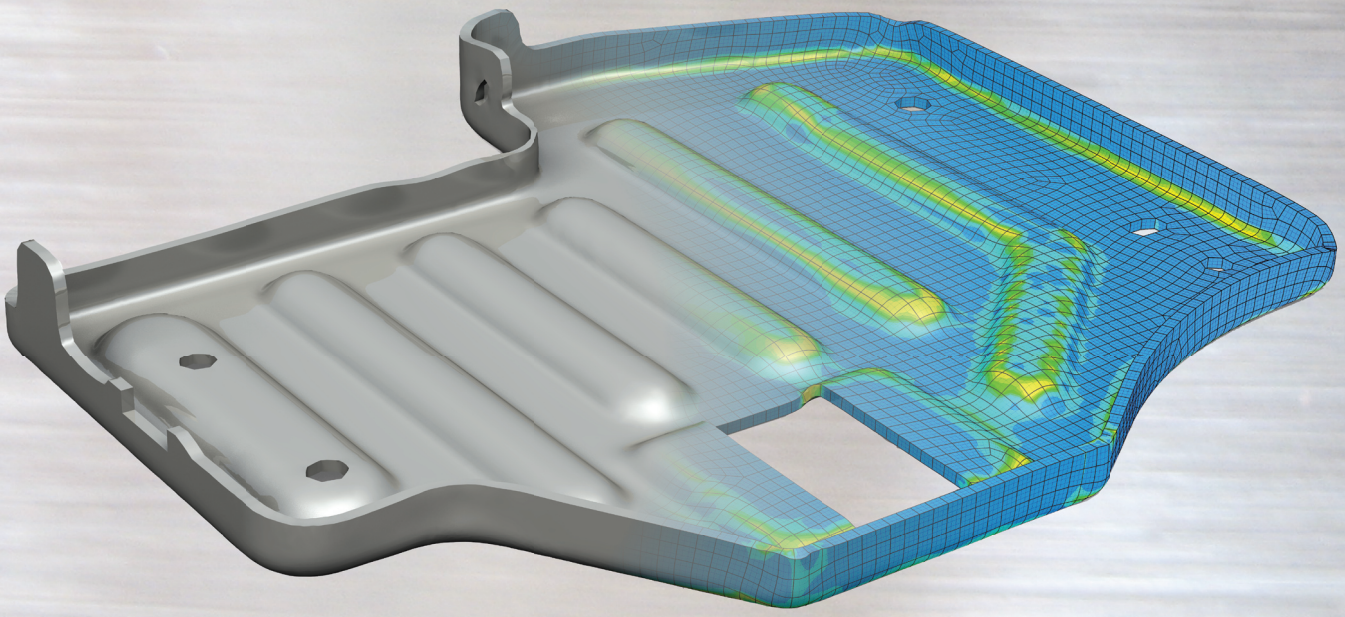
Certa Sim

Providing Innovative Solutions

The IMPETUS Afea Solver®

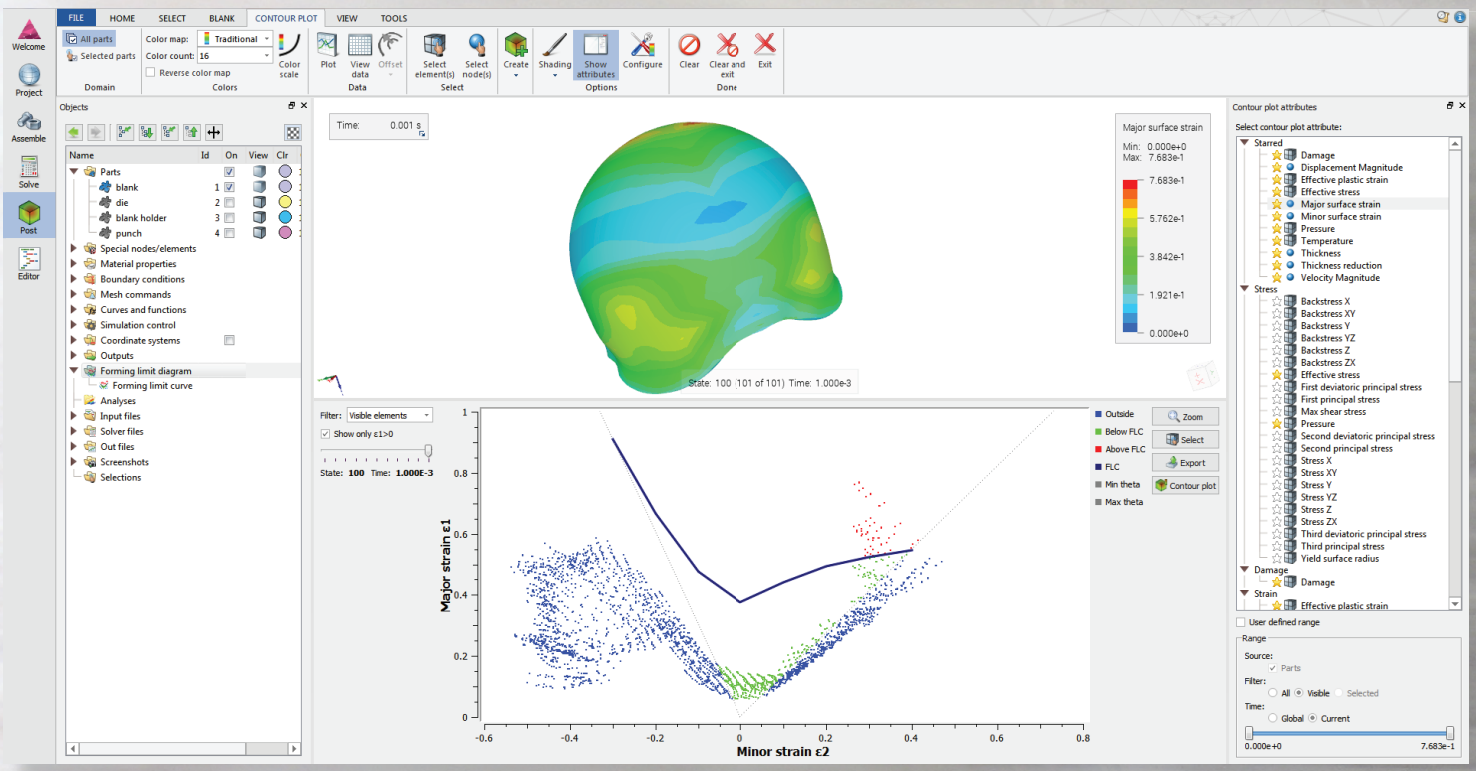
SHEET METAL FORMING

The Advanced Element Technology, ASET™, at the heart of the IMPETUS Afea Solver® makes it possible to model Sheet Metal Forming with solid elements, which is the only way to accurately capture the true three dimensional nature of the forming process. This is especially true for thicker parts and other situations where it is inaccurate to assume plane stress conditions. One example of this is hydroforming where a fluid generates an added pressure; another example is forming of Metal-Plastic-Metal sandwich plates where the metal sheets are bonded together with a thin polymer layer. These processes involve very large deformation and must be modeled with solid elements to accurately capture the physics. This is where the IMPETUS ASET™ elements provide the answer. Accurate high order elements further allow for modeling wrinkles and thinning. In general parts are modeled with only one high order element through the thickness. Refinement at runtime allows the analyst to select intelligently where more elements are needed, combining this with the ability to mix element order leads to a very flexible product development phase with limited use of a pre-processing tool, which lowers the turn-around time in the tool design phase.



Accurate modeling that captures forming defects leads to fewer prototype runs in the tool shop, improved productivity and higher manufacturing efficiency.

