

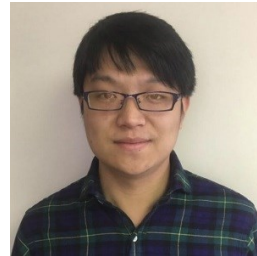
DANTE TIMES

Dante Solutions has expanded its staff by adding two mechanical engineers.



Justin Sims, BSME from Cleveland State University, interned at DANTE Solutions for almost two years and joined fulltime in June, 2016. He has a firm grasp on our DANTE heat treatment software and is involved in training our clients as well as projects.

Tianyu Yu, Ph.D. in Engineering Mechanics from Iowa State University, began his career at DANTE Solutions in January, 2017. He is strong in machining processes and also has excellent programming skills. He is leading development of additional post-processing capabilities in the ANSYS version of DANTE and for our utility programs.



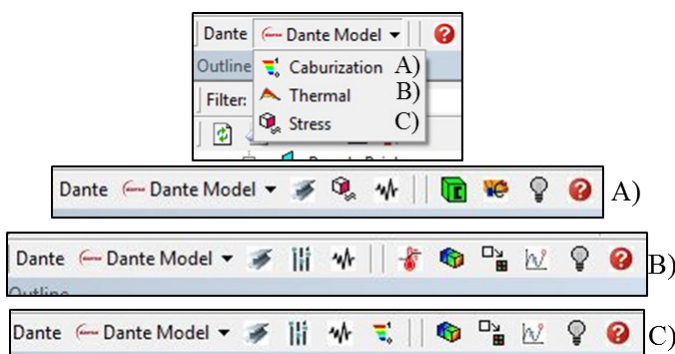
Quick News:

- Charlie Li has continued to teach 'Engineering Materials & Manufacturing Processes' as part of the Mechanical Engineering courses at Cleveland State University.
- For the second year, DANTE Solutions has sponsored a Senior Design Project at Cleveland State. Senior Mike Peabody is leading a small team that is investigating creep of austenite. The project involves experimentation using Pyrowear 53 steel, as well as modeling the experimental data to determine creep behavior.
- The staff at DANTE Solutions has expanded - see the brief introductions in this newsletter.

DANTE Software Updates

DANTE, when used with ANSYS, has just become more user-friendly! Check out the new ACT in ANSYS Mechanical below.

Pre-processing and post-processing of the heat treat models is now a very intuitive process, allowing designers, process engineers and other heat treat professionals alike to use DANTE to help with part and process troubleshooting. And don't forget to use the predictive capability when designing your next critical component.



Upcoming DANTE Solutions presentations in 2017

- 29th Heat Treating Society Conference & Exposition, Columbus, OH— October 24-26, 2017
 - ◆ "Computer Simulation of Single-Shot Induction Hardening Processes" (with Inductoheat)
 - ◆ "Vacuum Carburizing Steel Alloys Containing Strong Carbide Formers"
 - ◆ "Sources of Distortion Study after Quench Hardening using Computer Modeling"
 - ◆ "Solving Critical Heat Treatment Challenges with Practical Process Modeling"
- AGMA Fall Technical Meeting, Columbus, OH— October, 2017
 - ◆ "Sensitivity Study of Press Quench Process and Concept of Tooling Design for Reduced Distortion by Modeling"
- ASME 2017, Los Angeles, CA— June 4-8, 2017
 - ◆ "Induction Hardening Process with Preheat to Eliminate Cracking and Improve Quality of a Large Part with Varying Wall Thickness"



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www.Dante-Solutions.com

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.

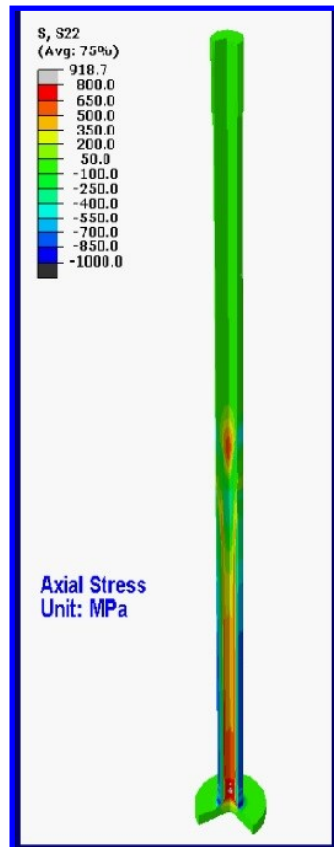
While we use computer analysis tools for most of our work, we are much more than analysts using computer software tools. Our staff includes experts in mechanical and metallurgical engineering. Let us help you improve your heat treatment and deformation processes, use new materials, and develop new products.

For more information, contact us.

support@dante-solutions.com

Project Highlights

Induction hardening offers the benefit of achieving a hardened surface case in a short amount of processing time, with beneficial residual compressive stress in the hardened layer. Because the bulk of the part typically remains at low temperatures, distortion issues tend to be minimal. However, with surface compressive stress, subsurface tensile stress must be present for equilibrium. Depending on the process timing, the peak tensile stress may be high enough to cause immediate cracking in the hardened component, or it may lead to subsurface cracking during service. These types of issues are not detectable by surface related non-destructive testing methods. Modeling using our DANTE software has proven to be a great tool for predicting the stress state throughout the induction hardening process and performance application. This has been especially useful for axles, shafts, and similar parts where centerline defects and cracking at the case-core interface can be extremely detrimental to performance.



Low Pressure Carburizing

Vacuum heat treatment has become increasingly popular for many reasons, including the bright, shiny appearance of the parts, avoidance of surface oxide fingers, and the elimination of oil fires by the use of gas quenching. An additional benefit is control of the case profile and depth in carburization of steel parts. Because the carbon source is a gas that dissociates directly on the hot surface of the steel part, the surface carbon content can be much higher than in conventional atmosphere carburizing, and the case can develop in shorter times. However, greater control of the process is required because of the process kinetics. Surface carbides may form to block carbon diffusion, resulting in soot formation and other issues.

The alloy content of the steel being carburized affects the potential for forming carbides, and the process schedule must take this into account. A sequence of boost-diffuse steps is typically required in order to achieve the desired case depth and to avoid the formation of undesirable carbides.

We have continued to work on low pressure carburization of gear steel with higher alloy contents, such as Pyrowear 53, Pyrowear 675, Vasco X-2M, and Questek's Ferrium C64. These alloys contain strong carbide formers and present different degrees of difficulty for carburization. The combination of experiments and modeling using our DANTE software have proven valuable in developing sound practices for low pressure carburization and high pressure gas quenching of these alloys.