Summer, 2018

Volume 16, No. 2

DEFORM® News

Training:

- August 14-17, 2018: DEFORM training will be conducted at the SFTC office in Columbus, OH.
- August 23, 2018: A one-day DEFORM training class will be offered following the Die Stress Analysis Workshop. This training will cover die stress analysis setup and simulation options from a DEFORM user's perspective.
- October 9-12, 2018: DEFORM training will be conducted at the SFTC office in Columbus, OH.

Events:

- August 21-22, 2018: 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.
- September 11-12, 2018: SFTC will exhibit at the 2018 Forging Industry Technical Conference in Long Beach, CA. Forging, heating, rolling, ring rolling, and heat treatment applications of DEFORM will be highlighted.
- October 30-31, 2018: The Fall 2018 User Group Meeting will be held in Columbus, OH. Details will be announced at a later date.
- November 6-8, 2018: SFTC will exhibit at FABTECH 2018 in Atlanta, GA. Bulk forming, stamping, joining, extrusion and spinning applications of DEFORM will be highlighted.

DEFORM®

Design Environment for FORMing

Sheet Metal:

Applications of the DEFORM process simulation system in bulk metal forming are well documented. The majority of examples involve hot forging or cold forming, which begin with wire, bar, billet or plate. Also practical is the simulation of sheet metal processes like coining, deep drawing, joining and stamping. One such stamping case study is described below.

Case Study:

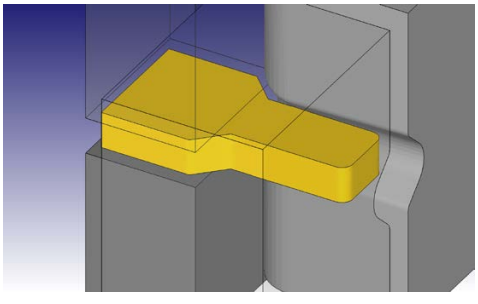
Penn United Technologies (Cabot, PA) specializes in metal stamping, carbide manufacturing and precision tool and die design. A customer approached the company with an opportunity to manufacture a precision stamped link. It was to be made from 0.022" thick, quarter-hard, grade 301 stainless steel. The original two piece design was to be a flat beam joined to a round stud. Press fitting and laser welding were the proposed joining methods.

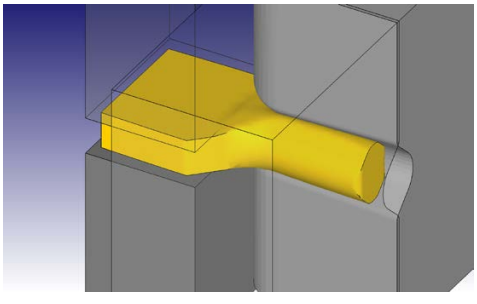
Engineers identified a number of issues during initial design for manufacturability reviews. The cross-section around the hole was quite thin. Final cut and break edge conditions would not have been suitable for press fit assembly. Customer requirements did not allow larger sections to improve fit. The laser welding alternative would have driven up capital and piece costs.

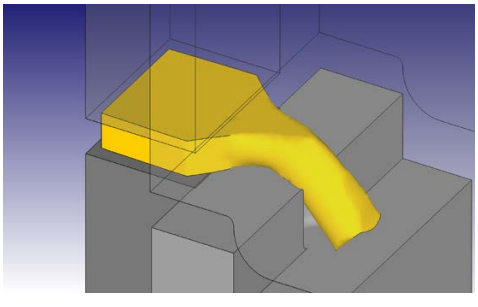
Limited by constraints, Penn United staff came up with a unique idea to form a round stud directly from the flat base stock. There was no precedence for such a design, so several concerns existed. Type 301 stainless steel readily work hardens, so there was concern that large deformation might lead to cracking. Starting with quarter-hard material, to meet customer strength requirements, only increased this risk. Also of concern was how round, uniform and filled the stud would be at various heights.

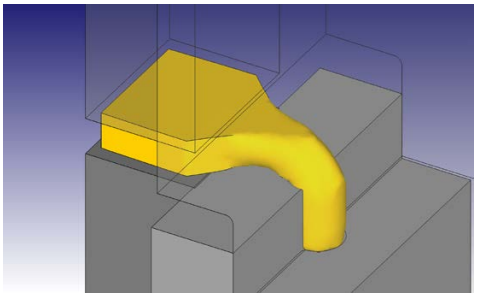
Process Simulation:

Penn United needed a way to evaluate their concept and maximize its chance of success. They chose to model the proposed stamping process with the DEFORM-3D system. Its multiple operation environment was ideal for replicating the progressive layout. The stud was formed across three stations. The images below illustrate how the trimmed blank (upper left) progressed through horizontal coin (upper right), vertical form (lower left) and horizontal form (lower right) operations. Tools moved either vertically, horizontally or axially.







