Fall, 2005

Volume 3, No. 4

# DEFORM™ News

## Events:

- November 1 & 2, 2005: The Fall DEFORM Users Group Meeting in North America will be held in Columbus, Ohio. Call or visit the web site (User's area) for more information.

## Training:

- November 3 & 4, 2005: Advanced training will be held at the SFTC office, in conjunction with the Fall DEFORM Users Group Meeting.
- December 6 & 7, 2005: 2D training will be conducted at SFTC in Columbus, Ohio.
- December 8 & 9, 2005: 3D training will be conducted at the SFTC office.

DEFORM™

Design Environment for FORMing

## DEFORM-F2:

DEFORM-PC was initially released in 1994. It was intended to meet the requirements of small to mid-sized companies requiring two-dimensional process simulation. The GUI was very easy to use, while retaining the power of DEFORM-2D through a shared FEM engine and the AMG mesh generator.

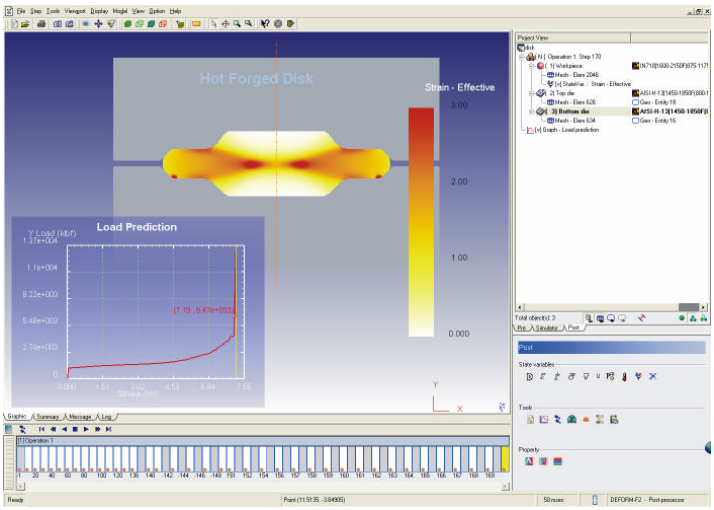
DEFORM-F2 was developed as the 'next generation' system to replace DEFORM-PC. In addition to FEM and AMG, it now shares many GUI components with DEFORM-2D. This provides an easier transition as users advance into more sophisticated applications.

DEFORM-F2 will formally replace DEFORM-PC with the version 9.0 release. All of the key functionality is in place and being tested. This next generation system represents a major improvement in all areas.

During the upcoming months, beta versions of DEFORM-F2 version 9.0 will be available in the User's area. SFTC will also provide a transition tutorial to aid DEFORM-PC users in the migration. Support staff will be available to provide additional guidance as required by our users.

DEFORM-PC PRO users will migrate to DEFORM-2D. The DEFORM-F2 GUI will also be available to forging and cold heading users.

In 2006, development and support for DEFORM-PC and DEFORM-PC PRO will cease.




The preprocessor was developed using elements from both open and guided systems. It provides step-by-step input for new users, with the flexibility to move directly to specific data as a user gains experience. Each window was optimized for common applications, to minimize user input. The postprocessor (above) includes hot keys for routine outputs. Finally, a graphical step list allows the user to directly display a particular step or to review important step information with a single (right) mouse click.

## DEFORM-F3:

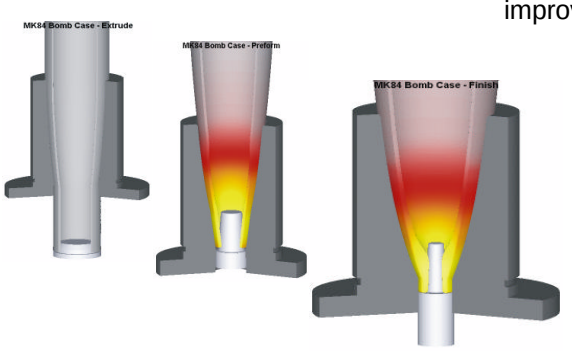
The popularity of 3D simulation is increasing in small to mid-sized companies. DEFORM-F3 was developed to satisfy this requirement. Applications include hammer and press shops and specialty cold formers. The core functionalities are shared with DEFORM-3D, while the GUI is streamlined for typical production applications. Many of the GUI elements are common with DEFORM-F2, further easing the transition into 3D simulation.

