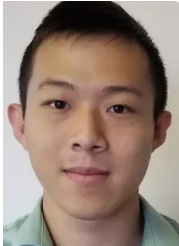
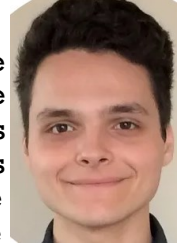


The Times They Are A-Changin’

- Come gather ‘round people, wherever you roam, and admit that the waters around us have grown...

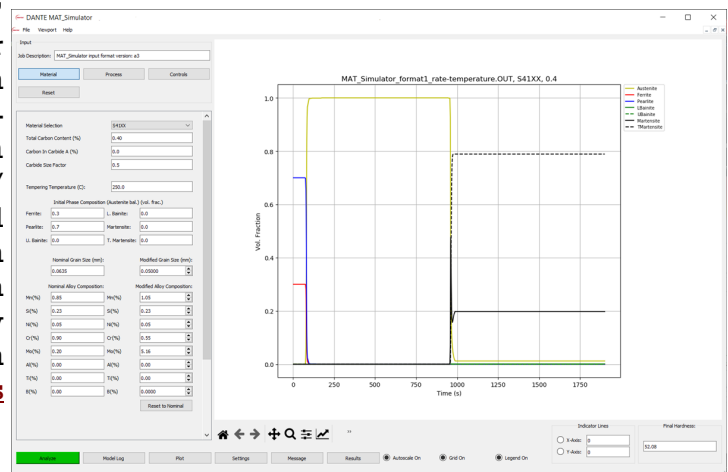
- DANTE Solutions will be saying goodbye to Dan Londrico, as he pursues his aerospace interests at Purdue University. Dan has been accepted to the Ph.D. program in the Mechanical Engineering department at Purdue and will be helping further this countries supersonic capabilities. He was invaluable here at DANTE, developing GUIs for our stand-alone utilities and helping with other software developmental tasks and consulting projects. We thank him for his time and effort with us and wish him the very best in his future endeavors.



- When one door closes, another opens. As such, DANTE Solutions would like to welcome Eddy Lee to the DANTE team. Eddy graduated with his Bachelor’s Degree in Mechanical Engineering from The Ohio State University. Eddy will slide into Dan’s role, continuing the development of DANTE’s utility GUIs and other software development tasks, as well as contributing to consulting projects. Welcome Eddy!

Quick News:

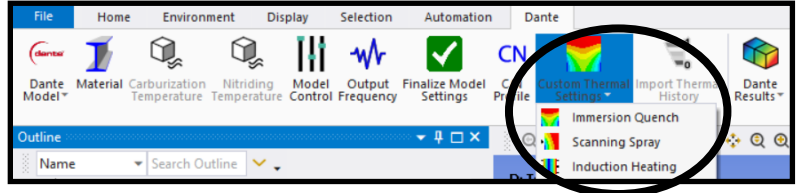
- The 2021 ASM Heat Treat Society (HTS) Technical Conference and Exposition (Heat Treat 2021) is fast approaching. Scheduled for September 14 - 16, 2021 in St. Louis, Missouri, DANTE Solutions will provide a booth to share our recent advancements in heat treatment modeling and talk heat treatment simulation with fellow conference goers. Come see us at Booth 1720 and see what’s new at DANTE!
- DANTE Solutions will also present two technical publications at Heat Treat 2021.
 - Justin Sims will present a publication, titled “Process to Minimize Distortion during High Pressure Gas Quenching Processes”, which examines a patent pending unique gas quenching process developed by DANTE Solutions. Termed DANTE Controlled Gas Quenching (DCGQ), the publication explores the prototype unit, operation, and experimental results.
 - Jason Meyer will present a publication, titled “Modeling the Effect of Chemistry Changes on Phase Transformation Timing, Hardness, and Distortion in Carburized 8620 Gear Steel”, which uses simulation to explore the effects of alloy composition variation on the heat treatment response of AISI 8620 steel alloy. The publication also validates the DANTE model against published data for AISI 8620.
- Jason Meyer presented DANTE Solutions’ stand-alone solutions for the LIFT Off Webinar series, hosted by LIFT. The presentation reviewed DANTE’s stand-alone utilities, which include carburization/nitriding design and prediction, TTT diagram generator, several data fitting utilities, and many more. The full webinar can be viewed through [this link](#).