The IMPETUS Afea Solver® GUI for post-processing has a tailored interface for metal forming. It is possible to generate contour plots of thickness, thickness reduction, Major and Minor strains, etc. The Forming Limit Diagram is implemented to plot formability and obtain knowledge about the process.



Key Features and Benefits:

- ASET™ Elements provide accuracy and capture the real three dimensional stress state.
- Element technology allows for large deformation and large draw.
- High order elements allow for smoothing of geometric surfaces for accurate tool contact.
- Selective mass-scaling which includes a unique cluster technique speeds up calculations for thinner work pieces.
- Ability to use functions in the material's hardening law makes it very easy to test new ideas.
- Wear functions in the contact definition allows fast prediction of tool wear and easy post-processing.
- Inclusion of thermal terms in contact and thermal solver is suitable for hot forming.
- Access to intrinsic variables allows for in-process control loops, e.g., variable blank holder force as a function of punch force.
- Option to perform blank trimming based upon projected curve and smooth trim edge due to high order elements.
- Unique Node Splitting Algorithm easily accounts for crack propagation.
- Constitutive Models based on Lankford coefficients which can be functions of effective plastic strain.
- Large amount of Metal Forming options in Post-Processing GUI: Forming Limit Diagram, Thinning, Process Signature, etc.

CertaSim Providing Innovative Solutions

IMPETUS driving precision

www.certasim.com • sales@certasim.com