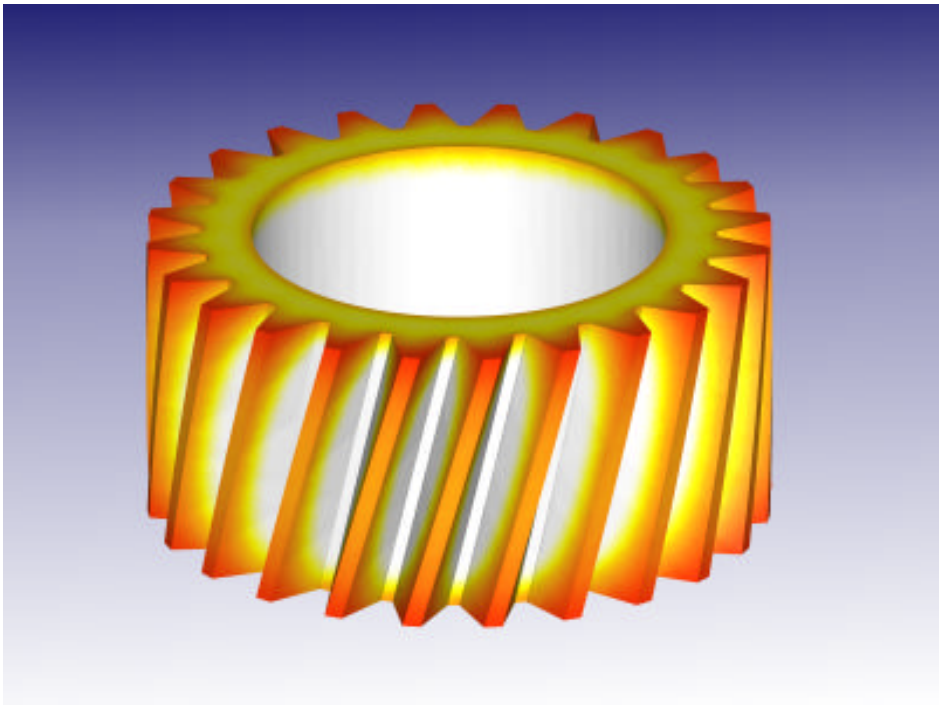
DEFORM™ - HT

Scientific Forming Technologies Corporation

DEFORM™-HT is a powerful stand-alone finite element modeling system for simulating heat treatment processes. The system predicts thermal, mechanical and metallurgical responses of parts during heat treatment. Heat treat distortion, quench cracking and residual stresses can be predicted. The system can also provide information on phase transformation and phase volume fraction.

A variety of materials ranging from carbon steel and aluminum to titanium and nickel based alloys can be modeled. Typical heat treatment processes include:

- normalizing
- quenching
- austenizing
- tempering
- carburizing
- aging
- solution treatments
- stress relieving



DEFORM-HT can be used to analyze diffusion processes such as carburization, providing a prediction of case depth. Residual stresses after heat treatment processes can also be predicted. The system can also simulate stress relaxation and aging. Modeling of stress relaxation is important since the residual stresses in the part can significantly impact subsequent machining distortion. Residual stress influences the life of a component in service.

This powerful modeling tool provides critical information about the process variables required to control and optimize heat treatment processes. It provides the ability to visualize the microstructure, temperature and stress during heat treatment. This is simply not possible with experiments. It is possible to conduct sensitivity analysis without the time and cost of physical trials. DEFORM-HT is a tool that enables users to achieve an optimum balance of mechanical properties, while avoiding quench cracks and minimizing heat treat distortion and residual stresses.

Product Specifications

- DEFORM-HT is available as a 2D or 3D stand-alone system.
- Heat transfer, phase transformation and diffusion modules are coupled in an integrated simulation environment.
- Material models include elasto-plastic, thermal elasto-plastic and creep.
- A mixture rule is used to define various phase properties as a function of temperature and primary alloying element.
- Model outputs niclude evolution of temperature, residual stress, dostortion, phase volume fraction and hardness.
- Volume change due to phase transformation is accounted for in the model.
- Five popular creep models are implemented to simulate the stress relaxation process.
- Multiple heat treat operations can be set up to run sequentially without manual intervention.
- Induction and resistance heating can be modeled for axisymmetric (2D) products and processes.
- Grain size and percentage recrystallization can be predicted for IN718 and Waspalloy.

