Winter, 2020

Volume 18, No. 1

DEFORM® News

Training:

- April 14-17, 2020: DEFORM training will be conducted at the SFTC office in Columbus, Ohio.
- June 16-19, 2020: DEFORM training will be conducted at the SFTC office in Columbus, Ohio.
- August 11-14, 2020: DEFORM training will be conducted at the SFTC office in Columbus, Ohio.

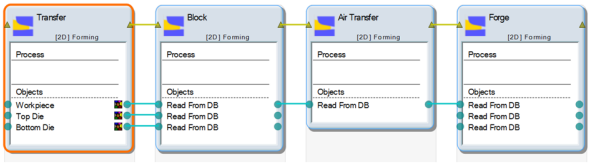
Events:

- August 18-19, 2020: The annual Die Stress Workshop will be hosted by SFTC, in conjunction with Marquette University, in Columbus, Ohio.
- August 20, 2020: A one-day training (teaching die stress modeling within DEFORM) will be conducted following the workshop.

Design of Experiments (DOE) & Optimization

Version 11 of the DEFORM® system revolutionized process simulation by offering a truly multiple-operation (MO) interface that could be combined with first-of-its-kind DOE/optimization integration. Customers have successfully leveraged the technology to reverse-engineer difficult-to-measure process behavior, optimize designs, gauge process sensitivity and robustness and feed "state of the art" data analytics models.

A DEFORM MO project (right) allows a nominal process workflow (chain) to be saved to a reusable preprocessing file. It can consist of one or more operations, which may be similar or dissimilar in nature.



The DOE/Optimization module applies user-defined design/process variations to this nominal chain and saves each scenario as an alternate simulation model (illustrated below). It then automatically runs the all of the alternative models, which may number in the tens, hundreds or thousands. Finally, statistical post-processing tools analyze the predicted process sensitivity and response behavior.

The release of DEFORM Version 12.0 greatly expanded the software's DOE and optimization capabilities.

Key enhancements include:

- Case variables
- Common DOE/OPT structure
- Curves/points as DOE variables
- New evaluation functions
- Outputs from multiple operations
- Enhanced output analysis

Case variables are used when an optimum solution needs to satisfy different processing scenarios (cases). If reverse-engineering a material's flow stress via optimization, one might use case variables to represent different forming techniques. Hot upsetting, forging, extrusion process behavior could then be considered when fitting the material's flow stress definition. One might think of case studies as the technique of fitting data across multiple individual DOE studies at the same time.

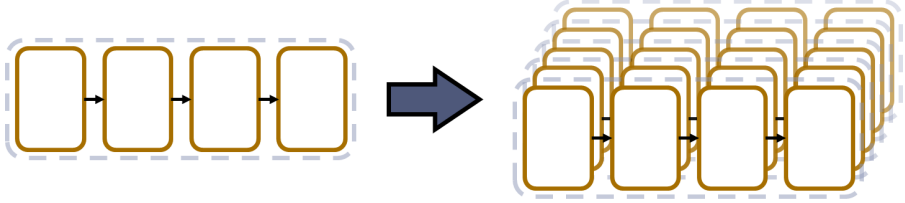
Preprocessing is now even easier to use. DOE and optimization setup procedures have been integrated into a common workflow. Meanwhile, the definition of input variables has become more flexible. Individual data curves and data points may now be altered as DOE input variables.

Postprocessing continues to get more powerful. V12 added the ability to include evaluation functions in DOE projects. Studies are also no longer limited to statistical analysis from only a single operation. Outputs may now be analyzed from one or more operations across the process chain. Finally, probes, plotting and summaries have been improved to provide enhanced output analysis.

Licensees of the all-inclusive DEFORM Premier system have access to the DOE/Optimization Module. Others who would like to learn more about the module and its licensing may contact their local DEFORM distributor for assistance.

Nominal Simulation

Automated Simulations



DEFORM®

Design Environment for FORMing

Customer Success

Orchid Orthopedic Solutions is a worldwide leader of medical device outsourcing services from design and development through finished goods manufacturing. Orchid's facility in Holt, MI specializes in near-net shape forgings for the orthopedic implant industry. Near-net forging processes result in precisely formed products that are exceptionally strong and durable, requiring little or no machining or finishing.

To ensure that they meet and exceed the service, quality, and delivery requirements for their customers, Orchid continuously assesses ways to improve their manufacturing processes. Over the years, die designers and engineers upgraded their software for manufacturing process simulation. The company chose the DEFORM system as the ideal solution for their die development needs.

Orchid uses DEFORM-3D to couple the die designers' experience of historical forming practices with a finite-element metal flow simulation. The analysis shows if the die cavity will fill correctly and whether there is a risk of defects and nonconforming material. After the simulation runs, the die designers can adjust the die and billet geometries to improve material flow and reduce strain before the die is ever cut.

Over the years, DEFORM has matured in speed, accuracy and robustness. Meanwhile, computer hardware performance has increased dramatically. These changes enable Orchid to simulate larger models than ever before. Large models allow them to achieve finer model resolutions and more accurate results. Despite the relative increase in typical model sizes, simulation times have reduced to hours or less.

Orchid is able to analyze their hot forging processes on the computer, rather than on the shop floor using trial and error. Simulation enhancements have been instrumental in decreasing development time and new product launch windows. The DEFORM system truly benefits their cost, quality and delivery initiatives.

Special Honors

At the recent TMS 2020 Annual Meeting, an honorary symposium was held to recognize four individuals who had a profound impact on the metal forming industry. The event was named "Purveyors of Processing Science and ICME: A SMD Symposium to Honor the Many Contributions of Taylan Altan, Wei Tsu Wu, Soo-Ik Oh, and Lee Semiatin". These men contributed to the first practical application of process simulation to forging (ALPID) while at Battelle Memorial Institute during the 1970's and 1980's.

About 40 select presentations, made by industrial, government and academic members, highlighted the many contributions from these four individuals. They were thanked for their decades of service to generations of engineers and researchers.

Dr. Oh was involved in the development of DEFORM and ALPID and was a co-founder of SFTC. Dr. Wu also worked on ALPID, was a co-founder of SFTC, acts as its Executive Vice-President and leads current development. Dr. Altan is well known for his work on ALPID development as well as educational and research contributions at The Ohio State University. Dr. Semiatin, of the U.S. Air Force Research Laboratory, has been a leader in thermomechanical processing and material modeling research and development.

Each of these men made lasting contributions to the application of finite element methods to metal forming and material modeling. SFTC congratulates each of these innovators on their success and this special honor.

Releases:

DEFORM V12.0 Service Pack 1 (V12.0.1) was released in early December. It contains numerous bug fixes and system enhancements. Select changes include:

- V12 Linux support
- Main menu usability
- Forming Express MO handling
- Solver performance
- Running job status
- Object display defaults
- 2D DXF ellipse entities
- Multi-object scheduled remeshing
- Coating mesh data
- ALE mesh generation
- DOE advanced thermal BCC
- Contact generation speed
- Spinning roll positioning
- Matched cogging die positioning
- Shape rolling twist prevention
- Ring rolling MO setup
- Material unit notations
- BCC unit notations
- Language translations
- Extrusion lab documentation
- Material Suite lab documentation
- License Manager
- Service Control

The complete list of improvements can be found in the V12.0.1 Release Notes. Release notes are included with the software installation and are also available on the DEFORM User Area.

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