

All-in-One Integrated Software for Additive Manufacturing

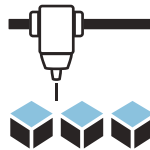
3DXpert® provides a complete, integrated solution for the entire additive manufacturing (AM) workflow. It preserves data integrity and eliminates the need to work with multiple systems and data conversions, saving time and money. This software incorporates the most up-to-date technologies and capabilities for print preparation, design optimization, build simulation, and scanning strategies. By using 3DXpert you will gain the confidence and expertise needed for AM serial production.

3DXPERT KEY BENEFITS:



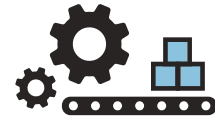
Data Integrity

- Single, integrated system for the entire workflow
- Supports B-rep (solids), mesh and voxel data—eliminate costly CAD conversion and healing operations
- Read native CAD data and generic formats



Print Preparation

- Best-in-class tools for part orientation and positioning
- Rich and customizable supports
- Advanced nesting and tray arrangements tools



DfAM

- Generative design tools for light weight design
- Generate complex geometries using implicit modeling
- Full set of lattice design capabilities
- Integrated FEA analysis tools for optimization



Automation

- Scripting and workflow automation
- Classify parts using machine-learning algorithms and apply scripts
- Programming free script generation



Optimization

- Simulate build and thermal conditions to boost success rate
- Inspect, monitor and validate data collected during the physical print
- All-in-one platform for true integration and root-cause-analysis



Slicer

- Automatic balancing of multiple laser heads for optimal performance
- 3D zoning – assign different scanning strategies to different portions of the part without splitting it

Introducing 3DXpert 17

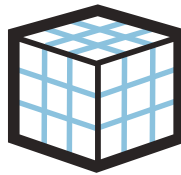
3DXpert 17 offers major benefits and more value to AM designers and manufacturers across their entire process. From design and optimization for additive through build prep, simulation, and slicing. This new version helps ensure that you are more proficient and productive than ever in your competitive marketplace.

Here is a short list of the main highlights of 3DXpert 17:



SHORTEN DESIGN-TO-MANUFACTURING LEAD TIME

- **Automation**
 - Automation of AM design and manufacturing workflows
 - Wizard mode based on user inputs
- **Machine Learning**
 - Automatic part classification
 - Customized workflows based on ML inputs
- **Dental**
 - Fully automatic, one-click solution for all dental parts



OPTIMIZE DESIGN STRUCTURE

- **Generative Design**
 - Best-in-class Generative Design engine
 - High quality, printable geometries
 - Easily compare different case studies
 - Automatically convert end result to a solid model
- **Implicit Modeling**
 - Create complex function-based geometries
 - Fast and seamless visualization
 - Predefined functions available



MINIMIZE MANUFACTURING COST

- **High Performance**
 - Enhanced slicing algorithm for efficient and high quality printing results
 - Multiple laser heads
 - Automatic best fit assignment of laser heads to parts
 - Optimal workload balancing of multiple laser heads

Generative Design

Expand your design innovation with smart, high performance Generative Design

Additive manufacturing surpasses traditional design limitations and offers new ways to design and manufacture parts. Generative Design allows lowering the part weight, material usage and printing time, and enhancing functional part properties, while complying with the part mechanical specification.

Challenge: Generating highly efficient, lightweight design structures based on performance requirements, material parameters, manufacturing methods, and cost constraints.

Solution: 3DXpert 17 integrates Hexagon's leading MCS Apex Generative Design engine seamlessly within 3DXpert's DfAM environment.

After defining different load cases (including the part's fixation points, different loads/stresses) and what volume the part may occupy, the system starts iteratively reducing the amount of material while constantly running analyses on the quality of the resulting shape. The eventual output is an optimal shape to be 3D printed. The benefit of running all of this inside 3DXpert is that it allows you to examine the resulting shape from a print preparation perspective. You can also run different case studies, compare their results and choose the one you prefer based on the print preparation parameters of each. Finally, you can turn the resulting shape into a real solid object with automatic surfacing, creating a robust model with minimal effort.

