Xp 3DXpert™

Introducing 3DXpert 15

Facilitate Production-Grade Additive Manufacturing

3DXpert® is an all-in-one, integrated software solution for production-grade preparation, optimization, and manufacturing of 3D CAD models using additive manufacturing (AM). Supporting every step of the AM workflow from design to post processing, 3DXpert can help you transition quickly and efficiently from a 3D model to profitable, printed parts.

3DXpert enables you to:

- **Easily achieve successful, quality prints** - prepare designs for AM.
- **Shorten design to manufacturing lead time** - streamline your preparation and optimization workflow.
- **Optimize design structure** - get the most out of AM with lighter weights, enhanced functional properties, and more.
- **Minimize manufacturing costs** - reduce print time, material consumption, and post processing.

3DXpert 15 includes key new features and enhancements that bring new value to these objectives with a special focus on capabilities that are required to move from rapid prototyping to serial production.

Shorten Design-to-Manufacturing Lead Time

- **Power Supports - New Automated Support Generation**
- **New Lattice QuickSlice Slicer Engine**
- **Enhanced Build Simulation Analysis**
- **New Bi-Directional Direct Data Transfer with SOLIDWORKS**
- **New 3DXpert for Dental**
- **New Additive Molding Add-On**

Optimize Design Structure

- **New Lattice Design Freedom**
  - **Enhanced editing and control functionality**
  - **Enhanced structure strength**
  - **Enhanced functional properties**

Minimize Manufacturing Costs

- **Enhanced Multiple Print Head Control**
- **New DMP Inspection for Automated Print Analysis and Validation (Beta release)**
- **Enhanced Multi-Technology and Multi-Vendor Support**
- **New 3D Nesting Capability**

3D SYSTEMS

Shorten Design-to-Manufacturing Lead Time

3DXpert 15 has several new features that help you shorten design-to-manufacturing lead time.

## Power Supports - New Automated Support Generation

Shorten Preparation Time and Reduce Manufacturing Costs

Many printing technologies require support generation, which can be a tedious and time-consuming task. Correct support setting has a significant impact on print success, surface quality, and post-processing time and cost. Automating the generation of supports is a challenging task as you must take many considerations into account.

Challenge : Generating adequate support structures and place them correctly is a time consuming task requiring special expertise.

Solution : The new power supports feature allows full automation of the support generation process for different geometries with a click of a button while maintaining a high level of optional manual control. Lattice-like or tree-like supports grow from the part geometry down to the build plate in a click of a button. The new support structures require less material and are much easier to remove. The support structure automatically keeps its distance from the part geometry to ease its removal while gusset connections are used to shorten connector length

where required. The automatic generation is based on a set of pre-defined parameters per material, which you have full control over. A designated function enables you to fine tune and edit the created support structure by moving, adding, and removing elements.
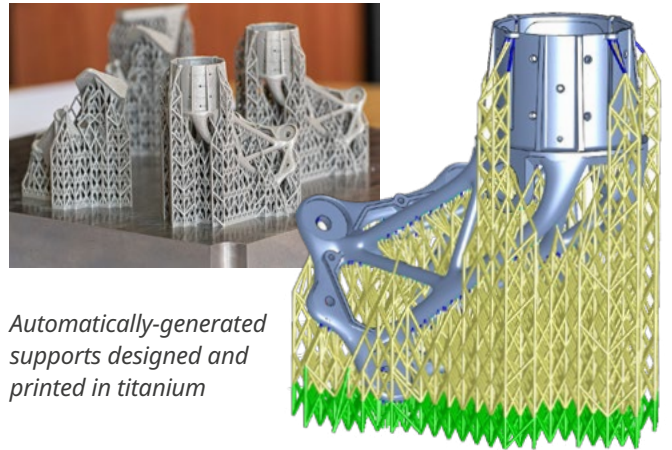
*Automatically-generated supports designed and printed in titanium*

New Lattice QuickSlice

Shorten Slicing Time for High-Volume Lattice Structures

As printer volumes become bigger, so does the size of the printed parts and the possible amount of lattices on a single print tray. The lattice structure element count may be in the hundreds of thousands or even millions range.

Challenge : Slicing of so many elements is a computing-intensive task that might take a very long time—hours and sometimes even days.

