DEFORM™ News

Training:

• February 24-27, 2015: DEFORM training will be conducted at the SFTC office in Columbus, OH.

• April 21-24, 2015: DEFORM training at the SFTC office in Columbus, OH.

• June 16-19, 2015: DEFORM training will be held at the SFTC office in Columbus, OH.

Events:

• April 28 and 29, 2015: DEFORM User Group meeting. The location for the meeting will be finalized and announced in the coming weeks.

• August 18-19, 2015: The annual Die Stress Analysis Workshop will be held at the SFTC office in Columbus, OH. Professor Joe Domblesky, from Marquette University, will co-instruct this very popular workshop.

• August 20, 2015: A one-day training on simulating die stress analysis will be offered for the first time after the Die Stress Analysis Workshop. This event will cover the setup and simulation options from a nuts and bolts perspective.

3D Meshing Enhancements

DEFORM is used to model manufacturing processes involving large plastic deformation. Remeshing is a fairly common occurrence due to this. SFTC has put a lot of effort into improving the meshing process in V11.0, with excellent results. This article discusses some of the enhancements to 3D meshing.

64-bit Based Remesh Procedure

When a remesh is triggered in DEFORM, several procedures are called back-to-back to accomplish such tasks as border extraction, surface meshing, solid meshing and data interpolation. In V10.2.1, almost all of this was done using 32 bit executables. These files could only access 2^{32} bytes (4.3 Gb) of addressable RAM, meaning very large models (~one million elements) could not be meshed. Converting these to 64 bit programs has increased this limit by several orders of magnitude.

Meshing speed has increased significantly for very large models, with vastly improved model size, robustness and stability.

The remeshing speed was compared for a range of model sizes from 100,000 to one million elements. The time reported is for the entire automated remeshing procedure, which includes border extraction, surface and solid meshing, as well as data interpolation.

The graph shows that for small models, remeshing is now approximately 12% faster. As the model size increases, this speed improvement increases to 20%. For a large one million element model, the remeshing failed in the previous version but was successful in V11.0.1.

DEFORM™

Design Environment for FORMing
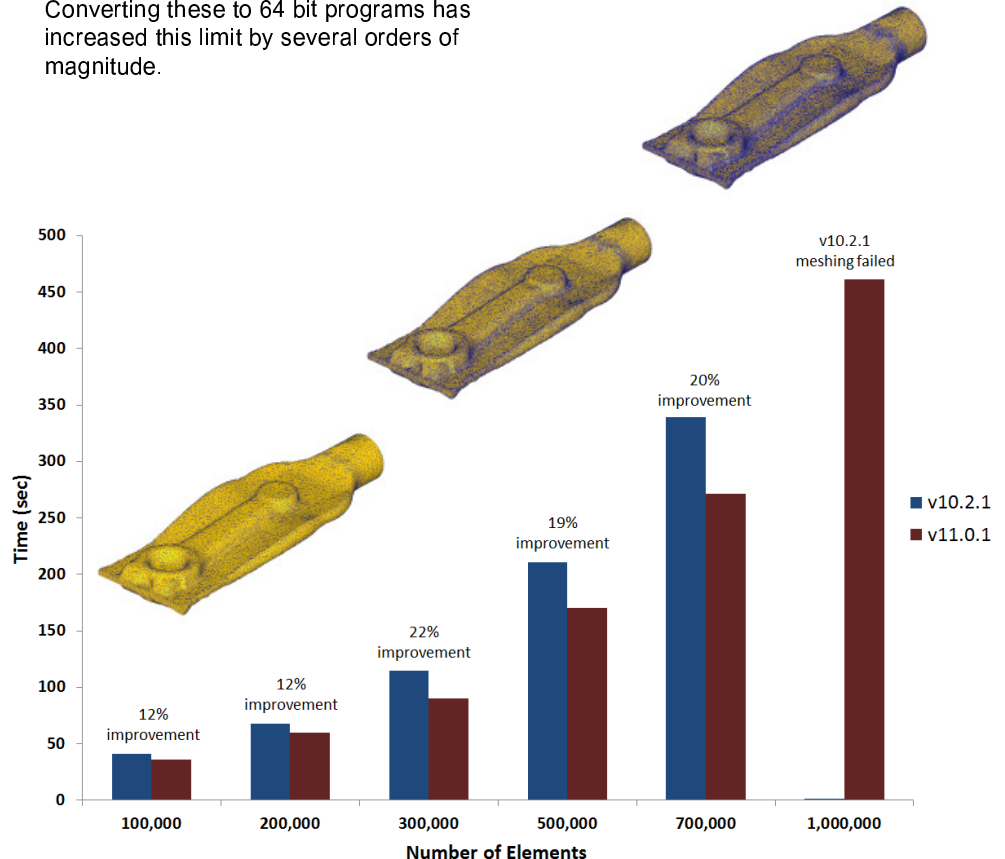
Use of Die Surface Curvature in Meshing

Weighting factors are used when generating a mesh in DEFORM. Surface curvature, strain distribution and strain rate distribution are used by default. In V11+, the use of surface curvature has been greatly improved to more accurately take into account die features.