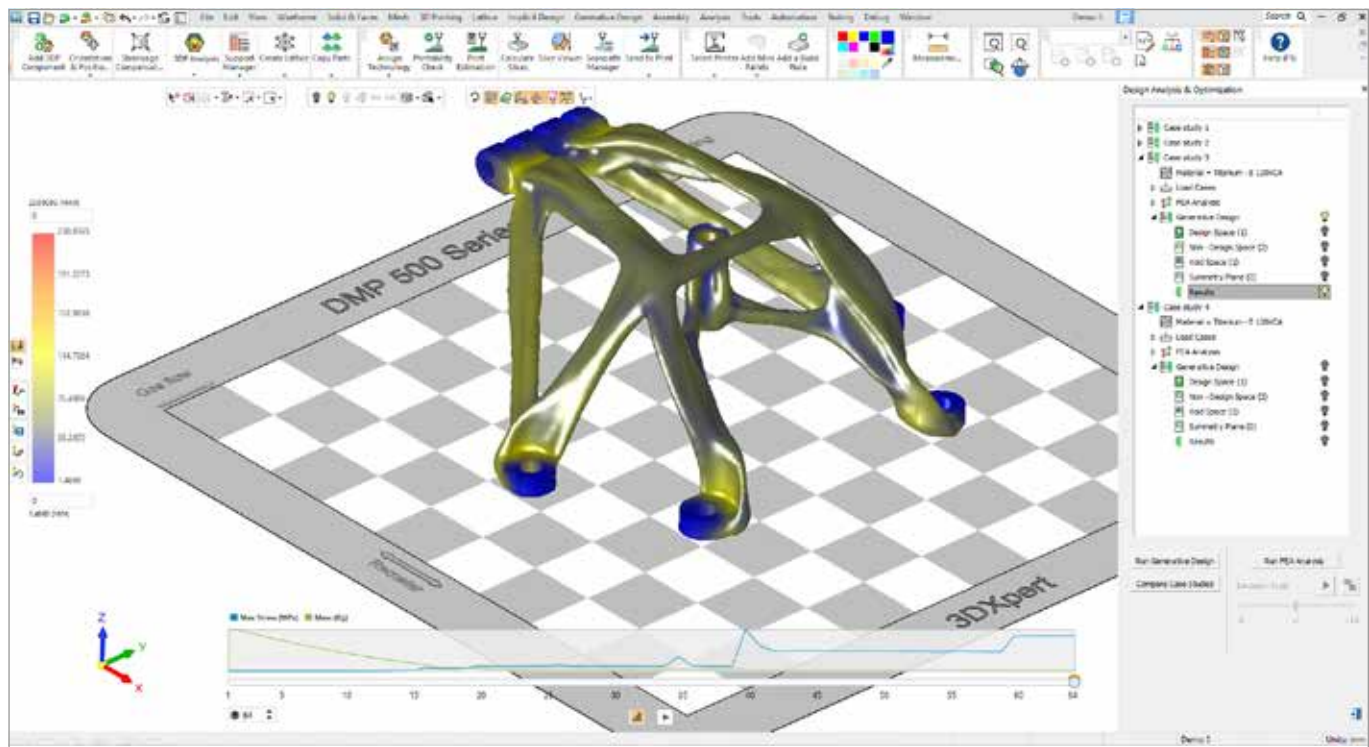


Figure 1: Generative Design - the result of the topology optimization tool on bracket part

Implicit Modeling

Generating implicit geometries to solve complex problems

Implicit modeling is a way of describing a 3D model geometry through a mathematical formula, rather than by calculating its edges and vertices (which is what we refer to as Explicit Design).

Challenge: Designing volumes with implicit geometries is not feasible using traditional CAD methods.

Solution: Introducing new tools in 3DXpert 17 for creating equation driven structures and performing robust modeling operations.

Implicit modeling is a very efficient way to describe a model and allows for enhanced and advanced shape design. It is mainly used for the design of complex internal structures of parts, used for light weighting or for adding structures with very large surface areas (for example for heat exchangers).

