 2017 and joined us full time in the summer of last year after graduating with his Bachelor in Mechanical Engineering from Cleveland State University. Jason started as an intern in January 2018 and joined the staff full-time this summer. Stefan started his internship in January 2018 and became a full-time employee with Dan in the summer of 2019. All three are extremely hard workers with a great attention to detail. Dan and Stefan both bring considerable programming skills to the table. They have been paramount in the continued development of the DANTE software and our Utility tools.

Stefan's focus has been on the ACT for ANSYS and our new Plug-In for ABAQUS. His development of the Plug-In has brought an ease of use to our ABAQUS users not seen before. He is currently working on bringing new functionality to both. He also takes part in consulting jobs, training, and support activities. He is responsible for communicating with our representatives in India, Turkey, Brazil, and Ukraine.

Dan has mainly been focused on developing graphical user interfaces (GUIs) for our Utility tools. When Dan first arrived at DANTE, all Utility tools were executed from command windows and results were plotted using Excel. It was a tedious process to say the least. Dan's work has combined the pre-processing, execution, and post-processing into a simple to use package. He also participates in consulting jobs, training, and support activities. He is our main trainer for the Utility tools TTT Generator, VCarb, GCarb, and MatSim. He is responsible for communicating with our representative in Mexico.

Jason brings a solid mechanical background to DANTE. His main focus has been on the consulting side of the business, training customers on DANTE, and support. He is also responsible for our marketing activities.

Software Highlights

DANTE 5.0 IS NOW LIVE!

DANTE Solutions, Inc. is pleased to announce the release of DANTE 5.0, the most advanced heat treatment simulation software from DANTE Solutions. Included in DANTE 5.0 are several new features designed to describe the physics of steel heat treatment more accurately; they include:

- Carbon Separation Model
- Carbide Decomposition Model
- Residual Stress Relaxation Model
- Alloy Composition Variation Modeling
- Liquidus/Solidus Latent Heat Model
- Abaqus Plug-In
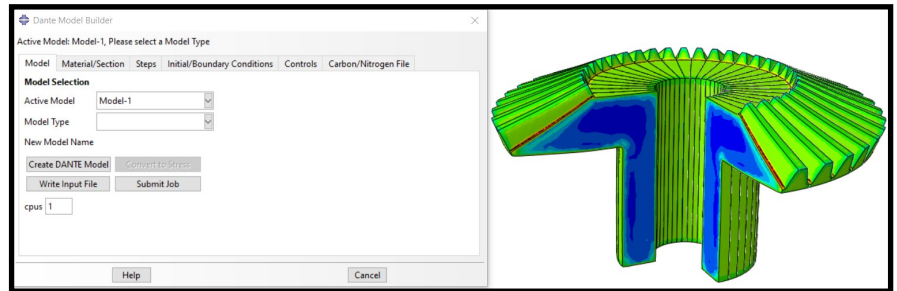
DANTE Plug-In is shown on the left, with bevel gear model on the right

DANTE's Latest Utility Tool, MatSim, is Now Available

MatSim allows for evaluation of a material from the DANTE database subjected to a heating/cooling schedule defined by the user. MatSim predicts, throughout the entire process, phase fraction, carbon, temperature, final hardness, and strain. The carbon prediction can include carbides which dissolve upon heating, as shown in the figure below, in which an AISI 8620 is assumed to have 0.2% base carbon, plus 0.2% carbon in carbide. MatSim can be used to quickly evaluate a material's response to a given heating/cooling schedule, ensure that material parameter modifications are still reasonable, and even design processes for a given microstructure or final hardness.
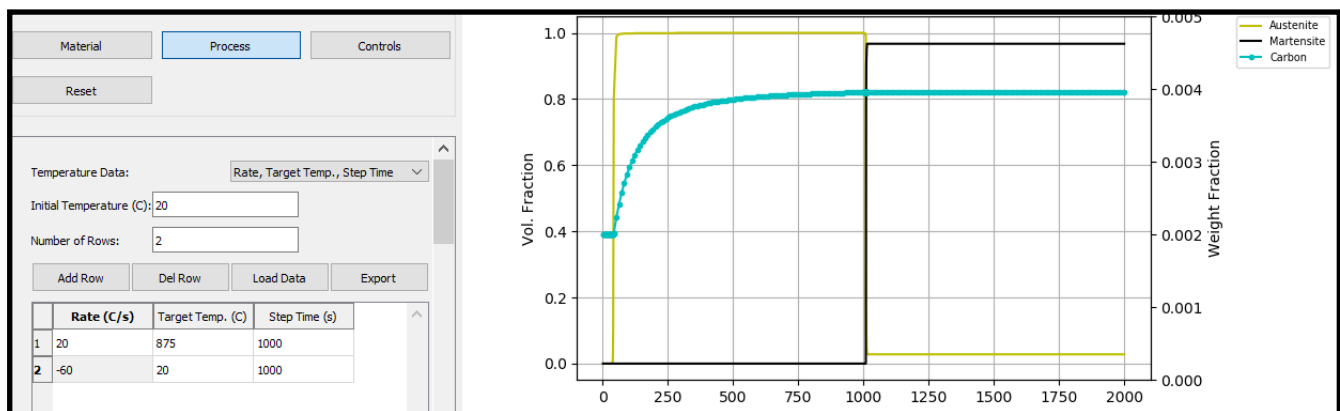
Since 1982 we have provided engineering services to the metalworking industries, and for over 30 years we have focused on thermal processing. Our range of services has expanded to include several software products, with our DANTE° software being the premier package in the world for modeling heat treatment 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

