Fall, 2020
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DEFORM News

Training

SFTC offers DEFORM training for U.S. and Canadian customers on the following dates in early 2021.

- February 9-11
- April 13-15

Additional training details are listed on the DEFORM website.

For users outside the U.S. and Canada, please contact your local DEFORM distributor for more information on the training events available in your region.

Events

The Forging Industry Association "Theory & Applications of Forming & Die Design" course will be held online on January 12-13, 2021. An SFTC staff member will be one of the instructors. Visit www.forging.org for detailed information.

Announcements

SFTC has recently launched social media on LinkedIn and YouTube!

www.deform.com/linkedin
www.deform.com/youtube

These resources are your link to the latest news, events, developments and examples from SFTC and DEFORM. Please view, like, share and subscribe today.

DEFORM®
Design Environment for FORMing

Induction Heating Capability and Improvements

Induction heating is ideal for a variety of applications across a wide range of manufacturers. It is often used to heat preforms for hot/warm forging or finished workpieces for heat treating. Local induction heating is applied in processes such as case hardening and annealing, where control of heating pattern, depth and speed are used to tailor product performance.

Induction heating is popular because it is a fast, economical way to heat metal. An alternating current is passed through a copper coil, which generates a magnetic field near the coil. Electric current is induced in a magnetic workpiece if placed within the field. The metal electrically resists the induced current, which causes internal heat generation within the workpiece.

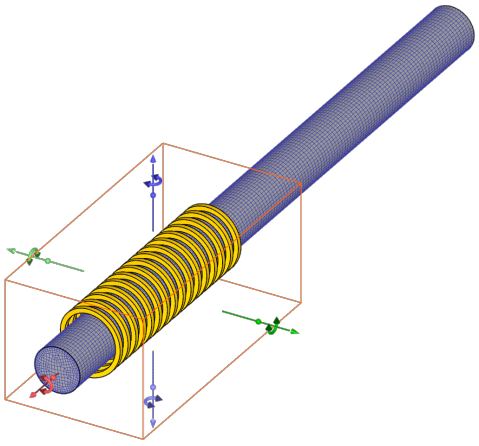
Design engineers have control over induction heating through process parameters such as coil design, alternating frequency and input power. The DEFORM system provides users with the ability to investigate critical process parameters on a computer. It helps them to verify designs and test competing alternatives. Its advanced simulation capabilities allow users to optimize results such as heating rate, location and penetration depth.

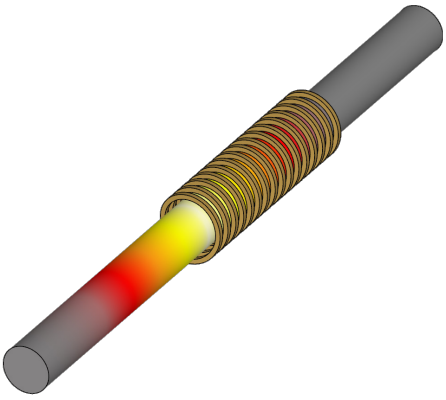
DEFORM includes two solvers for simulating induction heating, the finite-element method (FEM) and the boundary-element method (BEM).

FEM Method
- Air must be meshed
- Scanning process challenges
- Most accurate solution

BEM Method
- Simple setup; no air mesh
- Easily handles scanning
- Longer solution time

User-defined BEM heating windows (below; left) were also introduced in 3D induction models. They reduce the effective model size, while maintaining suitable solution accuracy, by limiting induction calculations to the workpiece surfaces that fall within the window. Outside of a reasonably-sized window, it is assumed that the coils have little direct effect on the workpiece. Induction windows can also move with the coil, which simplifies the model setup for coil/workpiece interactions in a scanning heating process (below; right).