DEFORM™

Design Environment for FORMing

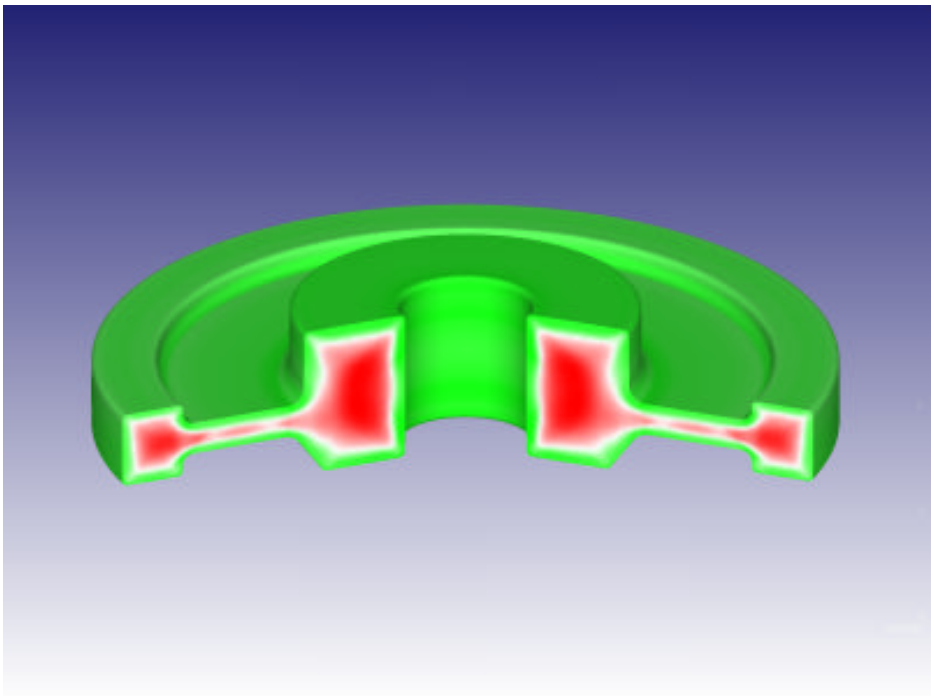
DEFORM™ - HT

Licensing Options

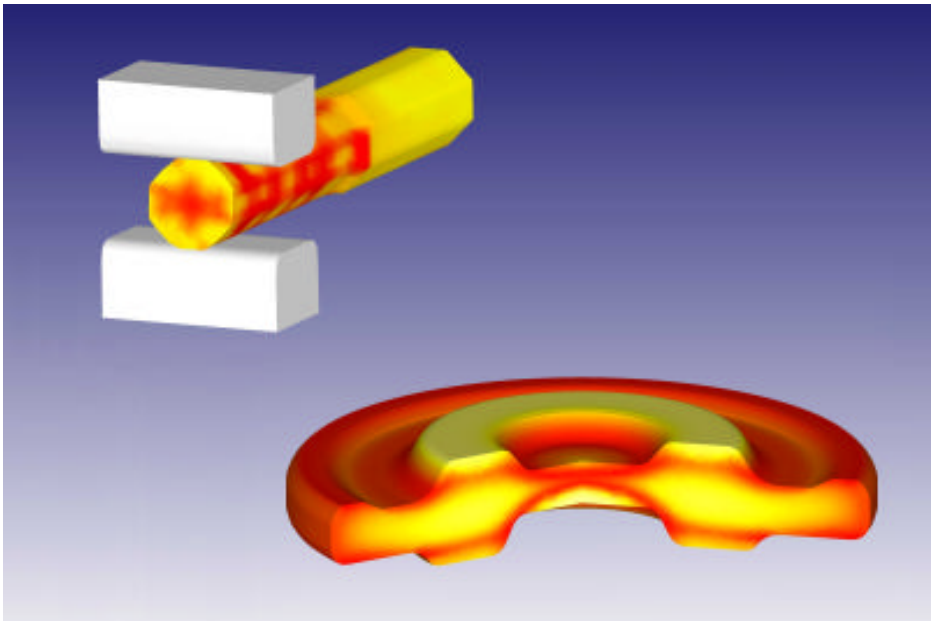
- DEFORM-HT can be licensed as a stand-alone 2D or 3D system.
- A **Microstructure Module** can be added to a DEFORM-2D or DEFORM-3D license to enable microstructure modeling during deformation processes.
- Model outputs for the **Microstructure Module** with include percentage recrystallization and average grain size in addition to the standard DEFORM-HT outputs.

System Requirements

- DEFORM-HT runs under WINDOWS XP/2000 or Linux.
- The recommended configuration is 1 GB RAM with at least 100 GB of free disk space.
- A read/write CD or DVD is recommended to back up results.
- Internet access is recommended for technical support and updates.



Residual hoop stress in a turbine disk is shown after an oil quench and stress relieve cycle. The red areas are in tension and the green depicts compression.



Upper left: The grain size prediction during a cogging process is shown. Lower right: The grain size of a hot forged nickel based alloy disk is shown. In both cases, the red shows a finer grain and yellow a coarser grain size.

1/8/07

Scientific Forming Technologies Corporation
5038 Reed Road
Columbus, Ohio
43220-2514
Tel: (614) 451-8330
Fax: (614) 451-8325

www.deform.com email: sales@deform.com