Software Highlights

**...AND ACCEPT THAT SOON YOU'LL BE QUENCHED TO THE BONE
IF YOUR PART TO YOU IS WORTH SAVIN'
THEN YOU BETTER USE IMMERSIN' OR YOU'LL DISTORT UNKNOWN...
FOR THE TIMES THEY ARE A-CHANGIN'**

DANTE Solutions is excited to announce the addition of the new Custom Thermal Settings in the DANTE-ANSYS ACT. The Custom Thermal Settings functionality allows DANTE users to easily model immersion and scanning spray processes of long components. The ability to add a body heating profile, what DANTE calls a Power File, to describe an induction heating process, is also provided. When combined with the Spray Quenching functionality, the induction hardening process can be easily modeled using DANTE with ANSYS.



Details of "Immersion Quench"	
General	
Number of Surfaces	1
Immersion Quench Activation Table	Tabular Data
Current Surface	1
Part Motion Relative to Quench	
X	0
Y	-1
Z	0
Surface 1	
Quenching Surface	
Quench Speed Type	constant
Constant Quench Speed (mm/s)	5
Quench Start Time (s)	0
Relative Distance from Quench to Part (mm)	0
Ambient Air Temperature (C)	20
Ambient Quench Temperature (C)	20
Ambient Air HTC (W/mm ² K)	5E-05
Temperature-Dependent Ambient Quench HTC (W/mm ² K)	Tabular Data

IMMERSION QUENCHING PARAMETERS

General: Used to define the immersion step in the analysis and indicate which surface definitions are being modified (DANTE can define multiple surfaces if the immersion parameters are different)

Part Motion Relative to Quench: Used to define the immersion direction of the part based on the global coordinates of the model and can be in any direction

Surface 1: Used to define the immersion rate (constant or time dependent), any delays before immersion begins (time or distance), ambient temperatures for the air above the quenchant and the quenchant (constant only), and HTCs for the air above the quenchant (constant) and the quenchant (function of part surface temperature).

Details of "Scanning Spray"	
General	
Number of Surfaces	1
Scanning Spray Activation Table	Tabular Data
Current Surface	1
Part Motion Relative to Quench	
X	0
Y	-1
Z	0
Surface 1	
Quenching Surface	
Quench Speed Type	constant
Constant Quench Speed (mm/s)	5
Quench Start Time (s)	0
Relative Distance from Quench to Part (mm)	0
Spray Quench Linear Coverage (mm)	25
Dribble Effect Linear Coverage (mm)	0
Ambient Air Temperature (C)	20
Ambient Dribble Effect Temperature (C)	20
Ambient Quench Temperature (C)	20
Ambient Air HTC (W/mm ² K)	0.0005
Ambient Dribble Effect HTC (W/mm ² K)	0.001
Temperature-Dependent Ambient Quench HTC (W/mm ² K)	Tabular Data

SCANNING SPRAY PARAMETERS

General: Used to define the scanning spray step in the analysis and indicate which surface definitions are being modified (DANTE can define multiple surfaces if the scanning spray parameters are different)

Part Motion Relative to Quench: Used to define the scanning spray direction of the part based on the global coordinates of the model and can be in any direction

Surface 1: Used to define the scanning spray rate (constant or time dependent), any delays before spray scanning begins (time or distance), the linear spray coverage, ambient temperature and HTC of quenchant overspray/dribble (both constant), ambient temperatures for the air above the quenchant and the quenchant (constant only), and heat transfer coefficients for the air above the quenchant (constant) and the quenchant (function of part surface temperature).

Details of "Induction Heating"	
General	
Number of Induction Heating Profiles	1
Power File	
Induction Heating Activation Table	Tabular Data

INDUCTION HEATING PARAMETERS

General: Used to specify the file containing the elemental coordinates and Joule body flux values for the modeling of induction heating (Power File). Also used to specify at which analysis step the file is read into the analysis.

This functionality can be combined with the Scanning Spray capability to fully model induction hardening processes.

