Winter, 2009

Volume 7, No. 1

DEFORM™ News

Events:

- May 6 & 7, 2009: The Spring DEFORM User Group Meeting will be held at the Bridgewater Banquet & Conference Center in Columbus, Ohio. Details are available on the web site. Register now for this exciting event.

Training:

- Advanced training will be held at the SFTC office in Columbus, Ohio on May 7 & 8, after the Spring DEFORM User Group Meeting.
- February 10 & 11, 2009: DEFORM-2D training (includes DEFORM-F2) will be conducted at SFTC in Columbus, Ohio.
- February 12 & 13, 2009: DEFORM-3D training (includes DEFORM-F3) will be conducted at the SFTC office.

Decoupled Die Stress – Tips from DEFORM Tech Support

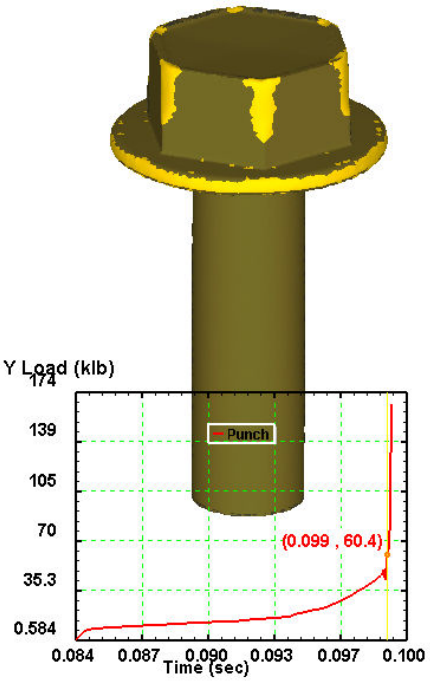
The Fall 2008 DEFORM News discussed the use of coupled die stress analysis in DEFORM. Coupled die stress solves for the stresses in the tools at the same time as the deformation of the plastic workpiece. The majority of die stress issues can be resolved using decoupled die stress, however, which is much faster and less computationally intense.

Decoupled die stress solves for the stresses in the tools after the forming simulation has already been completed. Often, customers have questions about how to set up these simulations. This DEFORM News addresses some of the most common questions that arise.

The following is the general procedure for setting up a decoupled die stress analysis, along with some helpful tips.

1) Run the forming simulation

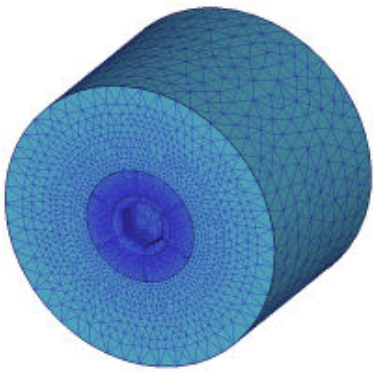
2) Identify critical step in forming simulation
   · **Tip:** Critical step is typically at the end of the stroke where load is highest. To get accurate simulated load, do not completely fill corners of the part that do not get filled on the shop floor.

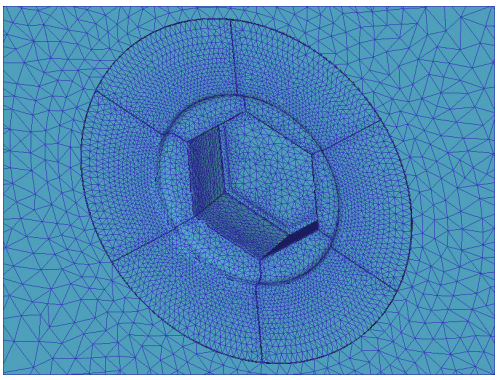


Correct step for die stress based on die fill (shaded area is die contact)

3) Create a die stress problem and import critical step from deformation database

4) Import support tools and mesh all elastic dies
   · **Tip:** When meshing the tools, use enough elements so that the tools look realistic.
   · **Tip:** When multiple tools are in contact, it is beneficial to mesh the inner object finer than the outer object.



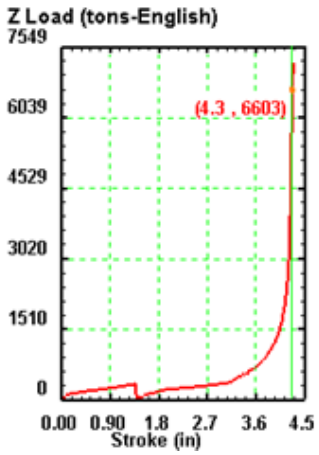


Segmented punch insert is shown - segments are meshed finer than the case.

DEFORM™
Design Environment for FORMing

5) Constrain tools - often by assigning velocity boundary conditions

6) Interpolate forces from forming simulation workpiece to elastic tools
   · **Tip:** Use an interpolation tolerance equal to a medium element edge length on the workpiece. The magnitude of the interpolated force should be very close to that seen in the load-stroke curve.

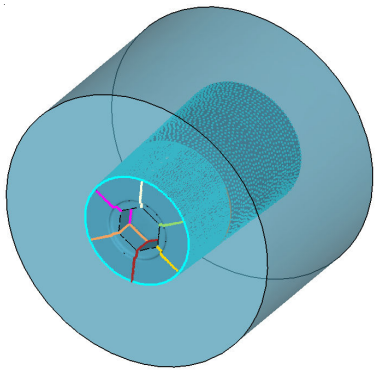


Forces have been interpolated from the workpiece to the die.
Error Limit : 0.10000
Workpiece force : Fx : 27.37300 Fy : 76.36400 Fz : -13202.00000
Die force : Fx : 24.48800 Fy : 78.99200 Fz : -13159.00000
Force interpolation is done.
(~6580 tons)

The load on the die in the forming simulation should be very close to the force interpolated onto the object in the die stress analysis.

7) Define shrink fits (if any) between the tool components
   · **Tip:** A correctly oriented shrink fit gets applied as a positive number on the outer object. Remember to input the radial shrink and not the total amount of shrink.
   · **Tip:** It is beneficial to run a simulation with only the applied shrink fit (no force interpolation) to investigate the stresses caused by the shrink fit.

8) Assign tool master-slave relationships & generate contact
   · **Tip:** For die stacks, make the outer object (coarser mesh) the Master to the inner Slave object (finer mesh).
   · **Tip:** Try to generate complete contact at mating die surfaces. If needed, gradually increase the contact tolerance to accomplish this.



Punch assembly shown with complete contact at all mating surfaces.

9) Write a new die stress database and run the simulation.
   · **Tip:** Use one simulation step if modeling only one die component. For multiple contacting die components, use 10 steps so equilibrium is obtained.

These tips should help get decoupled die stress simulations running smoothly. DEFORM Technical Support is always available if additional questions arise.

Releases:

DEFORM-3D V6.1.3 and DEFORM-F3 V6.1.3 were released in May. DEFORM-2D V9.1.1 was released in March. These service packs are primarily bug fixes and code refinements.

A major release is in development for the very near term. Version 10.0 will include 2D - 3D integration, license manager improvements, multiple material groups and developments in shape rolling and ring rolling. Additionally, compiler and operating system studies are being performed to improve system performance.

More details on the 10.0 release will be presented at the Spring DEFORM User Group Meeting. For specific details, please contact SFTC.

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