This coining simulation is a good example to show this enhanced meshing behavior. At a certain point in the forming process, the die comes into contact with the flat surface of the outer ring-shaped object. In previous versions, large elements were generated in the contact zone due to the flat surface of the workpiece. Additional functionality has now been added that will take into account the curvature of the dies. This helps to anticipate the impending contact so that a finer mesh is already present in critical locations. In the V11.0.2 release, this feature is triggered by placing the file DIECUV.DAT in the current project folder. Due to this mesh refinement, more elements will be used for the same absolute mesh settings.

V10.2.1   V11.0.2
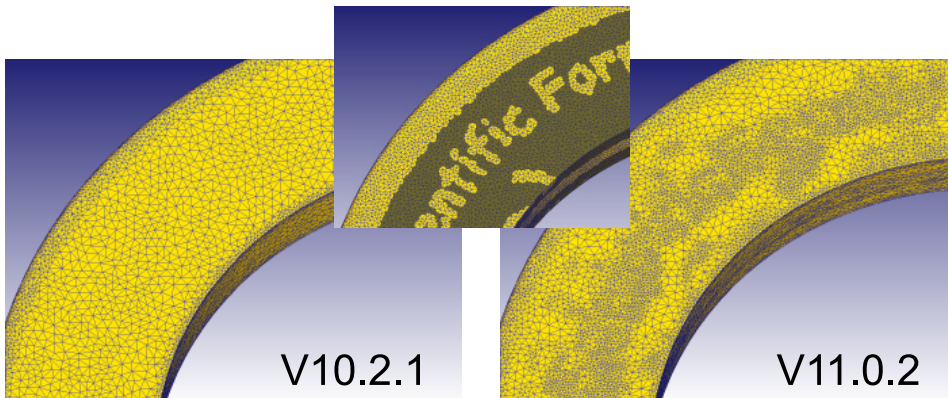
Enhanced Sheet Remeshing Capability

Sheet metal simulations have been run in DEFORM-3D for years. These simulations start with a brick meshed flat sheet. Version 10 contained the initial implementation of brick remeshing. Version 11 improves upon the brick remeshing functionality by allowing weighting factors to be better utilized and number of thickness elements to be modified. This feature is triggered by placing the file SHEETM.DAT (first line: # of thickness layers) in the current project folder. The image below shows the strain distribution on a brick mesh, along with a remeshed part which utilized this strain during meshing. Note how the remeshed part also has four thickness elements compared to the original one.
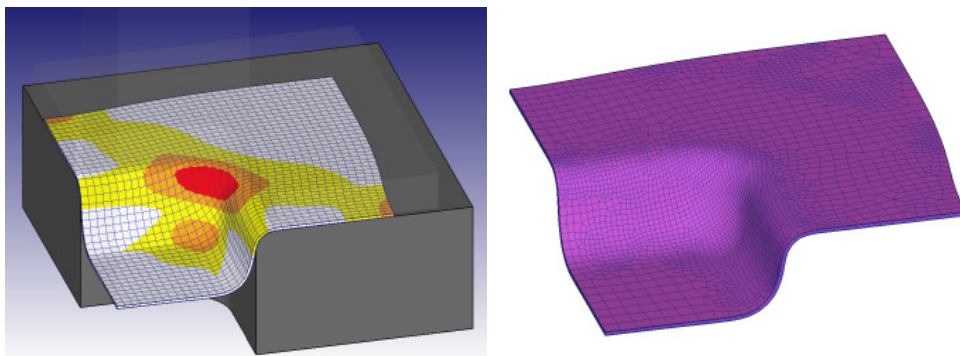
DEFORM V11.0.2 Release

DEFORM V11.0.2 was released in December. Important GUI improvements include:

- target volume calculation restored for 3D FORMING EXPRESS
- improved report generator
- PIP (picture-in-picture) implemented in next generation post-processor to view multiple database files
- quarter symmetry ALE shape rolling rotation supported
- various bug fixes and stability improvements
- geometry reference point location updated even when not used in the stopping criteria
- MTS (multiple time step) coupled die stress analysis now allows EP objects
- hyperelastic analyses use improved sub-stepping for accuracy
- frictional heat involving multiple deforming objects is enhanced

New Features in V11.1

DEFORM V11.1 is being targeted for a mid-2015 release. Some of the new features include:

- shape rolling, cutting and inverse HTC modules improved and available in new MO environment
- copy/mirror functionality in MO
- enhanced PIP and multiple viewports implemented in next generation post-processor
- brick remeshing improved to handle more complex shapes
- rotational symmetry enhanced
- dual mesh system implemented to improve solver speed
- Taguchi sampling for DOE
- CAD integration for DOE
- multiple simulation servers for a single DOE run

DEFORM V11.1 will contain the integrated 2D/3D and the F2/F3 user interfaces. Over time these will be phased out and replaced by the Multiple Operations GUI.