Solution : The new Lattice QuickSlice feature offers efficient and fast slicing for lattice structures of any size. This new, extremely fast slicing technique designed specifically for high-volume lattice structures dramatically shortens the time required to slice even enormous lattice structures while maintaining optimal quality. As a result, slicing time is no longer a barrier to use lattice structures within large parts or to apply changes to complex structures.
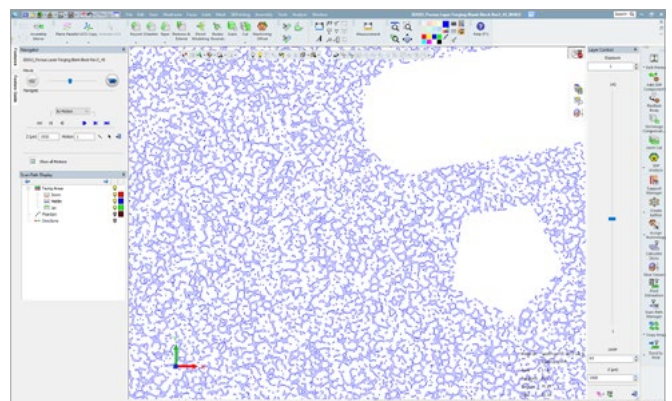
Lattice structure sliced using new Lattice QuickSlice

Enhanced Build Simulation Analysis
## Clearer Visualization of Simulation Results

Build simulation ensures a successful print that meets the model specifications, helps the user optimize the design, and minimizes the number of tryouts. Integrated within the design environment, build simulation provides designers with immediate feedback on their design decisions including orientation, number of supports (both too few and too many), and part printability. This is of particular importance when printing costly or large-volume parts.

Challenge : Simulation results might be hard to understand and link to appropriate corrective actions.

Solution : Enhanced visualization of build simulation analysis results accompanied with a new set of tools make it easier and simpler to find and focus on relevant simulation results:

- New histograms along with a graph of actual analysis results for each layer enable you to focus easily on the build layers that have deviated from a user-defined threshold.
- Magnifying small displacements and animating the change from the original state to the displaced state enable easier identification of those displacements.

- A new analysis clearly shows whether displacement adds or removes material.
- Separating the stress to its elements (Z associated with tensile stress and XZ and XY associated with shear stress) enables you to determine more easily the appropriate corrective action.
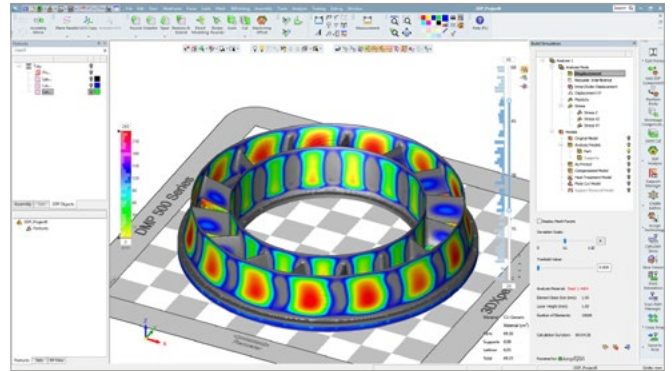
New histogram and legend showing in which layers and in what intensity different criteria are met

New Bi-Directional Direct Data Transfer with SOLIDWORKS
## Maintain Design Integrity

Direct read of native CAD data from CAD software helps maintain design integrity and is already supported by 3DXpert.

Challenge : A tighter integration is required to help designers who would like to get the AM-ready data back into their CAD software or to easily implement changes to the model.

Solution : The new 3DXpert bi-directional direct data transfer with SOLIDWORKS extends and eases direct data transfer to and from 3DXpert and SOLIDWORKS. A click of a button in SOLIDWORKS sends the CAD model directly to 3DXpert, enabling you to continue working with your native CAD data (both solid and mesh) without conversion. Data integrity is maintained including analytic geometry, part topology, and color coding. After you have prepared the model for printing in 3DXpert, another click of a button in SOLIDWORKS brings the data back in.