Scanning Induction Hardening of Steel Coupler

Problem Statement and Objective:

- A large coupler experienced cracking in the fillet of the bore during a scanning induction hardening process

- Use DANTE to determine the cause of cracking and devise a solution to remedy the issue

Model and Process Description:

- Material: AISI 4340

- Case Depth: 0.160 inches

- DANTE does not model the physics of the electro-magnetic field. Power distributions as functions of time and geometry, predicted from EM modeling tools such as Flux, can be imported to drive the DANTE model. For this project, power distributions were estimated from DANTE Solutions' past modeling experience.



High crack possibility area
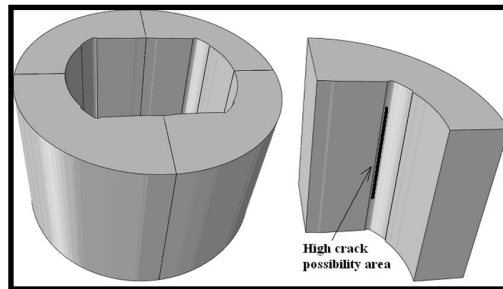
Results: Determining Cause of Cracking

- Simulation results showed a high tensile stress at the area of cracking, shown in the figure at the top of the next column

- Determined to be caused when the surface cools and tries to shrink but is restrained by the cold material outside the induction hardened case
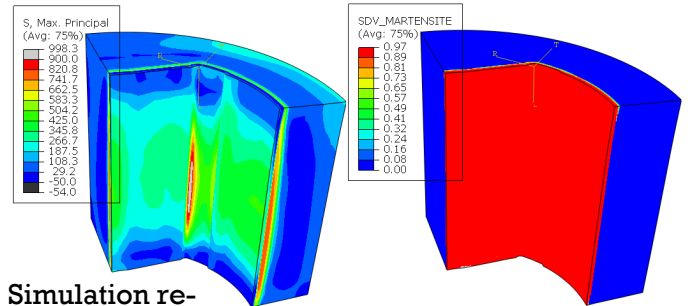

Simulation results showing high tensile stress in location of cracking (above-left) and time history of stress and temperature at area of cracking (right)
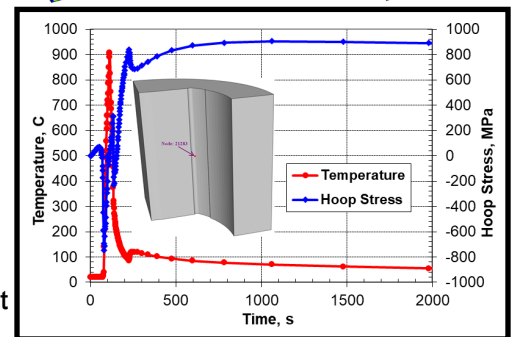
Results: Process Modification

- Using a preheat of 500° F before hardening was shown to significantly reduce the chance of cracking, though there is still a spike in the tensile stress as the case is cooled

- The simulation also predicted a significant reduction in the residual tension

- DANTE can be used to optimize the preheat temperature, possibly even ending up with residual compression
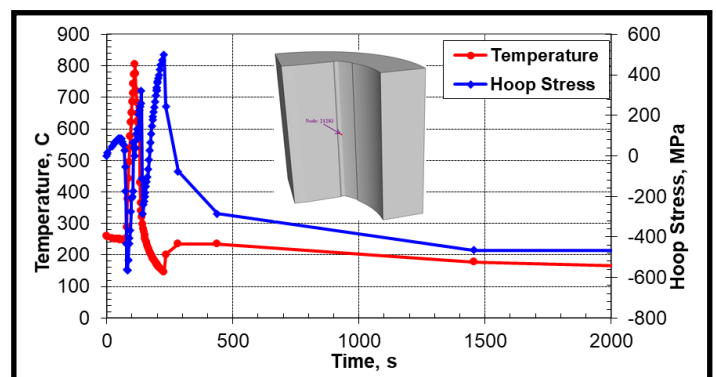
Conclusion

The DANTE model of the original process was found to effectively capture the cracking location and reasons for cracking. The modeling results showed that preheating the component to 500° F would reduce the cracking possibility, and implementation of the preheating practice did effectively solve the cracking problem in production. In addition, preheating prior to induction hardening has the potential to change an unfavorable residual tensile stress to a favorable compressive surface stress.

One can view this, and many more aerospace case studies online at: dante-solutions.com/steel-production