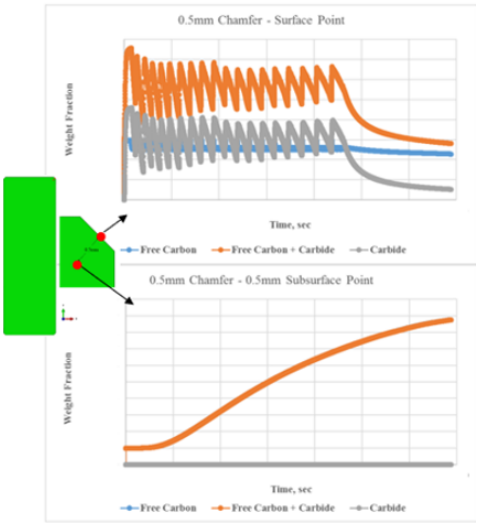
CARBIDE MODEL NOW LIVE

Carbide modeling during low pressure carburization is now available in DANTE software.



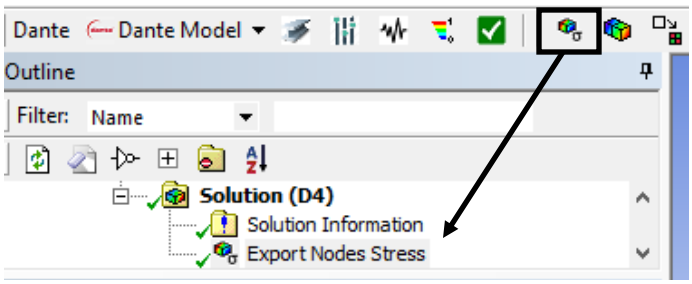
In a low pressure carburization process, a carbon carrier gas fills a chamber at extremely low pressure, typically between 5 – 15 mbar, and temperatures between 870-1050°C. Carbon builds up on the part surfaces and diffuses into the steel. As carbon is transferred from the part surface, carbides can form and grow. A subsequent diffusion step then allows the carbon to dissolve into the metal matrix and transport deeper into the part, forming the carbon case. This process is repeated as many times as necessary in order to meet the required case depth specifications. The time needed to dissolve the carbides and diffuse surface carbon inward and/or control carbide growth can be modeled with DANTE software, helping take the guesswork out of the boost-diffuse cycles. Large carbides are problematic as they block diffusion of carbon and may cause severe problems with internal stresses during service if left unchecked. With solution variables for carbide size, dissolved carbon, and overall carbon case, you can use DANTE to ensure accurate, time and money saving results for your individual process. Paired with the Vcarb utility, you can have total control over the low pressure carburization process. Vcarb from DANTE is used to design a boost-diffuse process quickly, without taking the time to mesh and model an entire part, and receive results on carbon case in a fraction of the time.

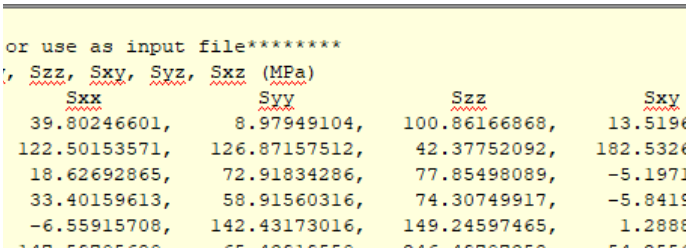
Quick News:

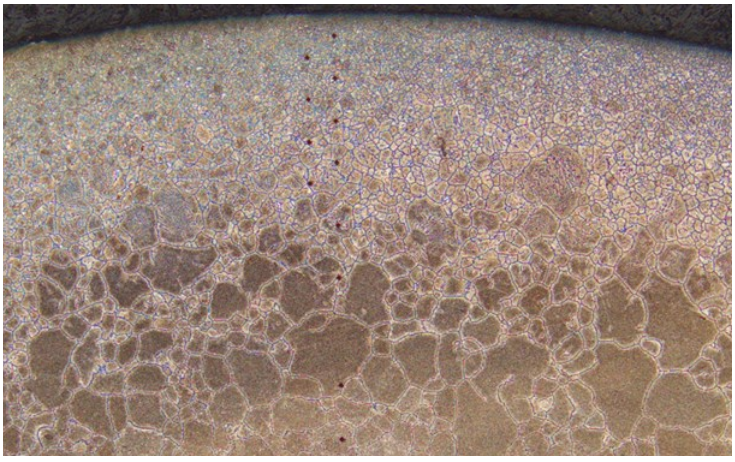
- DANTE expanded its users group in 2018:
  - **NLMK Europe**
  - **AVL**
  - **Liebherr**
  - **Caterpillar**
  - **Missouri S & T**
  - **WHEMCO**
  - **United Technologies Research Center**
- Charlie Li continues to instruct the next generation of engineers in materials and manufacturing processes at Cleveland State University.
- Research of high alloy aerospace steels continues with several government and industrial contracts
- DANTE welcomes our growing number of distributors outside the US: Japan (CAE Solutions), Korea (UIT), Brazil (SMARTTECH), and Turkey (SimuTek) join DANTE distributors in Mexico (Kimeca) and China (AutoCAE)

