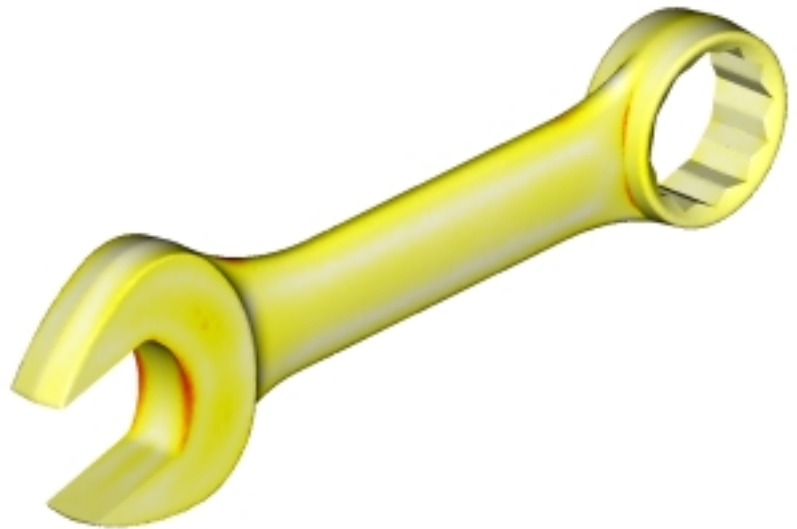


DEFORM™ - HT

DEFORM™-HT is a module of the DEFORM™ System capable of simulating a wide range of heat treatment cycles. Numerous critical service components are manufactured using forging, heat treatment and machining. It enables material scientists and engineers to study the thermal, metallurgical and mechanical behavior during these complex processes. One strength of DEFORM™-HT is the ability to predict microstructure, grain size, residual stress, distortion and fracture resulting from a range of processes including:

- hardening
- tempering
- annealing
- carburizing
- solution treating
- aging



DEFORM™-HT can analyze very complex processes. To the right, the residual stress is shown (red is higher) after austenitizing and quenching a combination wrench that was forged and heat treated. Below, the percentage of transforming martensite (red is higher) is shown during quenching of a helical gear.



DEFORM™-HT can be used to predict crack formation resulting from severe stresses encountered during quenching operations. It is possible to study distortion during quenching and subsequent machining operations in steel, superalloy, titanium and aluminum components. Material properties such as hardness can be analyzed for structural, oilfield and ordinance applications. The simulation of grain size and recrystallization during forming provides a competitive edge to the producers of aerospace billet and turbine disks. Case depth can be predicted during carburization and induction heating.

Developed and supported by Scientific Forming Technologies Corporation (SFTC), DEFORM™-HT is the latest addition to the DEFORM™ family of process simulation tools for the material forming, machining and heat treating industries. DEFORM™ has been widely used by manufacturers and researchers to analyze the manufacture of engineering components including turbine discs, gears, bearings, structural components, tools and crankshafts. SFTC, a company dedicated to bringing state of the art process modeling technology to the metal forming industry, provides training workshops, frequent program updates, users group meetings and responsive technical support.



Design Environment for FORMing

DEFORM™ - HT

Technical Product Specifications

- DEFORM™-HT can be used to simulate microstructure evolution during primary forming, secondary forming, heat treatment, welding and machining processes.
- DEFORM™-HT can model normalizing, annealing, quenching, tempering, aging, carburizing, prediction of hardness, volume fraction of metallic structure, distortion, residual stress and carbon content.
- Specialized heat treatment models including creep, phase transformation, recrystallization and precipitation are incorporated. Data for all models may be a function of temperature and carbon (or other primary atom) content.
- Material models include elastic, plastic, elasto-plastic, rigid, porous and user defined.
- Diffusion dependent phase transformations are predicted by the Johnson-Mehl equation and T-T-T data. Diffusionless phase transformation, involves a shear operation from Magee's equation as a function of temperature, stress and carbon content.
- Individual phase hardness or Jominy data may be used to predict the hardness distribution in the final product.
- Heat treat distortion can be analyzed for operations where transformation or plastic deformation is involved (i.e. quenching). Subsequent distortion after machining (material removal) may also be studied.
- DEFORM™-HT provides the critical stress, temperature and microstructural data required to analyze quench cracking. An understanding of the root cause of a cracking problem assists in redesigning problem processes.
- Localized heating and quenching windows can be applied for selective heat treatment.
- Each phase has its own elastic, plastic, thermal and hardness properties. Resultant material properties depend upon the percentage of each phase present at any step in the heat treatment simulation.

System Requirements

- DEFORM™-HT runs on popular UNIX workstations and personal computers running WINDOWS XP/2000/NT.
- DEFORM™-HT is an add-on module for DEFORM™-2D and/or DEFORM™-3D. See the appropriate system brochure for applicable system requirements.

General Information

- Training, support and regular updates are available to active DEFORM™ Users.
- DEFORM™ users group meetings are held regularly.
- On-line documentation is provided in HTML (web browser) and PDF (Adobe Acrobat) formats.
- Consulting and contract research are available.

For more information, call or write:

**Scientific
Forming
Technologies
Corporation**



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

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www.deform.com
e-mail: sales@deform.com