Spring, 2010

Volume 8, No. 2

DEFORM™ News

Events:

- June 21-23, 2010:
  SFTC will exhibit DEFORM at Aeromat 2010 in Bellevue, WA.
- September 13-18, 2010:
  SFTC will exhibit DEFORM at IMTS in Chicago, IL.
- November 2 & 3, 2010:
  DEFORM User Group Meeting will be held in Columbus, OH.

Training:

- August 10 & 11:
  DEFORM-2D training (includes DEFORM-F2) will be conducted at the SFTC office.
- August 12 & 13:
  DEFORM-3D training (includes DEFORM-F3) will be conducted at the SFTC office.
- August 25 & 26:
  The annual Die Stress Analysis Workshop is planned at Marquette University in Milwaukee, WI.
- October 5 & 6 (new dates):
  DEFORM-2D training (includes DEFORM-F2) will be conducted at the SFTC office.
- October 7 & 8 (new dates):
  DEFORM-3D training (includes DEFORM-F3) will be conducted at the SFTC office.

DEFORM™
Design Environment for FORMing

64-bit Update – Windows Implementation

In a previous DEFORM News, it was reported that a 64-bit FEM engine had been introduced for the Linux version of DEFORM-3D v10.0. The 64-bit version provided two major benefits over 32-bit:

- much larger simulations could be run using the 64-bit version
- the 64-bit version was up to 50% faster than the 32-bit version

In DEFORM v10.1, the 64-bit FEM engine has been implemented in the Windows version of the program. Computers having a 64-bit Windows operating system (XP, Vista or Windows 7) can take advantage of the 64-bit FEM engine.

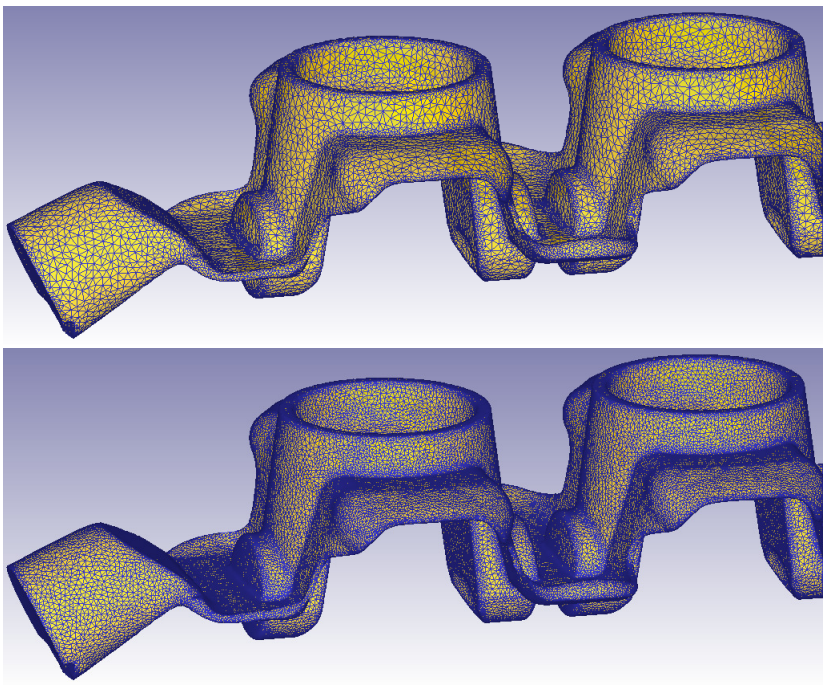
In order to use the new FEM engine with multiple processors, users should install the 64-bit MPICH2 during the v10.1 installation. Some configuration is needed, so follow the 64-bit Configuration Notes on the User Area.

Simulation Performance – Several Considerations

SFTC has been running speed benchmarks on various configurations of software/hardware. We have found that on average, there is a:

- **30% improvement** when you switch from a 3-year old computer to new hardware
- **30% improvement** when you switch from 2-core MPI to 4-core MPI
- **30% improvement** when you switch from 32-bit solver to 64-bit solver

SFTC has a standard speed benchmark for users to evaluate DEFORM performance on different software/hardware. Contact SFTC for more details.



The 300,000 element mesh on the top could be simulated using the 32-bit version, while the 800,000 element mesh on the bottom required 64-bit.

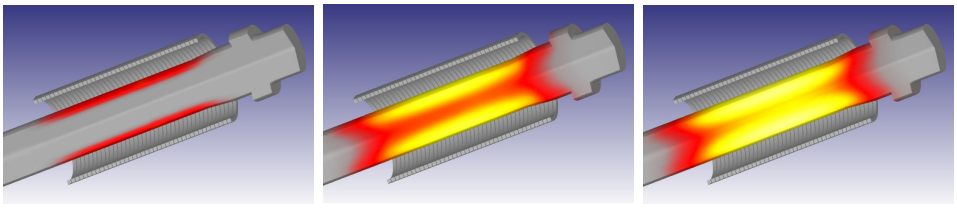
Induction Heating – Customer Case Study

SFTC recently collaborated with a customer to demonstrate how induction heating, forging and microstructure evolution could be coupled in one simulation.