3DXpert 17 now allows you to generate these complex geometries through implicit modeling, using predefined templates or writing your own formulas. You can also import Voxel files to visualize and print.

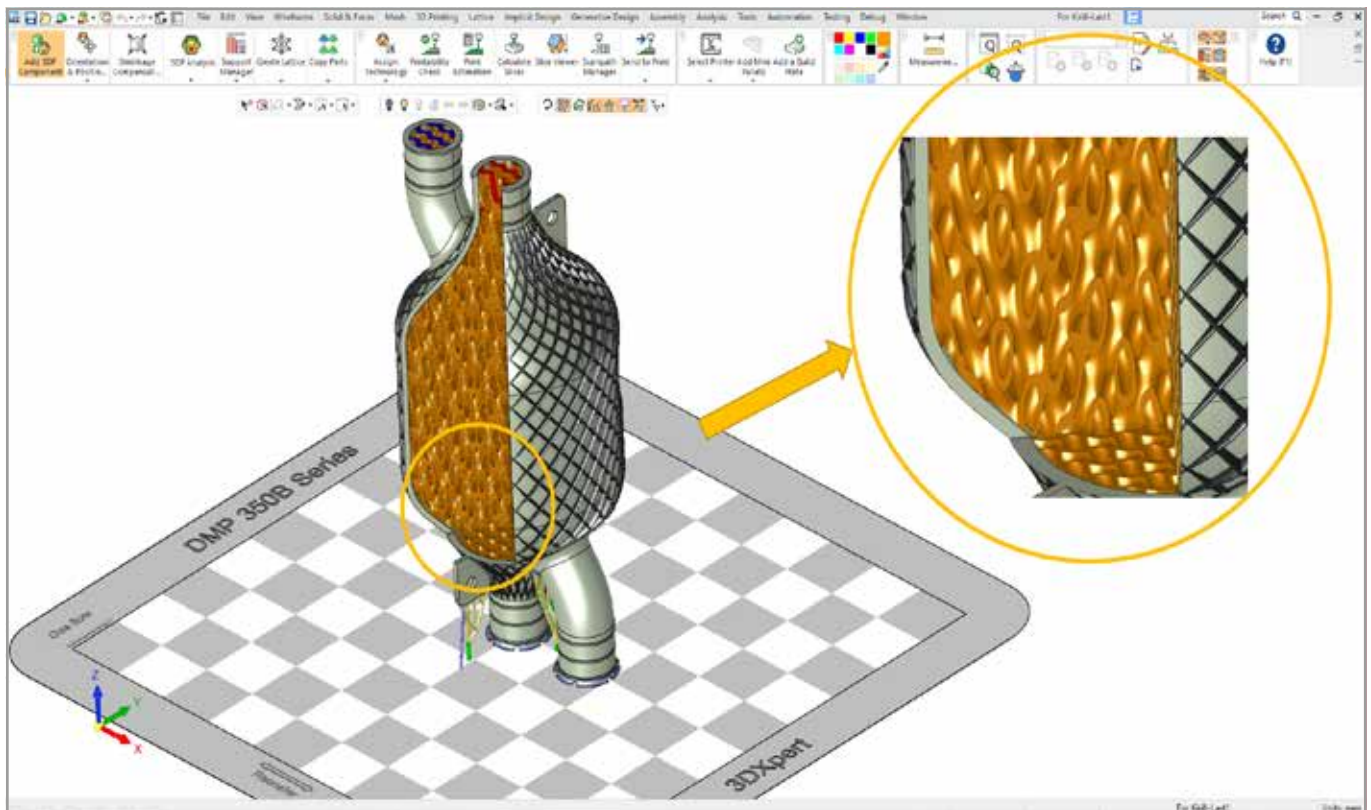


Figure 2: Heat exchange part with gyroid implicit volume for conducting hot/cold water with web lines lattice on the outer surface

Thermal Simulation

Use thermal simulation to achieve thermal stability

One of the challenges of metal additive manufacturing is the overheating of layers during printing, which may lead to printing issues, including print failures.

Challenge: Ensure thermal stability throughout the printing process to avoid defects and failures during printing.