Bi-directional direct data transfer is implemented within 3DXpert for SOLIDWORKS already. These capabilities are now extended for 3DXpert users as well, along with enhancements to that interface that are available in

version 15 of both products that allow more data to flow from 3DXpert to SOLIDWORKS. Transferring more data enables higher data integrity within SOLIDWORKS, and a higher level of process documentation within the SOLIDWORKS file. These enhancements include capturing the part's orientation; controlling the visibility of different types of printed objects, lattice, and support structures; and assigning physical properties to lattice volumes.
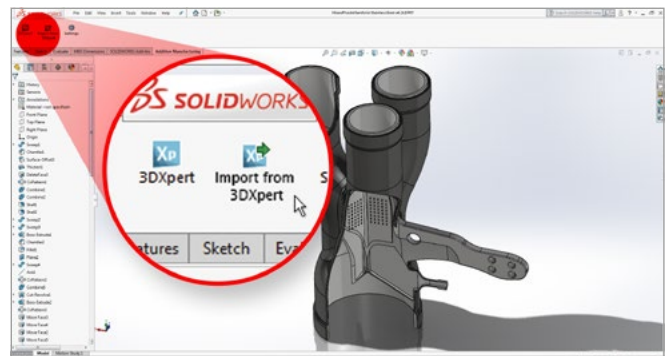
New SOLIDWORKS ribbon option for bi-directional data transfer between 3DXpert and SOLIDWORKS

New 3DXpert for Dental
Easily Print Metal Dental Parts

3D printing of dental parts such as crowns, bridges, implants, and more has been revolutionizing the dental care market. Specific applications involving metal-printed parts have very specific requirements to ensure high-quality, fast, and cost-effective printing.

Challenge : Preparing and 3D printing metal dental parts is time consuming, inefficient, and requires manual intervention.

Solution : The new 3DXpert for Dental application automates the printing preparation process of dental parts and enables you to prepare an entire tray with a few clicks and minimal manual intervention. 3DXpert for Dental automatically recognizes what type of part is printed, verifies its geometric integrity and fixes it if necessary, orients and positions it on the tray, supports it, and slices it. This very efficient method is made possible by the knowledge of the types of operations required for such parts and results in a fast, cost-effective process with minimal manual labor.
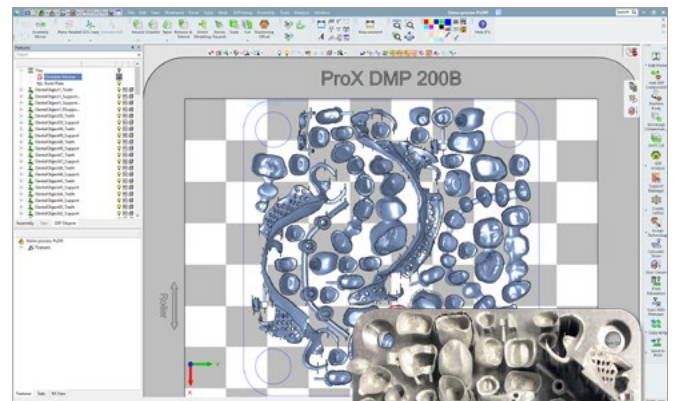
Dental tray designed using 3DXpert and printed in titanium

New Additive Molding Add-On
Quickly and Easily Design Conformal Cooling Channels

Cooling the plastic down in a controlled and even way within a mold is crucial for reducing warpage and ensuring the part dimensions meet defined tolerances. 3D printing mold components allows conformal cooling channels to get cooling agents to areas of the mold that are impossible to reach with traditional cooling channels. Conformal cooling shortens the cooling process, which can reduce cycle time and as a result also the cost of the plastic part.

Challenge : Designing conformal cooling channels requires expertise and may be relatively complex and labor intensive.

Solution : A new, dedicated conformal cooling toolset available in the new additive molding add-on for 3DXpert 15 greatly enhances and automates the conformal cooling design process, turning a task that used to take hours into minutes. 3DXpert has been a leader in the field of conformal cooling channel design for years. The 3DXpert 15 additive molding add-on is bringing capabilities in this area to new heights. Now you can create the path of the conformal cooling channel automatically with a few clicks, clinging to the walls of the part that require cooling. Additional capabilities where added to allow you to generate and modify the cooling channel's final shape quickly and verify the distance of the cooling channel from the walls and its printability. These enhancements finally open the door for any mold maker to design conformal cooling channels easier and faster than ever before.
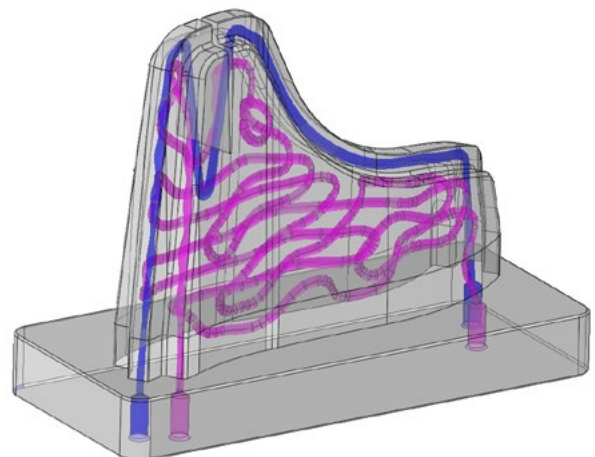
Conformal cooling insert. The purple cooling circuit generated with new automatic conformal cooling channel design