DANTE Software Updates

- An updated tempered martensite model with a more accurate Retained Austenite to Martensite calculation was released.
- DANTE-ACT 2.2 for ANSYS was released earlier this year with stress output functionality. This allows residual stress tensor data to be exported from heat treatment models to loading or fatigue models.





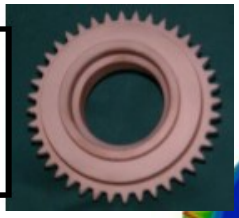


Upcoming DANTE Software Improvements

DANTE is dedicated to improving its software package with future updates for Nitride Modeling, Carbon tracking during phase transformations, Precipitation hardening, and Induction tempering modeling.

Project Highlights

Improving Gear Tooth Bending Fatigue Life



Straight Spur Gear with 40 Teeth, DP of 10, and 6 mm Face Width

Problem Statement: Helicopter transmission life limits load carrying capacity and acceleration. Improved gear bending fatigue life will allow heavier loads and improved acceleration. New designs are costly and require long development times. A process improvement for an existing design saves time and money.

Process Description: A change from conventional oil quench hardening to intensive water quenching produced higher compressive surface residual stress. This in turn resulted in a 15% increase in bending fatigue endurance in carburized Pyrowear 53 gears.

Benefits: The quench process change achieved improved bending fatigue life with no gear redesign or alloy change. The water quenching method was more environmentally friendly than oil quenching and safer.

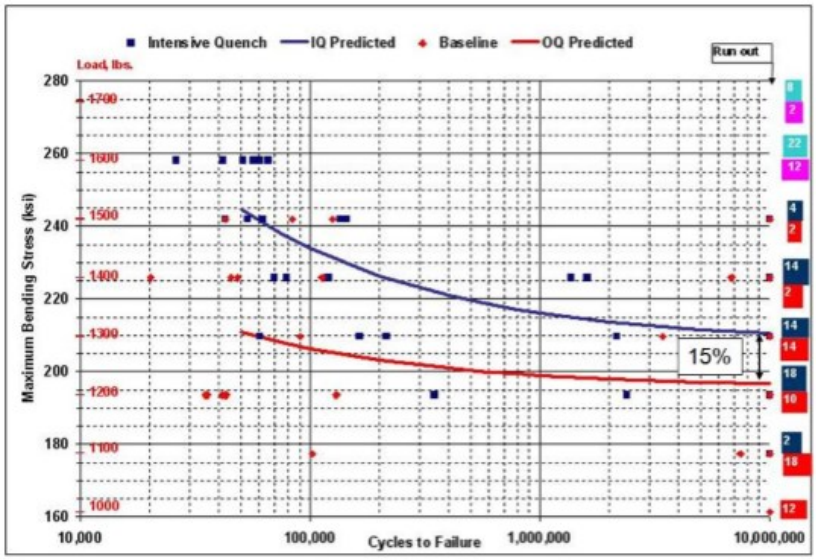
Conclusions:

This study proved the feasibility of improving bending fatigue strength by altering the hardening process. The intensive quenching process produced a deeper compressive stress state after heat treatment than conventional oil quenching, and this resulted in improved bending fatigue strength.

In addition to actual test data, this study showed the benefit of using accurate numerical simulation of the carburization and hardening processes to assess the nature of the differences between the processes and to predetermine the quenching conditions required to achieve the goal of deeper residual compression and thus improved resistance to fatigue.

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

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



Single Tooth Bending Fatigue Test Data Showing 15% Improvement in Endurance Limit Due to Increased Residual Compressive Surface Stress

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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