Solution: 3Dxpert 17 offers a new Thermal Simulation tool which can analyze the thermal behavior of the actual scan-path and laser parameters to be used in the printer. Thermal stability can be achieved by modifying the number of parts on the tray or changing orientation and supports. It can also be achieved automatically by adding delays to the scan-path when it is required and sending it to the printer. Thermal analysis is part of the Build Simulation tool.

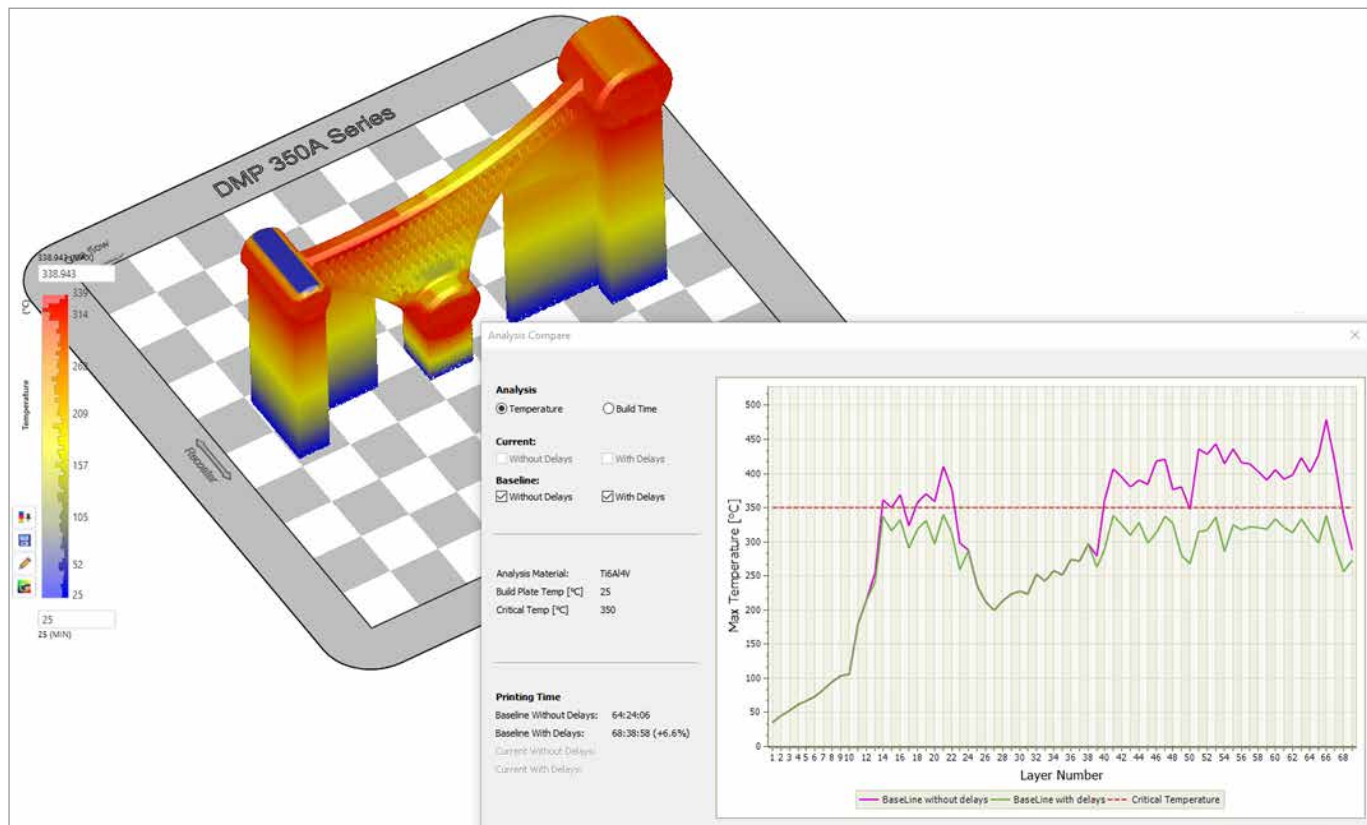


Figure 3: Thermal simulation graph - unstable thermal condition vs. automatic (scan-path) thermal stability

Automation and Scripting

Enabling automation and customization of AM workflows

The successful printing of parts requires expertise, experience, and precision. The expertise gathered through experimentation and innovation can now be captured into the additive manufacturing workflow. Scripting is a tool that enables automation of workflows, simplification of the design and preparation process and enables standardization to meet compliance and validation processes.

