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The value of 2D nesting

Using less material to make more products

What is 2D nesting?
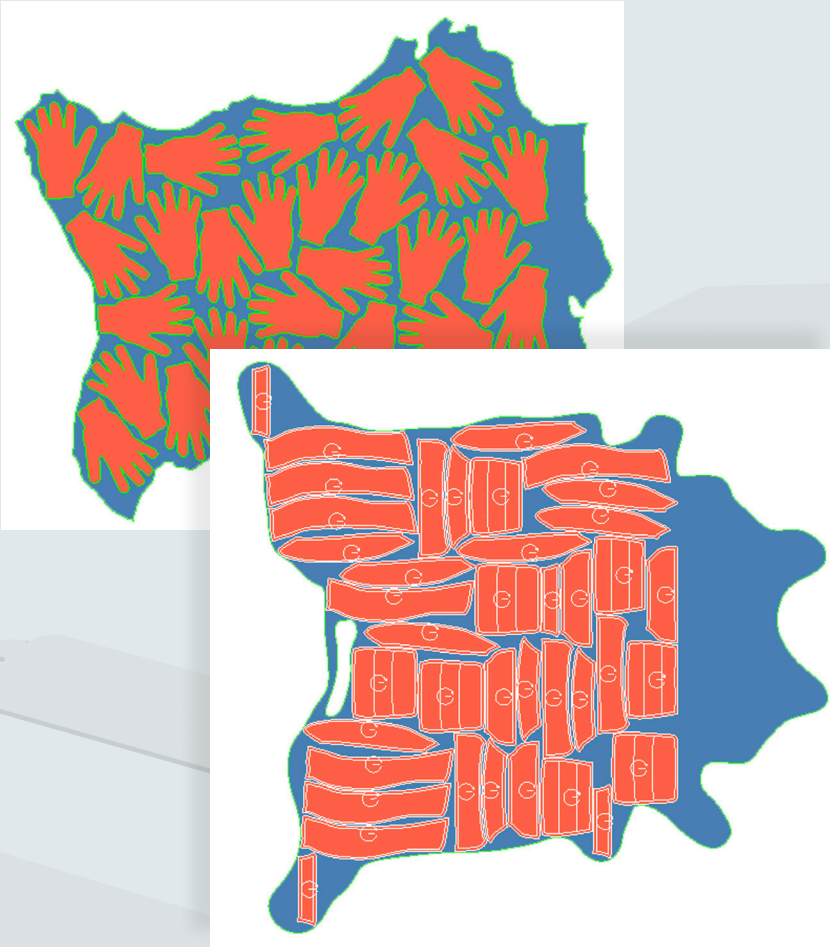
The process of 2D nesting is the organization of 2D shapes on a single cutting plane with the goal of producing as much product with as little waste as possible. The optimized nesting patterns, created using a modern nesting algorithm, markedly reduce preparation time, waste and costs. Although modern nesting is done with software tools, it resembles the processes dressmakers have used for decades when laying out sewing patterns.

With 2D nesting you can reduce tailings or partial sheets. These tailings and partial sheet usage result in wasted material.

Although we often think of 2D nesting in a sheet metal environment, nesting is NOT just for sheet metal. There are lots of applications outside of sheet metal that require 2D shapes cut from stock, including wood cabinetry, cardboard (for boxes), clothing and leather goods manufacture, plastic manufacturing (both traditional and additive) and shipbuilding.

In this ebook we'll explore how automating your 2D nesting can improve your efficiency, productivity and bottom line.

Benefits of 2D nesting
- Reduce time and labor costs
- Reduce material cost and waste
- Establish better costing estimates
- Improve quality and reduce errors

Reduce time and labor costs

In most cases, nesting software can generate a layout much faster than manual nesting. Although this represents a small savings of time for an individual project, the savings increase exponentially when multiple users and projects are factored in.

In addition, as shape complexity and quantity increase, it can be time-consuming and complicated to manually nest shapes. Automating nesting with software provides substantial time savings (and reduces frustration).

