Summer, 2022

Volume 20, No. 2

DEFORM News

Training

SFTC will offer DEFORM training for U.S. and Canadian customers on the following dates in late 2022 and early 2023.

- Dec 6-8
- Feb 7-9

Additional training details are listed on the DEFORM website.

For users outside the U.S. and Canada, please contact your local DEFORM distributor for more information on the training events available in your region.

Events

The Fall 2022 DEFORM User Group Meeting (online) is tentatively scheduled for Nov 1-2. Details will be emailed to applicable users.

Social Media

www.deform.com/linkedin
www.deform.com/youtube

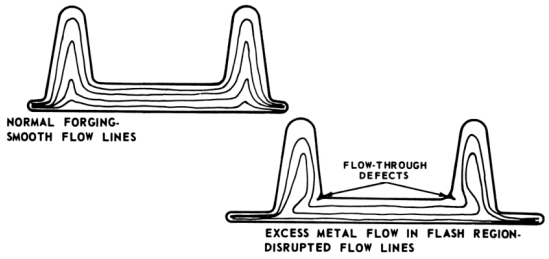
Careers

SFTC is taking applications for technical sales/support candidates. Candidates must be eligible to work in the USA. Visa sponsorship is not available for the position. Interested candidates may apply through the DEFORM website.

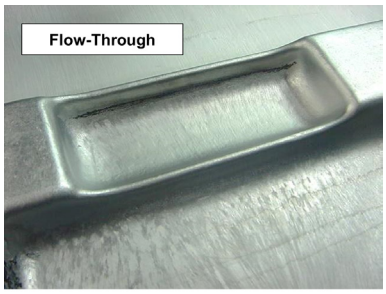
DEFORM®
Design Environment for FORMing

Flow Defects

One of the more challenging problems to predict in cold forming and forging are flow defects. They do not typically show up in a mesh, like a fold or lap, despite their crack-like appearance on physical parts. The DEFORM system has included tools applicable to flow defect detection for decades. Recent enhancements have introduced new, easy-to-use state variables for flow defect prediction.



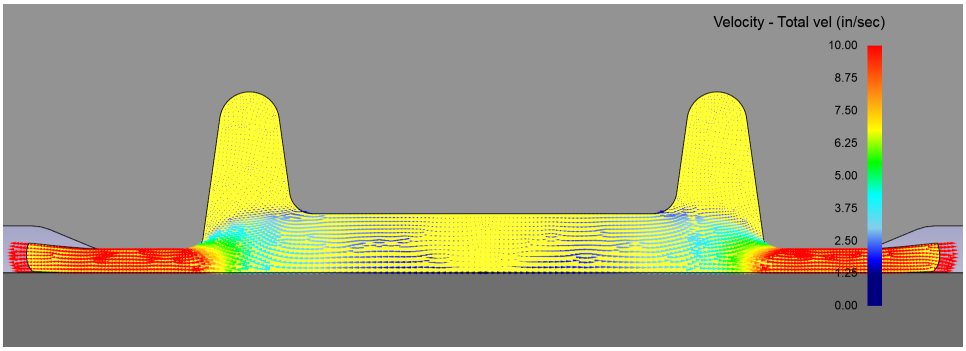
Ref: Dieter, Kuhm, Semiatin, Handbook of Workability and Process Design. ASM International, 2003, pp. 203-204. Print

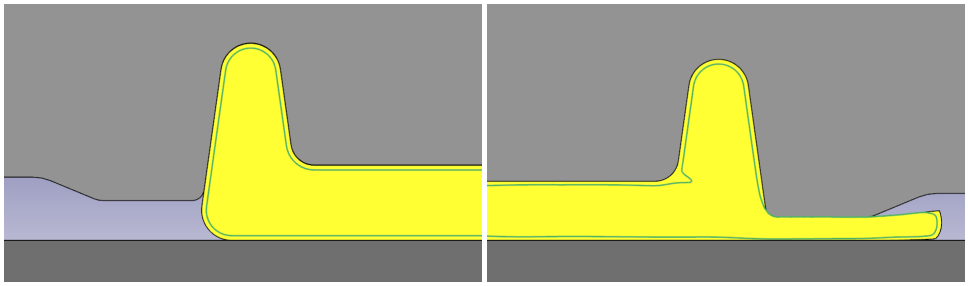


Flow defects go by many names: flow-bys, flow-throughs, piping defects, suck-ins, etc. Their fundamental behavior is illustrated in the handbook example shown above. Flow defects can occur when metal is forced past a cavity that has already filled. They are associated with poor grain flow and flow localization. Physical defects (right) may appear as a shallow lap, crack or wrinkling. The defects are a result of inadequate die design, preform geometry or lubrication.