Project Highlights

Significance of Modeling Immersion

Objective:

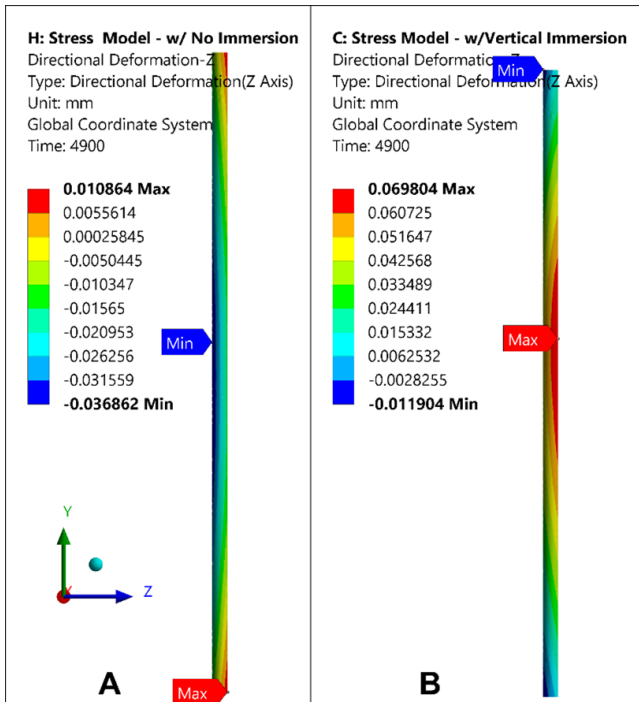
- This study shows the significance of simulating the immersion process during quench hardening of relatively long steel components.

Geometry & Model Description:

- Material: AISI 9310
- Bar diameter: 12 mm
- Bar length: 500 mm
- Conditions modeled and compared:
 - No immersion vs. immersion
 - 3 immersion rates
 - 2 immersion orientations

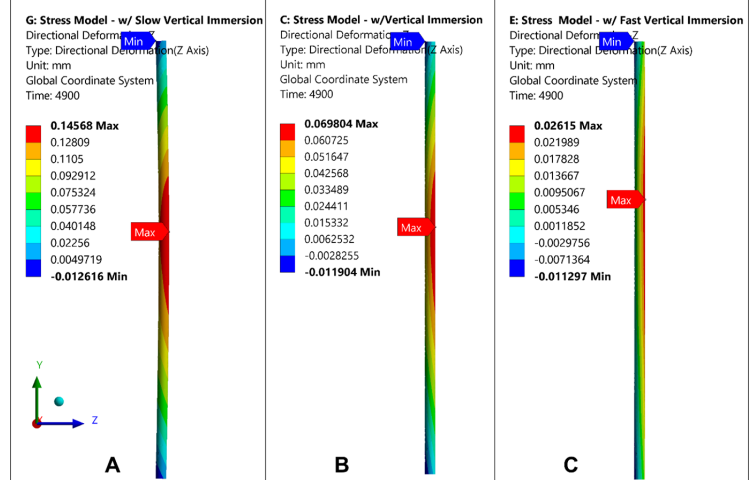
Results: No Immersion vs. Immersion

- Bow distortion prediction for (A) not considering immersion and (B) considering immersion
- Bow magnitude twice as much when immersion is considered
- Bow direction is opposite between the two conditions



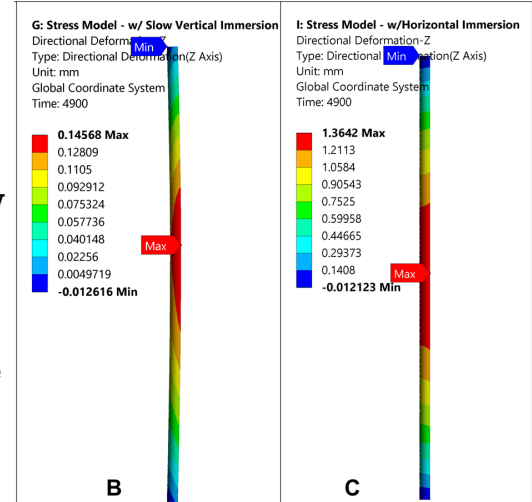
Results: Immersion Rate Effect

- Bow distortion prediction for immersion rates of (A) 2.5, (B) 5.0, and (C) 10.0 mm/s
- Slower immersion rates result in significantly more bow distortion for this case



Results: Immersion Orientation Effect

- Bow distortion prediction comparing when the bar is (B) immersed vertically at a rate of 2.5 mm/s and (C) immersed horizontally at a rate of 1 mm/s
- Predicted bow distortion for the horizontal immersion direction is a full magnitude greater than the vertically immersed bar



Conclusion

- DANTE was used to easily setup and simulate the immersion of a long steel component into a quench bath
- The results show that including the immersion into the quench bath is critical for accurate distortion predictions
- DANTE can be used to evaluate the immersion parameters on distortion