With 2D nesting software you can also automatically extract flat pattern data from your computer-aided design (CAD) files. That means you don't have to pay expensive hourly labor to go through the process of manually opening a file, saving each file as a flat and closing it.
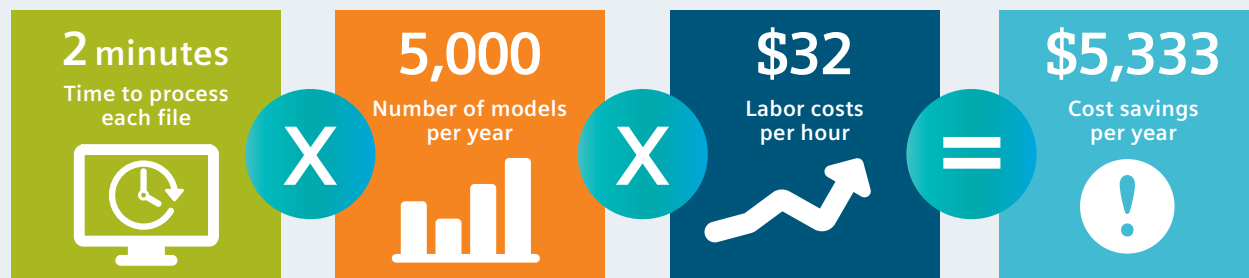
Reduce material cost and waste

Using 2D nesting is all about efficiency, with the goal of maximizing material use while wasting as little as possible. Less waste means less frequent restocking of materials and reduced costs while being kinder to the environment.

Less waste can be accomplished in multiple ways:

- **More efficient use of stock materials.** For example, if one model has a large cutout, the 2D nesting program can place items inside that cutout. This reduces discarded scrap materials

- **Grouping "like with like."** When looking at a model, often there is more than one material being used. Using 2D nesting enables you to intelligently gather flat patterns based on material type and group them in a nest

- **Grouping across multiple jobs.** Most companies have multiple products and most products are manufactured in bulk. Similar materials from different projects can be combined in the same nesting calculation

- **Use of odd-shaped blanks and re-use of scrap material.** The 2D nesting can accommodate odd shapes, whether the inherent shapes of raw materials (such as hides) or on-hand scrap material, encouraging the use of ends and leftovers.

Calculate the savings:

2 minutes
Time to process each file

X

5,000
Number of models per year

X

$32
Labor costs per hour

=

$5,333
Cost savings per year

Specify material grain direction of parts

A key component of automated 2D nesting is the ability to rotate parts on a sheet of material, specifically to align with material grain direction in preparation for nesting. In the case of materials such as wood, sheet metal and cloth (if pattern is directional), parts laid out in the wrong alignment can mean wasted material and costly rework. Improper grain alignment even jeopardizes the integrity of a part in some designs. Grain direction is particularly important in the nesting of sheet metal components where consideration of grain is necessary for forming.

Grain direction
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Establish better costing estimates

Cost savings from 2D nesting can also be realized with up-front savings – more accurate customer quotes, better understanding of inventory needs and less material purchased in advance. From user-defined costs per square meter or yard, 2D nesting quickly generates the accurate cost-of-material estimates that users need for job-cost accounting. These cost estimates can then be used for quoting and inventory purposes.

