

DEFORM™ News

Running Large Models in DEFORM

Events:

- November 6 & 7, 2013: DEFORM User Group meeting at the Bridge-water Banquet and Conference Center in Columbus, OH

Training:

- October 15-18, 2013: DEFORM training will be conducted at the SFTC office in Columbus, OH.
- December 10-13, 2013: DEFORM training will be conducted at the SFTC office in Columbus, OH.
- 2014 training dates to be announced

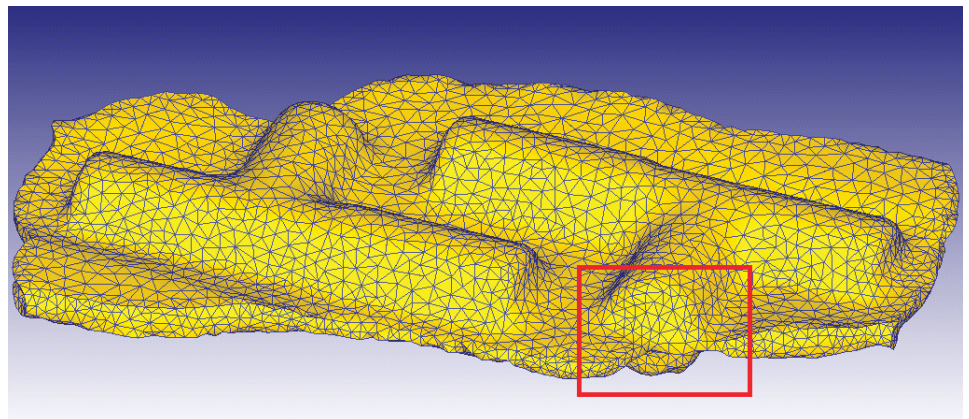
The interest in running very large models in DEFORM increased as 3D simulations became routine. A decade ago, 100,000 elements was considered large. Today, the threshold is a million or more.

Objectives include resolving finer details, capturing very small defects, and die stress in an intricate die, to name a few.

In version 10, a 64 bit FEM engine allowed larger simulations to be run. As more cases were tested, the entire system was enhanced to support big models. This included meshing, interpolation, contact, GUI and database generation.

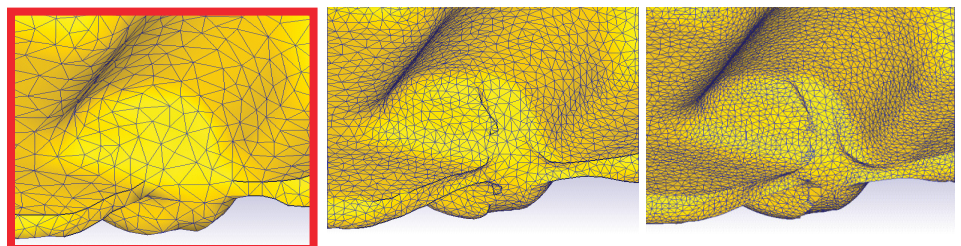
The ability to better detect small defects is one reason to use more elements in your simulation. In production, a double tee forging had a very shallow lap defect on the end of one of the tees. The size of the elements in the vicinity of the defect will determine how well the lap is displayed.

The tee forging meshed with 50,000 elements does not show a fold visually. While there are fold detection tools in DEFORM, the size and shape of the defect is not shown. The element size was larger than the fold width and depth, thus like measuring a machined surface with a ruler. Using smaller elements is analogous to replacing the ruler with a micrometer.

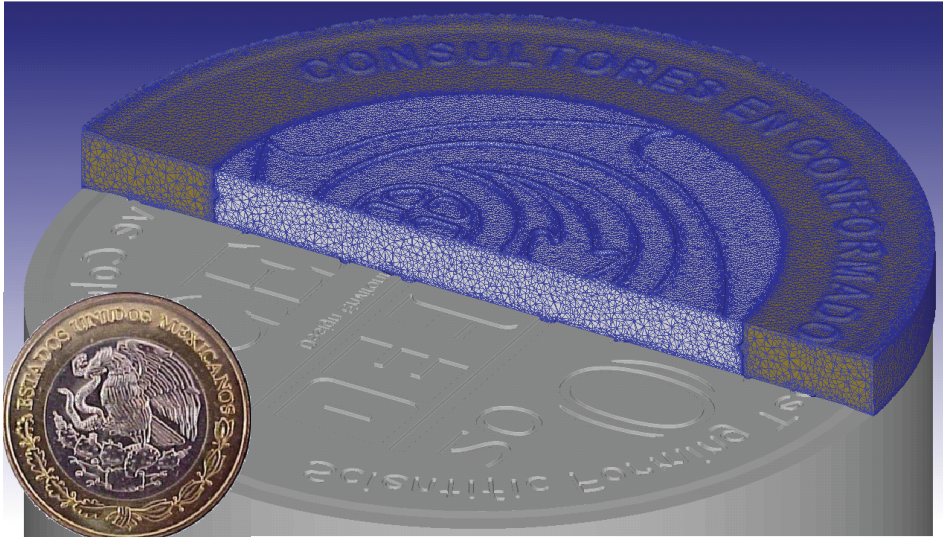


In version 11, model size should be limited by computer hardware, for practical purposes. Large models will require more memory. Computers with 24 or 32 GB of RAM may be required for models with several million elements.

The element size in a model with 50,000 elements is too coarse to show the defect (area in red box). The model with 250,000 elements (center) shows the defect clearly. With 1.2 million elements (right), the fold is shown in high resolution.



Multiple deforming body three dimensional simulations are computationally intense. This is especially true when each deforming object has over one million elements like the coining example, below. The simulation was intended to replicate the coining of a bimetallic coin, like the one shown in the inset image. This coin had a stainless steel core and a copper rim which were mechanically joined together during the final forming. The simulation result shows the formed coin, which has 1.3 million elements in the core and one million elements in the rim.



The die used in this coining process had extensive engraved text and other fine details. In order to investigate the stresses in the die, a large number of elements was required. The die was meshed using 1.9 million elements. A decoupled die stress analysis was run. The image below shows the effective stress in the die (red is higher). The close-up view shows the mesh resolution in this model. Note the resolution around the text.



DEFORM Version 11 Release

SFTC will continue to support the current integrated 2D/3D and F2/F3 interfaces as the new user interfaces are introduced.

DEFORM version 11 release includes:

- DEFORM integrated 2D/3D (similar look and feel to version 10.x)
- DEFORM integrated F2/F3 (similar look and feel to version 10.x)
- DEFORM new Multiple Operations (MO) interface with design of experiments and optimization capabilities (new look and feel interface)
- DEFORM next generation post-processor with automated report generation
- DEFORM License Manager version 3.0.4 with core licensing capability

A new DEFORM.PWD license file is required to run version 11.

Basic version 11 capabilities are supported by License Manager version 3.0.3 (released with version 10.2.1)

Design of experiments, optimization and core licensing require License Manager version 3.0.4

Major New Features

New multiple operations system

New cogging module

Much wider 64 bit support

New solvers:

- dynamic explicit elastic-plastic solver
- MUMPS sparse direct solver
- improved conjugate gradient iterative solver

New material models:

- crystal plasticity
- mesoscale
- improved handling of precipitation hardening alloys
- flow stress as a function of grain size

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