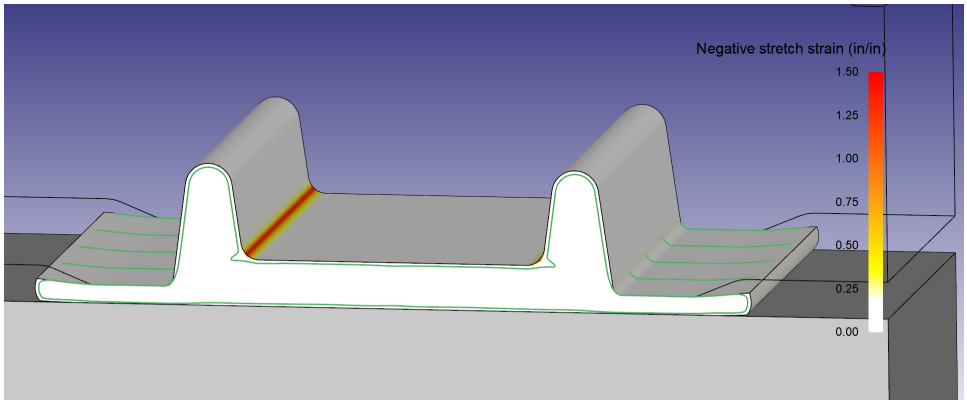
Flow defects are most common in soft metals (aluminum, copper, magnesium), though they may occur in steel and other metals. Flow softening and adiabatic heating contribute to the root cause, which is a local shear band that creates a preferential path for material flow. Remember the golden rule of metal forming: “Metal flow follows the path of least resistance.”

A velocity plot (below) reveals the trapping of material in the rib of a rib-web forging example. A large volume of web material flows past the stagnant rib material and into the flash. This is a situation where a flow defect is a concern.

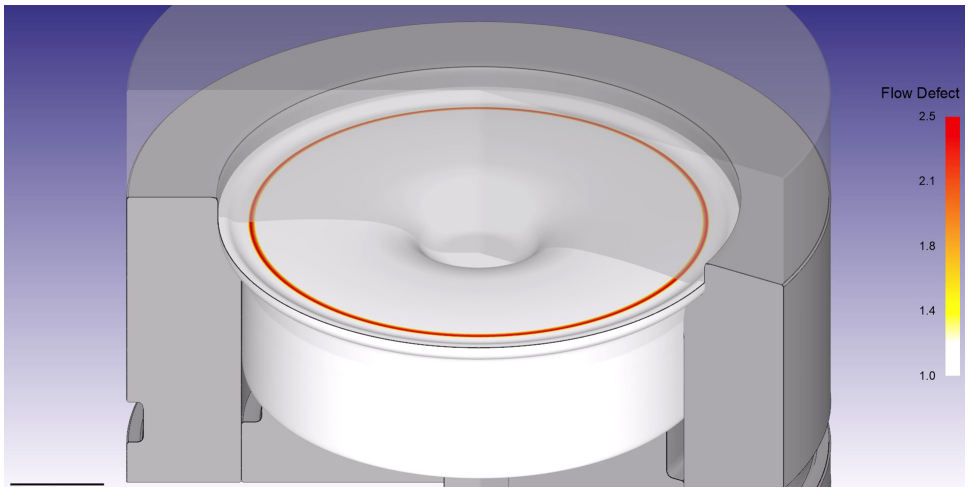




Over the years, DEFORM users have relied upon 2D offset curve and 3D offset surface FLOWNET patterns to help them detect flow defects. The sequence (above) shows the development of the characteristic V-shaped offset FLOWNET curve (green) that indicates a flow-through. The more an offset curve (or surface) pulls away from the geometry boundary, the greater the risk of a severe flow defect. Some users have quantified the risk based on their experience with real world pass/fail conditions and associated simulation results.



Two new analysis state variables, inward flow displacement and negative stretch strain, were introduced in DEFORM V13.0.1 to simplify flow defect detection. These “flow defect” state variables are easily visualized on the surface of a 2D or 3D model. They thus provide a faster way to gauge whether flow defects might be a risk in a process. The image above shows how well a flow defect state variable matches offset FLOWNET results.



Certain high-production aluminum wheel forging processes are susceptible to flow defects. In the above example, one of the new flow defect state variables clearly highlights an issue on the face of a forged wheel. The issue was quickly found without running the longer FLOWNET procedure. With the issue identified, forging concerns may be resolved by adding/removing operations, altering the preform design, adjusting tool geometries or changing process parameters.

DEFORM V13.0.1 Release

DEFORM V13.0.1 was released in August. The release includes a variety of enhancements and bug fixes. Notable DEFORM V13.0.1 changes include:

- Full 64-bit support on Linux
- Silent installer option
- GUI Main performance fixes
- Cylinder primative radius/diameter
- Hensel-Spittel flow stress model
- Damage model updates
- New 2D/3D meshers (beta)
- Shape roll entry section option
- Cogging reheat step controls
- Billet length stopping criteria
- Max/min diameter stopping control
- RVE void & inclusion updates
- Tool Life study feature (beta)
- Fatigue analysis (Tool Life)
- Arc Welding template (beta)
- Geo Mesh Tool product (beta)
- Deep neural networks (DNN)*
- Flow stress DNN predictor*
- Step browser/view Post option
- Improved fixed-datum color bars
- Added 2D Diff Step
- Chart/graph presets
- Surface expansion variables
- Flow defect state variables
- Remaining Energy variable
- Cutting speed DOE option
- New user manual system
- Next-gen Presentation Player*

** Windows only.*

A complete list of changes is available in the DEFORM V13.0.1 Release Notes.

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