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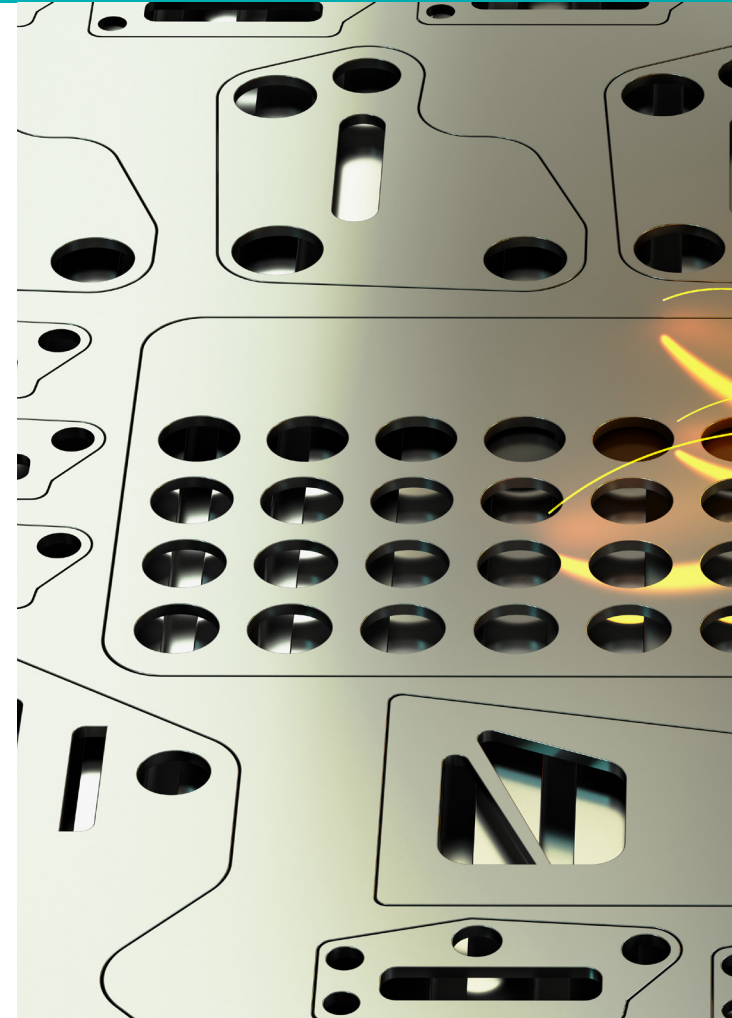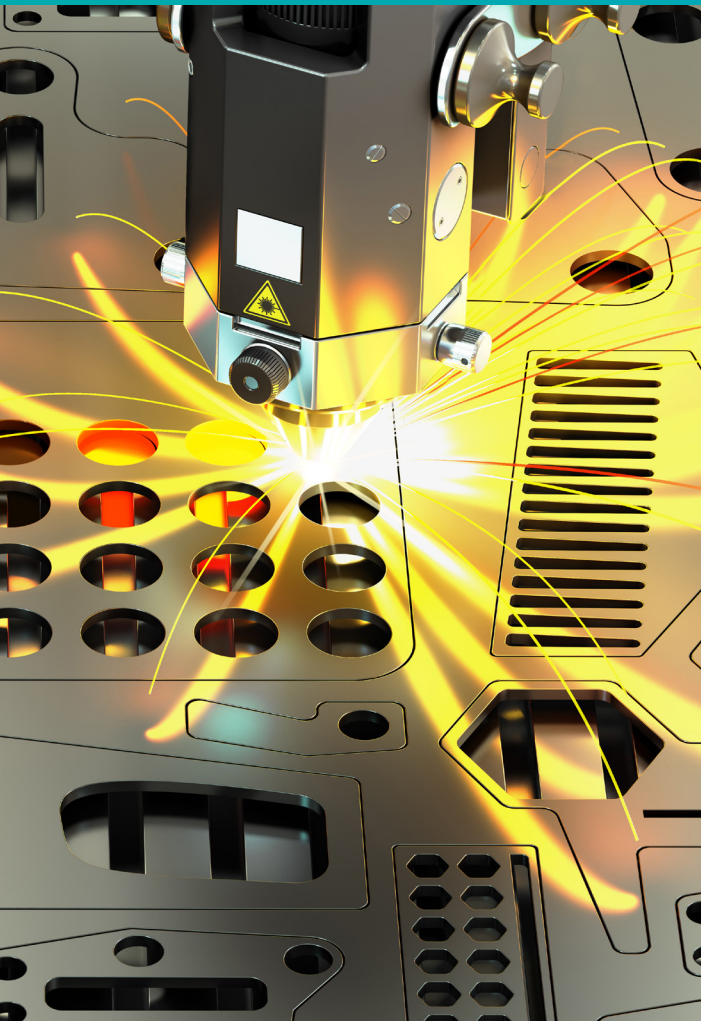
Improve quality by reducing errors

Although a lot of efficiency comes from the 2D nesting process, much of your potential improvements start before the process even begins – by feeding your 2D nesting processes automatically from your CAD system. Automating the creation of flat patterns and eliminating manual saving of DXF files not only reduces time needed to process jobs – it eliminates opportunities for human error. From choosing the wrong DXF file to typing in the wrong quantity, human mistakes can add up at the end of the day. By automating the connection between your CAD system and 2D nesting:

• **You always get current data**
If you are manually saving DXF files and then sending them to a 2D nesting system, you may not be capturing the latest model revisions. This means that you are making incorrect cuts based on outdated data, creating excess scrap and wasting money.

• **You eliminate confusion**
If you have a set of DXF files sitting around, which ones are appropriate for this job? It's better to extract the data directly from the CAD file.

• **You save storage space**
All those DXF files must be stored and accounted for as that folder of extraneous files can rapidly consume a lot of storage space.

• **You eliminate guesswork and miscounting**
How many of each model is required to make your product? Automatically extracting that information from the assembly occurrence properties of the CAD document eliminates mistakes when calculating quantity. It also saves the time it takes for a human to do the calculations, manually type the number in and (hopefully) double-check it.

An automatic setup sheet for each nest shows the machine operator what will be cut.