Optimize Design Structure

3DXpert 15 introduces new and enhanced features to help you optimize design structure.

New Lattice Design Freedom
Gain an Unmatched Competitive Edge

Lattice structures are a commonly-used strategy for lowering the weight of a part, enhancing its functional properties while maintaining its outer shape and adding texture to its outer faces. In addition to using the existing rich library of predefined lattice structures in 3DXpert, developing your own structures is a great way to gain a competitive edge, optimize manufacturing costs, and capitalize on your own IP and gained experience.

Challenge : How to have full control over lattice structures to address specific functional or manufacturing challenges optimally.

Solution : The 3DXpert lattice design has revolutionized the speed at which you can generate and manufacture lattices. The new lattice design development features offer tools and options to gain control over lattice structures and textures and alter them for best results.

Volume and Surface Lattice

- Enhanced editing and control functionality enables you to move, add, remove, or change lattice elements, and optimize and fine tune lattice designs to best suite your needs.
- Catalog-based lattice cells provide new design flexibility. Use complex and accurate lattice cell shapes, control the actual dimensions of features in cells based on b-rep geometry and form catalogs of sizes with preset dimensions.
- Zero thickness struts of lattice cells enable you to print with a single laser path with much faster slicing and printing.
- Lattice supports enables you to print lattice structures directly over the powder where needed.

Volume Lattice

- Apply uneven or rough lattice structures to part of a volume lattice that is left exposed. For example, medical professionals often prefer these areas to have rough, open faces.

Conformal Surface Lattice

- Surface lattices now enjoy the full lattice design freedom of volume lattices. You may use any cell structure defined and used in volume lattice including user-defined cells and have them conform to the shape of your part and form complex textures.
- A new option for texture design enables you to use images as the basis for textures that are spread on the faces of the part.
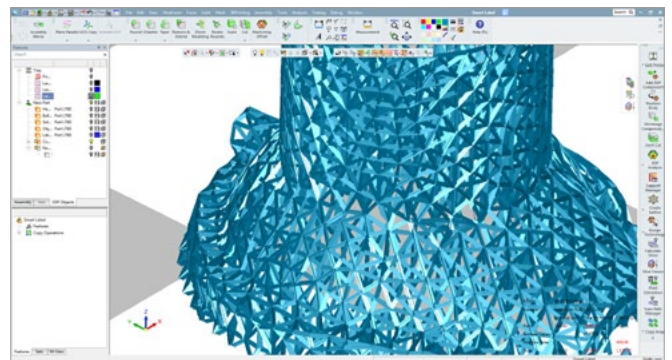
New zero-thickness struts fill object with open faces allowing for lower weight and faster printing

Minimize Manufacturing Costs

3DXpert 15 includes new features and enhancements to help you minimize manufacturing costs.

Enhanced Multiple Print Head Control
Increase Production Throughput While Maintaining Seamless Part Quality

Printing time is a key factor of AM throughput and is an increasingly crucial issue as printers and parts are getting bigger. Multiple print heads enable 3D printing time to shorten dramatically, which increases the manufacturing throughput and makes AM a feasible option for serial production.

Challenge : Cross influence of simultaneous multi-head operation might hurt print quality and requires dynamic multi-head assignment.

Solution : The 3DXpert flexible, auto-balancing control enables optimal quality with minimal printing time for the 3D Systems multi-head DMP Factory 500 printer. Intelligent multi-laser control ensures best utilization and balancing of the multiple print heads for high throughput production of multiple parts or large parts, up to the size of the full build volume. 3DXpert 15 allows more flexibility and control over the multiple-head assignment including the ability to assign a single head per part or per specific layer within a part, as well as advanced automatic assignment of heads.