Challenge: Simplify the process of designing, preparing, and printing AM parts. Preserve and automate learned expertise and know-how of repeatable workflows in order to make the process more accessible for novice users, and reduce engineering costs of design and preparation.

Solution: 3DXpert 17 introduces new enhancements that enable higher degrees of automation and flexibility. Machine Learning (ML) is used to automatically recognize and classify parts based on their geometry and apply different actions and workflows based on the part classification. Other enhancements include the ability to run a wizard mode automation versus full automation, receiving user inputs during the process and supporting new actions and features to be used in scripting.



Figure 4: Part Classification using a Machine Learning Platform

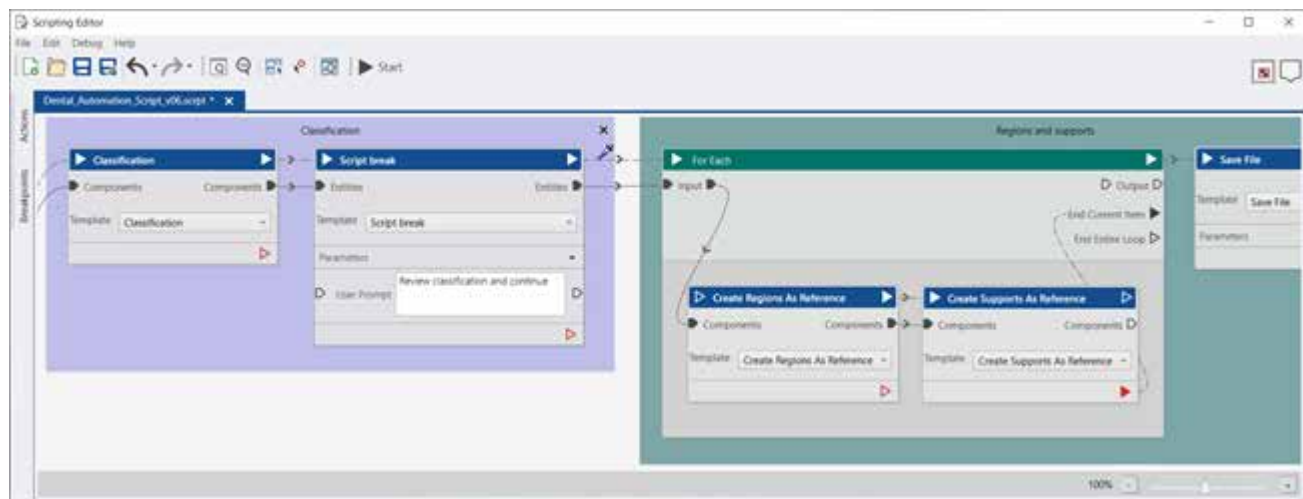


Figure 5: The Scripting Editor UI - creating regions and supports based on part classification

Dental Automatic Workflow

A simple one-click solution for metal dental applications

Digital dentistry requires the use of dedicated software solutions to support the dental data capture, design, and manufacturing using AM technologies. Dental AM customers generally prefer a simple-to-use, automatic solution in order to shorten time-to-manufacturing and allow them to increase their ROI from the entire process.

Challenge: Make the metal dental AM process more accessible and easier-to-use for our dental customers by introducing automatic dental workflows for designing, preparing, and printing dental applications such as crowns, bridges, RPDs and implant bars.

Solution: 3DXpert 17 introduces a new automatic Wizard application to guide you through the dental build preparation process. The Wizard app includes loading the dental models, automatic part classification and orientation using Machine Learning, automatic creation of labels, best fit supports, and nesting. At any point during the automation process you can pause, review, and edit, if needed. The automatic dental wizard is fully customizable and can be tuned to your workflows and requirements. The dental wizard simplifies the process, saves time, and allows you to focus on productivity.

