Winter, 2018

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DEFORM® News

Training:

- April 17-20, 2018: DEFORM training will be conducted at the SFTC office in Columbus, OH.
- June 19-22, 2018: DEFORM training will be conducted at the SFTC office in Columbus, OH.
- August 23, 2018: A one day training, on the mechanics of die stress analysis in DEFORM, will be conducted after the Die Stress Workshop.

Events:

- May 1-2, 2018: Spring UGM Meeting in Columbus, OH. Details will be announced at a later date.
- August 21-22, 2018: The 22nd annual Die Stress Workshop will be hosted by SFTC, in conjunction with Marquette University, at our office in Columbus, Ohio.

Shape Rolling

Manufacturers of rolled product have used DEFORM to optimize rolling profiles and process parameters for years. Three shape rolling methods are available in DEFORM: 3D Lagrangian (3D), ALE, and 2½D. The preprocessor has been enhanced, allowing the user to prepare models with all three methods. A new specialized brick meshing capability has been added to provide an excellent starting mesh for 3D and ALE.

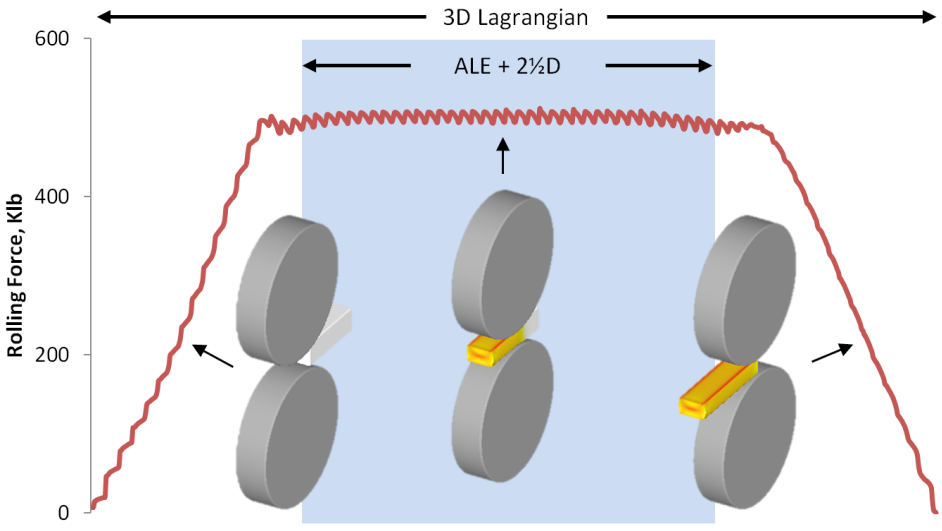
Solution Method

3D is an implicit FEM which utilizes automatic remeshing capabilities. This is the same technique used in a 3D forming operation. It models full transient behavior, including end effects. The sloped portions of the graph below are regions influenced by end effects. 3D is the most robust method available but has longer simulation run times.

The Arbitrary Lagrangian Eulerian (ALE) is a formulation which simulates a region in space and the flow of material though it. It is a steady state solution which can model one or more roll stands and their inter-stand influences. This method is excellent for complex processes because the full transient behavior is not included. Below, the region shown in blue displays the portion of a rolling process which can be modeled with ALE.

2½D utilizes a specialized plane strain modeling technique to simulate shape rolling processes. This method is best suited for simple geometries. Because of the small model sizes, its simulations are extremely fast, completing in minutes. It is intended to provide rapid feedback for the early stages of the design process.

Together, the three methods provide a range of options for balancing robustness, complexity, and speed. The choice of method depends on the process and the user's goals. 3D uses the fewest assumptions and can model any portion of a shape rolling process. ALE models steady state behavior and can handle very complex cases. 2½D considers steady state behavior and is the fastest option for shape rolling.