The 2D nesting auto placement mechanism was upgraded to take into account gas flow for multiple heads, ensuring maximal printing efficiency and quality.
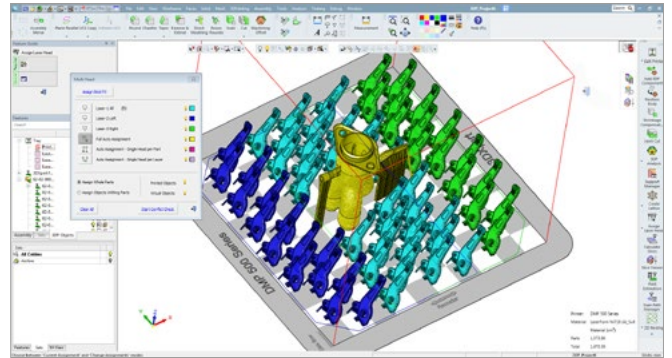
Multiple parts printed by 3 different heads on the new DMP Factory 500 Series printer. The yellow part is printed using all three print heads with full automatic assignment, while the smaller parts are automatically assigned to the different heads.

New DMP Inspection for Automated Print Analysis and Validation `Beta Release`
### Accelerate Design and Print Process Validation

A validated AM process is one that ensures that the quality and mechanical properties of the printed parts correspond to the design specifications. The common practice today to qualify the AM process is based on post-build tests. CT (computed tomography) scans and destructive tests are used to verify that the internal structure and material properties of printed parts are meeting the pre-defined thresholds for part quality. The current process is costly and lengthy and requires intensive manual work and expertise.

Challenge : Automatically inspect all printed parts and ease root cause analysis and fixing of detected quality issues.

Solution : An automated pots-build analysis identifies printed parts that do not meet quality specifications, helps find the root cause and take corrective actions.

DMP monitoring, available with 3D Systems ProX DMP 320 and ProX DMP 350, is collecting an immense amount of data during each print. This data includes a multitude of pictures taken during the printing process and data collected from different sensors within the printing chamber.

The new DMP Inspection (available in beta release) analyzes data collected by DMP monitoring and provides clear 3D visualization of suspected volumes. You can now use data from different pre-print and in-print resources for root cause analysis and 3DXpert extensive design tools to take the relevant corrective action. This revolutionary approach enables you to scan 100 percent of printed parts, to quickly identify parts that don't meet your quality standards and to save unnecessary post-processing work and secondary tests on those parts.
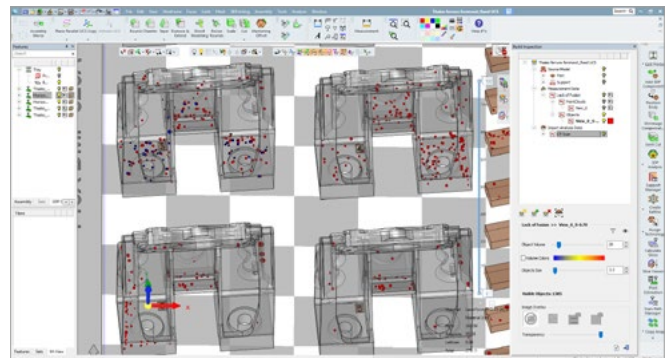
DMP inspection analysis of aerospace part (dots represent areas of interest such as areas with lack of fusion)

Enhanced Multi-Technology and Multi-Vendor Support
Single AM Software for Your Printing Facilities

The modern printing facility is using different printers and printing technologies to best address specific applications. Those printers may be from different vendors and using different materials. Each printing technology may use different attributes and settings and many printer vendors have developed their own certified slicing mechanisms with predefined optimized and validated printing strategies and parameters. To have an efficient AM workflow that best utilizes the printing facilities, it's best to use the same printing preparation method across the entire printing facilities.

Challenge : Use of multiple printers require the use of multiple AM software solutions.

Solution : 3DXpert multi-vendor and multi-technology support enables you to use the same AM software for all your 3D printers.

While 3DXpert is printer-vendor agnostic and printer-technology agnostic, we always strive to fine tune it to the different specific needs of each technology and printer vendor.