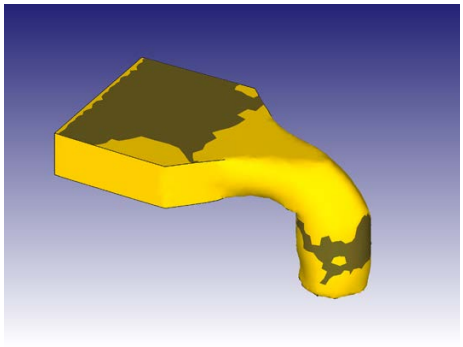


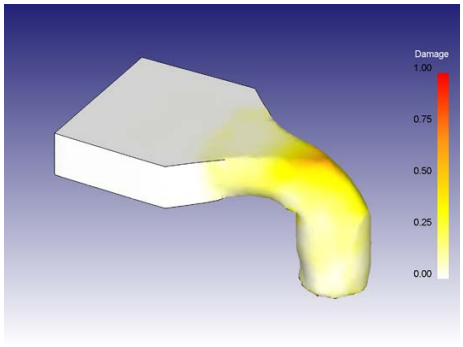
DEFORM simulations allowed Penn United to predict how blank geometry and tooling design impacted the finished part. The customer had identified areas of the link where under-fill was allowed. Toolmakers matched this information to simulation results as they optimized part shape and die fill. They also evaluated the accumulated damage within the part. This measure allowed them to minimize the risk of cracking.

In addition to the technical benefits, DEFORM results allowed Penn United to clearly and concisely communicate results to their customer. Process design had also been established scientifically, rather than through "gut feel".

Conclusion:

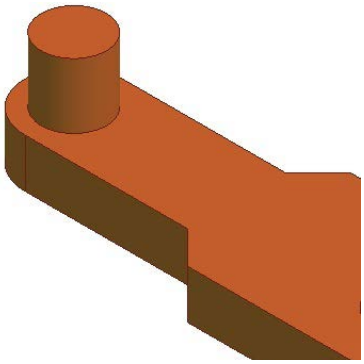
The customer reviewed the Penn United proposal to determine if the single-piece design was a viable solution. It included predictions of die fill (left) and damage (right). Promising DEFORM results convinced the customer to move forward with development and testing. Penn United manufactured single-hit tooling and produced a small batch of prototypes. The physical parts correlated well with simulation results.





Physical product testing of the prototype later revealed that more die fill was desirable. Toolmakers again used simulation and shop trials to further optimize the design. A fourth forming operation was subsequently added to the process. High-volume tooling was manufactured when the job was launched into production.

The customer's initial design (left) and the final part (right) are shown below. Penn United found DEFORM-3D instrumental in helping them justify and develop the "out of the box" concept. The company ran this job "for several years with great success".



The DEFORM system offers an ideal environment for process development, tool design and product optimization across a wide range of applications. Simple changes or radical concepts may be safely simulated in less time, with lower expense and having fewer risks than shop floor trials.

SFTC would like to thank Penn United Technologies for providing this case study. If you would like to share a DEFORM success story then please contact sales@deform.com.

DEFORM V11.2 Release

DEFORM V11.2 was released in late 2017. The list of enhancements and new features include:

Graphical User Interface
- System performance improvements
- Improved large model handling
- Limited MO BCC redefinition
- MO Stop operator
- MO Archive function
- Object copy tool
- Enhanced mechanical press setup
- Point tracking for trimmed objects
- Postprocessor updates
- Picture-In-Picture (PIP) display
- ALE FLOWNET tracking
- Volume tracking
- Backward region of interest tracking
- DOE friction window variable
- DOE/optimization enhancements
- Updated Shape Rolling template

3D FEM
- Parallel meshing
- Furnace combustion air flow loss
- Kinematic hardening improvements
- Hydraulic press enhancements
- Material data handling updates
- Porous mini elements
- Tool wear improvements

2D FEM
- Porous material flow softening
- Thickness-based element deletion
- Hydraulic press enhancements
- Material data handling updates

Miscellaneous
- Material data updates
- 4 new lab exercises
- New license manager
- DEFORM Service Control utility
- Web-based simulation monitoring

The complete list of the new features can be found in the V11.2 release notes. Release notes are included with the software installation and are also available on the DEFORM User Area.

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