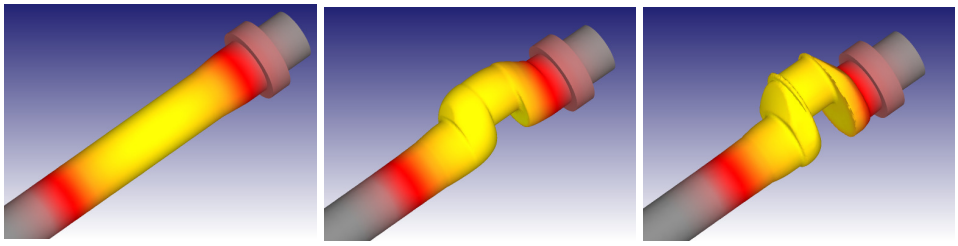
The part being modeled was a crankshaft. The input bar was axisymmetric, so the initial induction heating was performed in DEFORM-2D. Induction heating can be modeled in DEFORM using either the finite element method (air is meshed) or the boundary element method (air is not meshed). The FEM method was used in this study since it is typically faster. Each turn of the coils was explicitly modeled, where the electrical current and frequency were used as input.

After the induction heating was modeled in 2D, the bar was swept 360° in the integrated version of DEFORM v10.1. The forging operation was then simulated. During both the induction heating and forging phases of the simulation, changes in microstructure were tracked. During induction heating, the heated region of the bar transformed from pearlite to austenite. The phases did not change appreciably during forging.

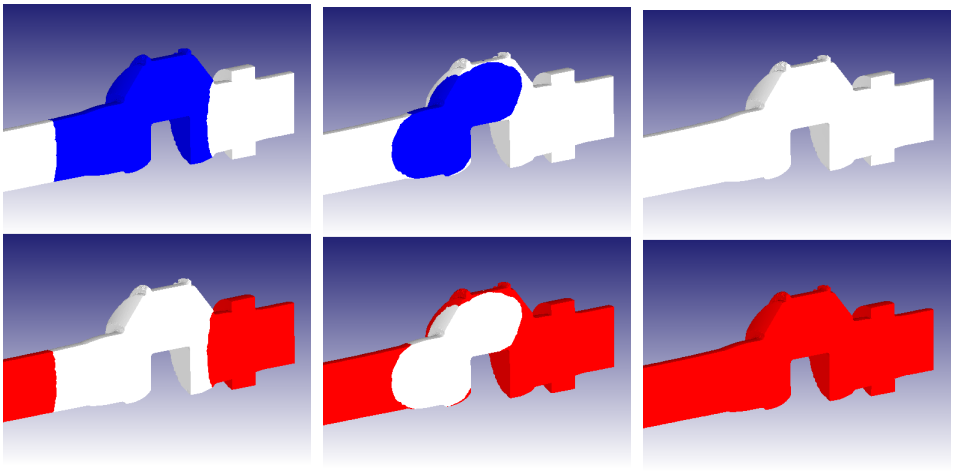
Once the forging was completed, the bar was cooled to room temperature. During the cool down, the austenite in the hot zone completely transformed back to pearlite. This means that the cooling rate was too slow for any martensitic transformation to occur.



This sequence shows the temperature gradient during induction heating.



The induction heated bar is forged into a crankshaft.



During cooling (left to right) the austenite (blue – top) in the heated region transforms back to pearlite (red – bottom).

Releases:

DEFORM v10.1 was released on March 15th, 2010 and included the following components:

- DEFORM-2D
- DEFORM-3D
- DEFORM-F2
- DEFORM-F3
- Integrated DEFORM
- Integrated DEFORM-F23

DEFORM v10.1 release included several enhancements. These are:

- improved 64 bit 3D FEM engine
- significant improvements in 3D shape rolling module
- improved handling of spring loaded cogging dies
- improved 2D-3D model conversion module
- force controls in non-orthogonal directions
- improved installation procedures
- license handling that is more tolerant to network delays
- a new License Manager 3.0.1 that allows remote desktop access

DEFORM v10.1(sp1) is planned for release in July/August, 2010 and will include the following:

- improved self contact handling with 64 bit FEM engine (bug fixes)
- arbitrary path movement support in 2D FEM engine
- global and local time handling improvements in multiple operation modules
- enhanced stability in 2D and 3D gas trapping simulations (bug fixes)

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