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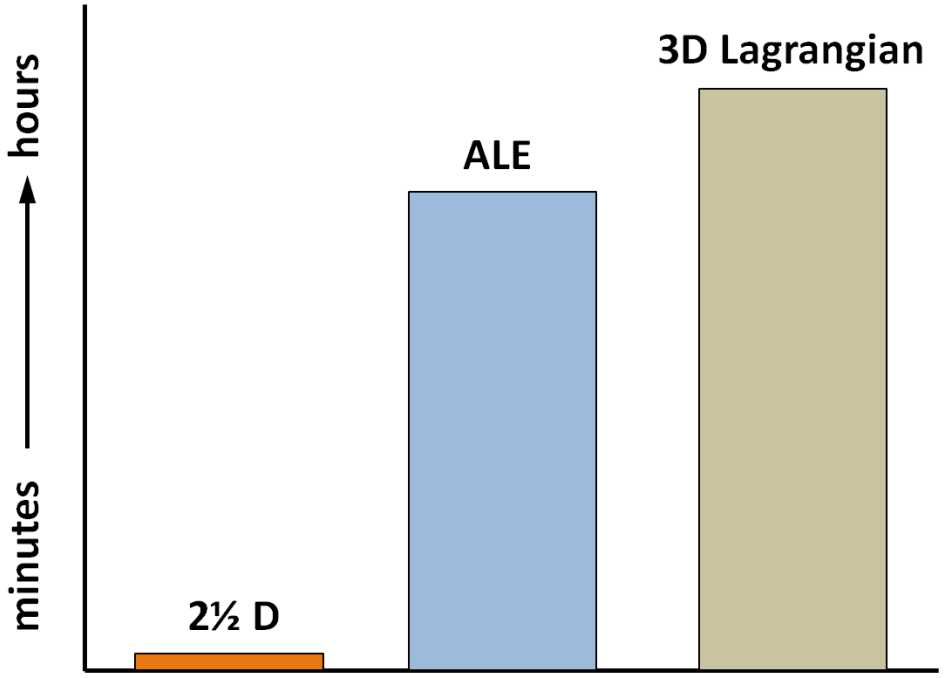
Design Environment for FORMing

Simulation Speed

Simulation speed depends on the amount of model detail and the number of simplifying assumptions. The following graph compares run times of the three solution methods. The 2½D method is orders of magnitude faster than the 3D methods.



ALE surpasses 3D in terms of simulation speed because it does not model the entire transient process. ALE provides increased flexibility to the user by allowing them to choose the most time efficient method for their process. It is also the most efficient way to model multiple stands, in series, and their inter-stand relationships.

3D has the broadest applicability. It is generally the most accurate and robust method. It is competitive with the other methods, when optimal settings are used to balance speed and accuracy.

Setting up a Model

Shape rolling setup is easier than ever before. All three methods are located within one interface. There is no need to switch between various windows or navigate through different operation tiles. The template automatically adapts to the selected method. As the user completes the template, operation tiles are automatically created and populated with the settings provided by the user. This automation takes the repetitive nature of shape rolling operations and uses it as an advantage in model setup.

Additional capabilities have also been added to improve meshing control. 2½D results can now be used to generate a mesh that tracks the roll grooves. This advanced meshing capability provides an excellent starting geometry for ALE and 3D simulations.

DEFORM V11.2 Release

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

Graphical User Interface
- System performance improvements
- Improved large model handling
- Object copy tool
- Enhanced mechanical press setup
- ALE FLOWNET tracking
- Updated shape rolling template

3D FEM
- Parallel meshing
- Hydraulic press enhancements
- Tool wear improvements

2D FEM
- Porous material flow softening
- Thickness-based element deletion
- Hydraulic press enhancements

Miscellaneous
- New license manager
- DEFORM Service Control utility
- Web-based simulation monitoring

A complete list of the new features can be found in the V11.2 release notes located in the DEFORM User Area.

Next Release:

Planning for the next release is currently underway. More information will be shared in the next DEFORM News or during the Spring UGM.

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