

DANTE Solutions, Inc. is evolving!

The month of May saw the transition of Dan Londrico and Stefan Habean from intern to staff engineer. Charlie Li moved from Vice President to President of the company, and Lynn Ferguson became Emeritus. Edward Lee, a mechanical engineering student at The Ohio State University, joined the DANTE team as an intern.



Dan Londrico



Stefan Habean

Both, Dan Londrico and Stefan Habean, are mechanical engineers and products of the fine engineering program at Cleveland State University. Stefan received his BS degree in May of 2018, and he is in the middle of completing an MS program. Dan recently received his BS degree and will receive his MS degree next May. At DANTE Solutions, they have been working on a variety of heat treatment related projects, including software code development.

In moving to Emeritus status, Ferguson is starting down the path toward retirement. Starting is the keyword because this will not be a sudden event. Over the past couple of years, Charlie Li has been assuming leadership, so this transition will be seamless. Look for DANTE Solutions to remain the world leader in heat treatment simulation.

Quick News:

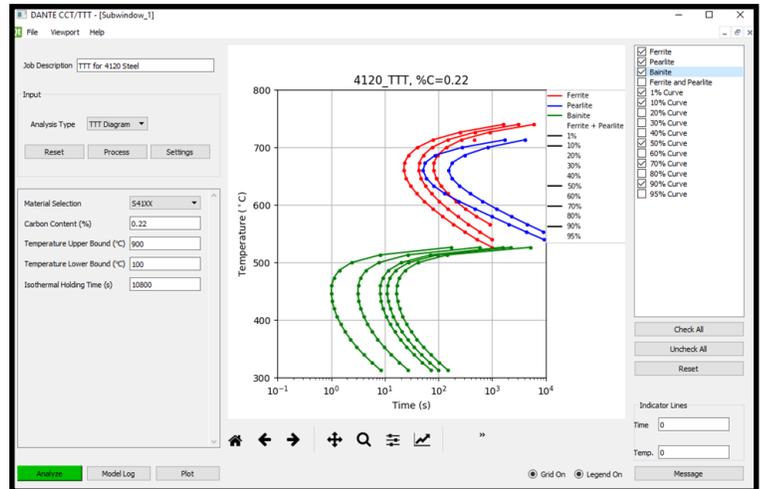
- DANTE Solutions welcomes the following companies to its expanding user group:
 - **Hyundai Motors (Korea)** - **Triumph Gear**
 - **Detroit Diesel Corporation of Daimler Trucks North America** - **Cummins (Juarez, Mexico)**
- DANTE Solutions has been a long-time member of the Center for Heat Treating Excellence (CHTE) at Worcester Polytechnic Institute (WPI). Justin Sims currently serves on the Board of Directors and is an active participant in several projects. He attended the recent CHTE Meeting at WPI/CHTE where he was updated on progress for on-going projects on distortion, austempering to form bainite, and post-processing of additively-manufactured parts. He also serves on the project committee for the upcoming Ferritic Nitrocarburizing project.
- The Heat Treating Society of ASM International will be holding its biannual technology conference and exposition in Detroit on October 15-17, 2019. DANTE Solutions will present three technical papers and host booth #1618 at the Expo. The presentations are:
 1. Justin Sims: "Causes of Distortion during High Pressure Gas Quenching Process of Steel Parts"
 2. Charlie Li: "Distortion Minimization of Bevel Gear Press Quench Process using Computer Modeling"
 3. Lynn Ferguson: "Quenching Process Improvement Through Modeling".
- DANTE Solutions continues to welcome our growing number of distributors outside the US: CEPC CAE Technology (China) and Veng Co. (Korea) have joined DANTE distributors in Mexico (Kimeca), Korea (UIT), Ukraine (Soft Engineering Group), Brazil (SMARTTECH), Turkey (SimuTek) and China (AutoCAE).

Software Highlights

TTT-CCT UTILITY NOW LIVE!

Dan Londrico has updated DANTE's utility software program used for plotting TTT and CCT diagrams from phase transformation kinetics data files stored in the DANTE material database. The figure shows a screenshot of the TTT diagram generated from 4120 steel kinetics data. The user selects the alloy, carbon level, and the phases that are to be plotted, and the software does the rest! This is a convenient method for displaying the phase diagrams, and for comparing the hardenability of various steel grades in the DANTE material database.