Multi-Technology

3DXpert 15 introduces enhanced capabilities directed at the requirements of SLS (selective laser sintering) and MIM (metal injection molding) technologies. These technologies require no supports at all for SLS or have very straight-forward supports that are created on an MIM printer. Some of these enhancements include:

- 3D nesting for maximal print volume utilization
- Special scaling-by-formula capabilities for the complex scaling based on tray location required for SLS
- Orientation optimization that takes into account down-facing areas instead of supports, which are no longer a factor for orientation in some technologies, ensuring a higher surface quality
- Joint-cut functionality allowing a very large part to be split into smaller parts with different connection methods

Joint cut with dovetail connections created for house model too large to fit on SLS printer tray
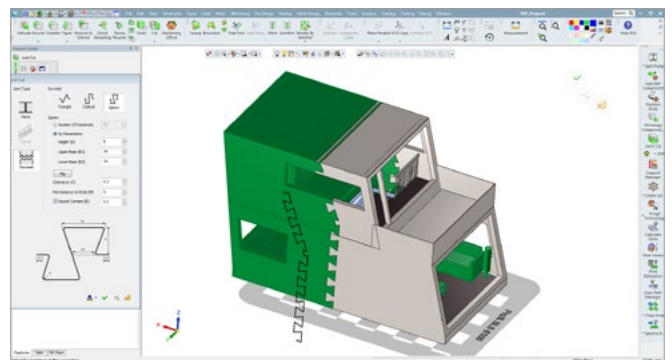
Multi-Vendor

New build processors enable direct printing to a variety of printers by multiple vendors (e.g., EOS, SLM, and Renishaw) using their slicing mechanism with their validated printing strategies and parameters. The enhanced capabilities enable using 3DXpert as the AM software of choice in a multi-vendor environment.
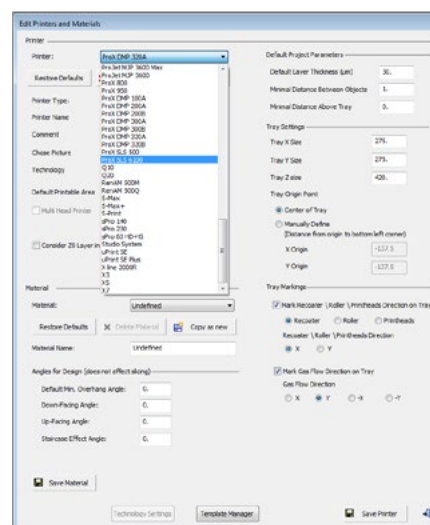

Choose from a large library of supported printers

**3D SYSTEMS**

New 3D Nesting Capability
Optimize Print Volume Utilization

Printer time is one of the most costly resources in the manufacturing environment. On top of the actual print time, you might spend substantial time preparing the printer and moving from one print job to another. Therefore, using the print volume in the most efficient manner is essential to drive the manufacturing costs down.

Challenge : How to use the Z axis to nest multiple parts over the entire print volume without hurting quality.

Solution : The new 3D nesting feature in 3DXpert 15 enables automatic best-fit part arrangement using the entire print volume. Simply let the system place within the print volume as many duplications as possible of one or more parts, taking into account your pre-defined constraints and priorities. You can fill the remaining volume with as many duplications of another selected part as possible.

You can create sinter boxes or cages to keep together several parts belonging to a specific assembly, customer, or series. You may build the box with bars or with full-sealed walls for confidential parts. You may 3D nest parts within the box and the box size will adjust accordingly. The box and label generation is parametric and may be edited without having to recreate the box if changes are required. Once created, the box is treated as a consolidated part and can be duplicated using the general 3D nesting process.
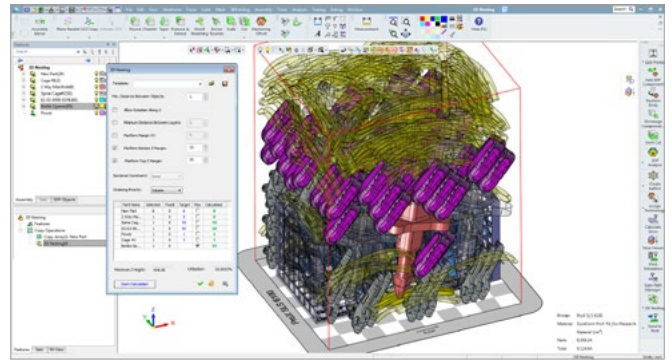
ProX SLS 6100 printer tray filled up with parts