## PRO-FAST Project:

In 1991, the Forging Defense Manufacturing Consortium initiated the PRO-FAST Project. SFTC is participating in a project named “Best in Class Practices of Forging Design and Process Simulation”. The objective is to help small to mid-sized companies take advantage of forging simulation. This example represents an improvement to a very challenging process.

General Dynamics Ordinance and Tactical Systems, formerly Intercontinental Manufacturing, produces the Mk 84 steel bomb case. The Mk 84 is the most difficult to produce in this family of parts, due to a large diameter to wall ratio. The production forging process of the Mk 84 bomb case consists of (as shown below left to right):

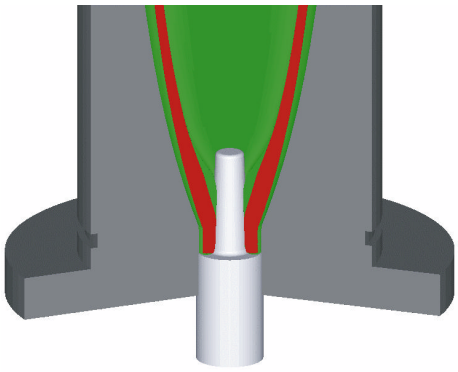
- cold extrusion
- heat end and preform
- heat end and finish forge




General Dynamics reported a range of frequent production problems. These included underfill in the nose, bulging on the outside diameter, inadequate blending, surface cracking, and excessive die wear. The nose underfill is shown (top center) with red being the underfilled condition.

During production, operators tuned the process by making adjustments based on production trends. The ideal process was elusive, due to the high diameter to wall ratio.

The process was simulated using nonisothermal two-dimensional DEFORM simulations. While running the initial models, it became clear that the process was very sensitive. The nominal process was developed to



match a defect-free case. Extrusion stroke, pressure, temperature distribution and friction were varied to reproduce the observed defects. At the end of the project, the root cause of each forging-related defect was determined.

DEFORM simulations provided insight into the process, resulting in improved process controls. A more robust process was developed through the use of a thicker walled pipe, with improved resistance to buckling.

General Dynamics reported that with thick walled pipe and improved process controls, the defect rate due to insufficient nose material dropped by a factor of 7:1. They also reported that the problems related to under-gauge material in the nose region and to pipe bulging were eliminated. The improvements were quantified during production spanning 40,000 parts.

The PRO-FAST Project is sponsored by the Defense Logistics Agency under Manufacturing Technology Program contract number SP0103-01-C-0002.

## Releases:

DEFORM is now supported on Suse version 9.2 (linux).

DEFORM-2D and DEFORM-F2 versions 8.3 are being released in late October. This maintenance release is primarily used to fix bugs.

DEFORM-2D and DEFORM-F2 versions 9.0 (beta 1) are also being released in late October. Enhancements include:

- improved movement (press) control, including press stretch;
- tool wear in DEFORM-2D;
- a new machining distortion module in DEFORM-2D;
- new material models, and additions to the material library;
- postprocessing (and animations) spanning multiple databases and
- GUI refinements to DEFORM-F2 to improve geometry, boundary conditions and operation management.

DEFORM-3D and DEFORM-F3 versions 5.2 and 6.0 (beta 1) are planned for release at the end of the year. Version 5.2 will be bug fixes. Version 6.0 enhancements include:

- movement control features from the 2D release;
- a new geometry editing/repairing module;
- heat transfer stages and transient analysis options in rolling and
- improved multiple CPU utilization using domain decomposition.

For a complete list of all the improvements, please refer to the release notes on the DEFORM User’s area.

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