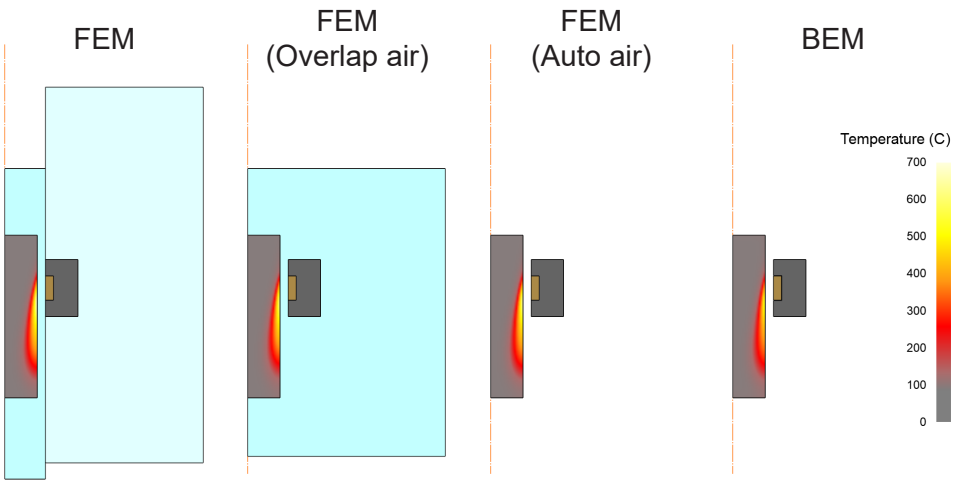


SFTC has made many developments to the induction solvers, continuously improving solution time and quality. DEFORM V12.1 includes an updated BEM solver, which significantly reduces memory usage and simulation times. For example, the 3D BEM induction model shown on the previous page exhibited the following performance improvement on a quad-core computer.

V12: 6 hours **V12.1**: 41 minutes **Speed improvement**: ~9X

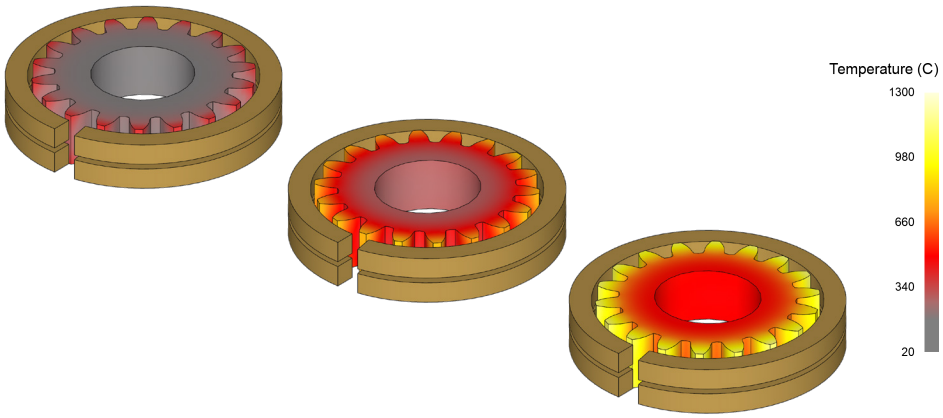
DEFORM has long offered a 2D FEM induction solver, but a limiting factor is the requirement for air to be meshed. This made it challenging to model a moving coil, since the air had to be divided into multiple objects in contact (below; left).

New versions of DEFORM support simplified 2D FEM induction modeling methods. In one approach, air is represented by a single meshed object that overlaps the other objects (middle left). Another method automatically generates an air mesh at every step (middle right). It does not require an additional object and is performed behind-the-scenes. These approaches allow the coil to move freely, eliminating multiple air meshes and air-to-air contact requirements.



2D FEM models have a slight edge over 2D BEM models (above; right) in terms of accuracy. In the example case shown above, the best combination of accuracy and ease-of-use are provided by the overlapped and automatically-generated (hidden) air mesh FEM models. The automatically-generated air FEM model and the BEM model took the least time and effort to create.

Induction heating capabilities are included in the DEFORM Premier and DEFORM-HT systems. Induction capabilities can also be added to the DEFORM-2D or DEFORM-3D systems via the Microstructure or Heating Module add-ons. Please contact your local DEFORM distributor for more information on induction heating licensing, technical capabilities and support.



DEFORM V12.1 Release

DEFORM V12.1 User Beta was released to the DEFORM User Area in early December. The final release is tentatively scheduled for late December.

The V12.1 release includes a wealth of new application and ease-of-use features. It also provides various enhacements and bug fixes.

- Multiple object importing
- Enhanced object management
- 2D geometry digitization tools
- 2D local remeshing
- Advanced material library search
- Graph digitizer
- Hoffman anisotropic yield criteria
- Multi-blow lift enhancements
- 2D 2nd rotation axis
- Contact pair importing (reuse)
- Per-object stopping criteria
- Max. diameter stopping criteria
- Heat transfer oper. die movement
- Mech-to-heat conversion functions
- 2D linear friction welding
- Shape rolling ALE enhancements
- Tube piercing spinning template
- Spinning (express) solver
- Automatic weld path generation
- Heat source path & orientation
- Heat source element activation
- Heat flux boundary condition
- Tool life prediction
- Worn geometry updating
- 2nd generation cellular automata (CA) grain growth model
- Custom views
- Custom hotkeys
- Cylindrical coordinate indicator
- Heat flux state variable
- Forming limit diagrams
- Next-gen Presentation Editor
- Geo/Mesh Tool (Beta)

The complete list of changes are listed in the V12.1 Release Notes, which are available in the V12.1 installation and the User Area.

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