The phase transformation kinetics data in the DANTE material database consists of parameters that drive a set of rate-based equations to calculate the fractions of metallurgical phases present during heating and cooling processes. It is not easy to judge a steel's hardenability by just viewing the raw parameters, so to see the behavior graphically is a big help.



DANTE Software Updates

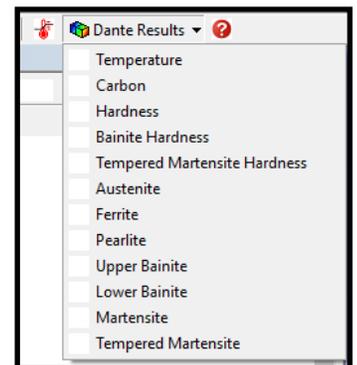
ABAQUS

DANTE version 4.0 is now live! DANTE 4.0 includes a Nitride model, high temperature tempering model, and coupled thermal and stress analysis functionality allowing the user to save time by running the thermal model and stress model as one.

ANSYS

A significant feature of DANTE linked to ANSYS Mechanical is the ACT (ANSYS Customization Toolkit). The DANTE ACT is a menu system that guides a user through heat treatment model building, process definition, model execution, and review of the model results. Recent enhancements to the ACT allow DANTE results to be processed like ANSYS results, providing a smoother and much improved post-processing experience. This also allows animations of the process steps, showing evolving material responses, to be much smoother and load much quicker. Overall the post-processing experience has seen much improvement. The figure to the right shows the list of DANTE variables available in the Thermal and Stress Models.

Charlie Li and Stefan Habean continue to make tremendous progress in improving the ACT functionality to provide a streamlined, user friendly environment for heat treatment modeling using the ANSYS Workbench.



Upcoming DANTE Software Improvements

The DANTE software continues to improve on functionality and accuracy. Notable improvements include 4.0 functionality for ANSYS, a new stress relaxation model, carbide size and growth calculations, carbon tracking during phase transformations, precipitation hardening, and continued improvement of the material database through experimental data.

Project Highlights

Distortion Analysis of Landing Gear during Oil Quenching

Problem Statement:

Large distortions after oil quenching for the following distortion modes:

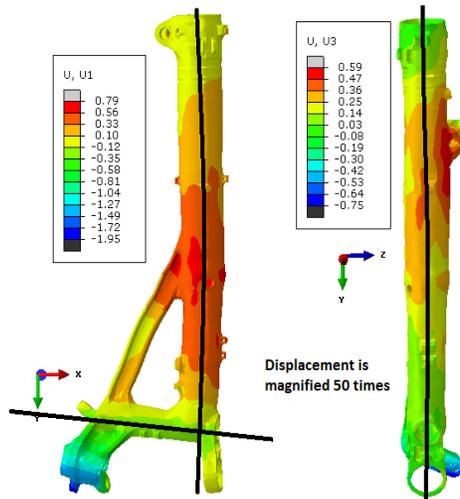
- Bow in XY-Plane
- Bow in YZ-Plane
- Straightness of a Blind Hole

All distortion modes shown in the figure make assembly of the entire structure very difficult.

Immersion into the oil tank is the main focus of the distortion analysis.

Project Objectives:

1. Define heat transfer coefficients (HTC) as a function of part surface temperature for the oil tank quench
 - Thermocouples were placed at various locations on a dummy landing gear, which had approximately the same overall dimensions and mass as the actual component, to determine HTCs at different locations of the part
2. Improve 300M material data in DANTE material database using dilatometry testing
3. Perform sensitivity simulation study to determine phenomena critical to distortion modes of interest, based on quench rates and quench direction, in critical locations



Conclusions:

- Bow distortion in the XY-Plane IS significantly affected by oil stagnancy around structural support beam, oil fill rate up the main tube, and the immersion direction
- Bow distortion in the YZ-Plane IS significantly affected by oil fill rate of the main tube and the distortion is controlled by a fitting near the open end of the tube that contributes to non-symmetric mass around the main tube in that area
- Modifications to the quenching process were made by the customer to improve the distortion response of the landing gear
- Benefits of using heat treatment simulation over physical experiments to perform sensitivity studies were shown to include:
 - Ability to modify, and see the effects of, just one process parameter with simulation is simple
 - Ability to modify, and see the effects of, isolating one process parameter with physical experiments is very difficult, if not impossible
 - Cost of simulation is minimal, while the cost of physical experiments can be very high



One can view the papers associated with this project, and more online at:

<https://dante-solutions.com/case-studies>



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.

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