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### Improve efficiencies across multiple machines

If 2D nesting creates efficiencies for one machine, its power is only amplified across multiple machines. In most factories, jobs aren't happening one at a time – anywhere from two to 25 or more machines are being built at once. The 2D nesting allows you to multiply the quantity of your parts by using the value you specify. This makes your company more efficient by increasing the numbers of parts to nest, and further reducing material at scale. It also means you're improving productivity as you're running a job once for the entire quantity of parts that you need rather than running it individually for each build.

This scalable nesting ability must include the automatic sorting of design assembly data by material type and thickness; you wouldn't want to nest stainless steel parts on the same sheet as parts that must be made of galvanized steel.

Documentation of the nested data is also critical, especially if you are mixing jobs. The machine operator needs to know which cutout parts go to which machine so they can be delivered properly.

This ability to scale across machines is critical: If your 2D nesting and manufacturing system is so cumbersome that you only nest and computer numerical control (CNC) cut each machine separately, you're wasting a lot of material.

For example, here is the tailing of one machine at a time; for a job of 17 machines, you'd get this tailing 17 times:
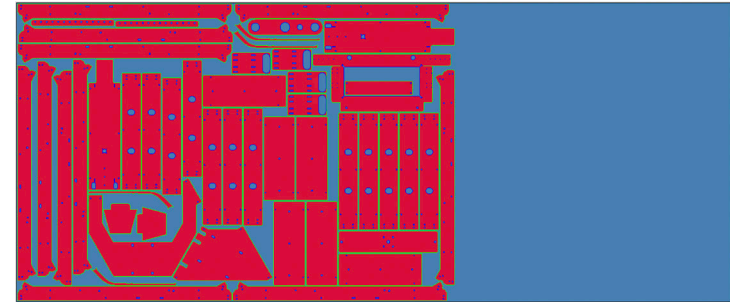
And here is the tailing of the same job when it has 17 machines in it:
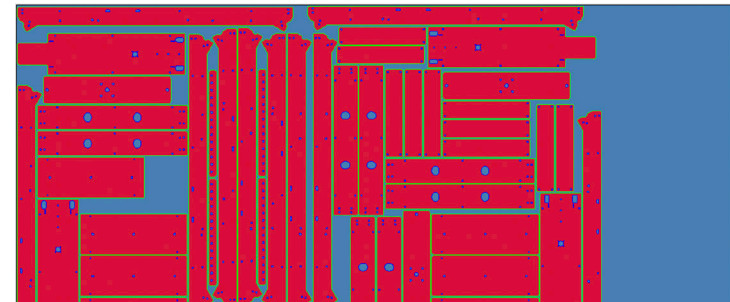
To put this example in financial terms, the single unit, run 17 times, cost $8,141.13 ($478.89 each). The 17-unit run cost $7,963.19 in material. And these costs only consider the material used, not the expense of the leftover material, which you had to buy up-front to run the job.

The 2D nesting allows you to multiply the quantity of your parts by using the value you specify.

In conclusion

Whether you're working with leather or sheet metal, producing shoes or building ships, 2D nesting can help you improve quality and save time and money. This efficiency drives the lifeblood of your business and ties directly into your bottom line by allowing you to:

- **Book more orders**
- **Spend less on raw materials**
- **Improve productivity**

Delivering 2D nesting with Solid Edge
Solid Edge® 2D Nesting software, which is part of the Xcelerator™ portfolio, the comprehensive and integrated portfolio of software and services from Siemens Digital Industries Software, is a powerful standalone module designed to generate optimized layouts for the two-dimensional cutting of fabrication materials, including sheet metal, plastic, wood, fabric and textiles.

With Solid Edge 2D Nesting you have full control over all the nesting settings needed to meet the demands of any cutting technology or material. An intuitive user interface (UI) makes it easy to select part quantities, sheet sizes and part rotation.

A key component of 2D nesting is the capability to specify the material grain direction of parts. Solid Edge 2D Nesting provides this capability, allowing you to meet the design requirement for the parts later needed in forming.

Solid Edge 2D Nesting launches from Solid Edge mechanical design products with a single click. Selecting parts to import for nesting is quick and easy. Solid Edge 2D Nesting supports sheet metal and part files (PSM, ASM and PAR), as well as neutral data formats including DXF and DWG, automatically extracting flat pattern data.

Learn more about Solid Edge 2D Nesting at:
https://solidedge.siemens.com/en/solutions/products/computer-aided-manufacturing-cam/2d-nesting/

With Solid Edge 2D Nesting you have full control over all the nesting settings needed to meet the demands of any cutting technology or material.

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