Get More Out of Fusion 360 with Nesting

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Learning Objectives

- Discover the purpose and value of automatic nesting to lower manufacturing costs
- Learn how to generate nests for Fusion 360 sheet metal models using desired sheet stock
- Learn how to update existing nests to include new design changes to a model
- Learn how to generate machine code to drive cutting machines or export nests as DXF

Description

Nesting—the 10th top-voted idea on Fusion 360 forums—is getting added to Fusion 360, and it aims to provide much more than material usage optimization. Come find out how the addition of nesting technology within Fusion 360 will help bridge the gap between “Design and Manufacturing.” We’ll discuss how Nesting in Fusion 360 will allow users to calculate multiple sheet nests with corresponding materials and quantities, compare results, create automatic reports, generate machine toolpaths, and export nests as DXF—all from within Fusion 360. Join us to learn how this solution can help you minimize the impact of design changes and maximize material efficiency for cutting with various computer numerical control (CNC) machines.

Speaker(s)

Philip Doup

Phillip Doup joined Autodesk along with the acquisition of Magestic Systems, Inc. and has a background in manufacturing, specifically automated manufacturing process for composites such as Automated Fiber Placement and Automated Tape laying. He has worked closely with machine tool vendors and customers alike in development of design and CAM software for these processes since his graduating from college. He is currently responsible for the architecture for products under the Cutting and Composites group under the Digital Manufacturing Group (DMG).
Introduction

What is nesting?
Nesting is the process of laying out cutting patterns to minimize the raw material waste.

Why is nesting important?
When creating new parts from planar materials, the near-net part profile must first be cut from a block or sheet of material. It is unlikely that the sheet will be the same size or dimension of the desired part shape. As a result, once the desired part has been cut out, there is generally unused material left over. Depending on the dimensions of the unused area, it may be usable (remnant) or unusable (waste). Nesting calculates optimal placement of parts on material stock to maximize yield, reduce material waste, and thus minimizes unit cost of part production.

What to expect from Nesting in Fusion?
Right from the beginning, you will be able to go from sheet metal Design & flat patterning to Nesting to CAM as a complete end-to-end workflow. If you make any design edits, the related nests will become "out-of-sync" and can be updated associatively. These changes can also be propagated to CAM to ensure toolpath operations are up-to-date with design and nest updates. Moreover, the new "Convert to Sheet Metal" feature in Design will allow you to import non-native sheet metal designs into Fusion and make them nestable. Sheet metal nesting is just the beginning; Nesting for non-sheet metal solids and sketches is also in the pipeline and will be available shortly thereafter.
(Note: At the time of Autodesk University 2019, this solution is still in development and not publicly available as "Preview")

Workflow

Create Nestable Designs

1. In the Design workspace, create a sheet metal design with associated flat patterns, or open an existing design.
2. Optional: Derive or XRef other sheet metal parts into this design
3. Save the design.
Access the Nest Workspace

1. Create a new document and save it.
2. Switch to the Nest workspace using the workspace switcher.
3. In the Fusion 360 Test Command box, enter "CAM.FeatureFlags" then enable the mfg-working-model feature flag.

Add and Manage Items for Nesting
1. Upon entering the Nest workspace, the Add Sources dialog gets presented where you can add items to Nest using the green Add icon in the bottom left corner of the dialog box.
2. Alternatively, you may click “Sources” on the Nesting toolbar to add items to Nest in a similar way.

Create and Manage Nest Studies
1. Click Study on the Nesting toolbar.
2. Optional: In the Create Nest Study dialog box that opens, enter a study name, comments and other properties such as position, calculation time, remnant optimization method, and job quantity.
3. In the Output tab, enable Automatically Create Manufacturing Model and Include Stock options.
4. Click OK to create new Nest Study.

Work with the Browser Tree

The components of a nesting study are listed as nodes in the Fusion browser tree.

1. To edit a Nest Study, right-click its node and select Properties.
2. To compare nests within a study, right-click the Nest Study node and select Compare.
3. Lightning icons indicate nodes that need to be calculated. Right-click the node and select Calculate.
4. To see an HTML report for a nest, right-click the Nest node and select Report.

Prepare Nest Results for Cutting

Now that the Nests are created, you may create Setups and Toolpaths in the Manufacture workspace or simply export the Nest results as DXF.
A. To work with a 3D model of the Nest result, switch to the Manufacture workspace.
   1. Each nest sheet result will automatically have a corresponding manufacturing model created with all of it 3D nest sources instantiated on corresponding sheet stock.
   2. Right-click and select Create Setup from Manufacturing Model
   3. Use 2D profile command in Fabrication tab to create Cutting toolpaths for laser, waterjet, plasma machines.
   4. Once toolpath operation is calculated, Generate NC code using available library of postprocessors.

This works as long as you enabled:
   a. The mig-working-model feature flag
   b. Automatically Create Manufacturing Model and Include Stock options in the Output tab of the Create Nest Study dialog box.

B. To export to DXF of the nest results, right-click a sheet node in the browser tree and select export. You can use default configuration file for layer mapping or create your own to define custom layer mapping criteria.

Edit Design and Update Existing Nests

Associative updates is one of the key benefits of having an end-to-end workflow from Design > Nest > Manufacture. In case of Design edits, you can quickly update existing Nests.

1. Edit design for one or more of the sheet metal parts that are currently nested. Update flat pattern and save design
2. In the Nest document, switch workspace to Design. Changes are detected. Click yellow triangle to get latest design changes
3. Switch to Nest workspace. Modified source now becomes out-of-date and gets resynchronized. As a result, related nests to become out-of-date as well. Right click the out-of-date Nest node and click Calculate to update the nest with latest design changes.