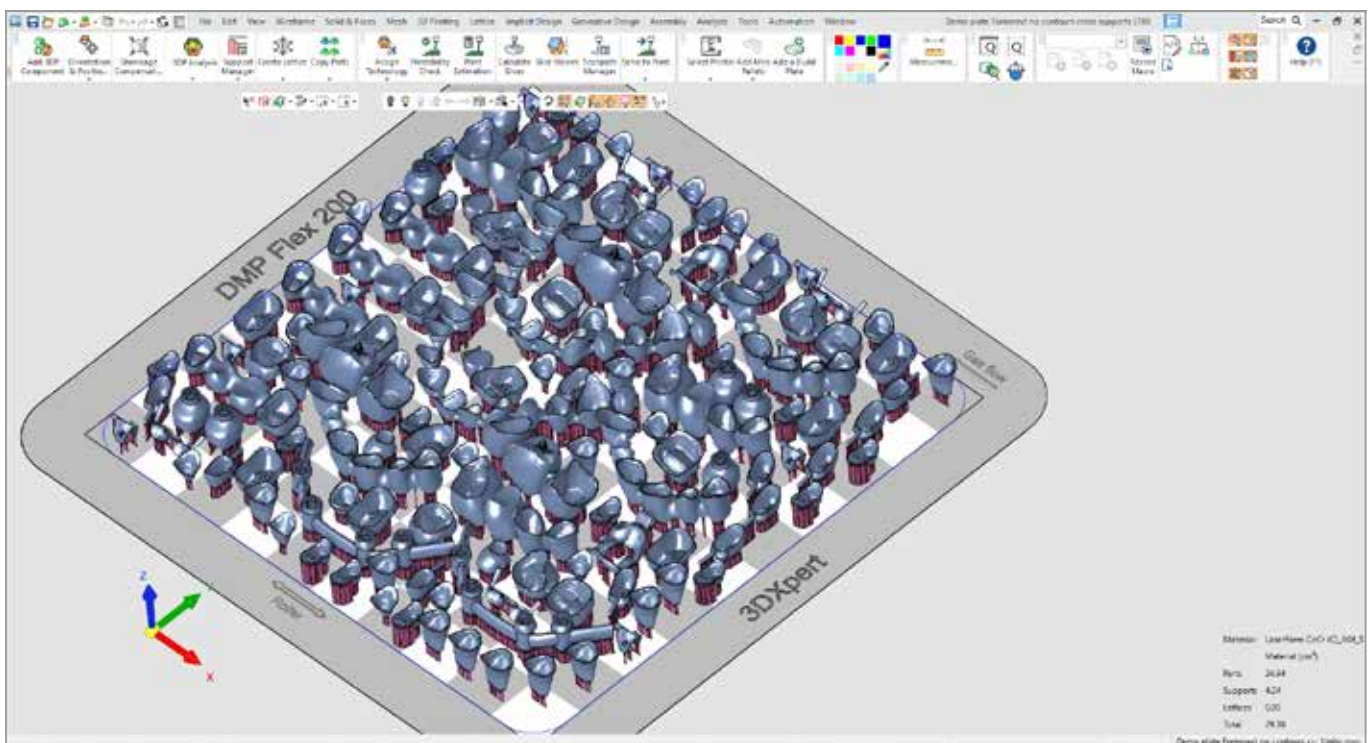


Figure 6: A full plate with 122 dental models automatically classified, oriented, and nested with supports applied

Slicer for Next Generation Machines

Increase productivity with a smarter slicer engine

Next generation L-PBF metal printers are becoming more and more complex to manage due to expanding sizes of printer build plates and use of multiple lasers. Delivering higher productivity is dependent on the slicer's capability to efficiently consider the different variables (gas flow, laser interference, etc.) and automatically producing optimized slicing and hatching scan-paths to ensure best productivity and quality.

Challenge: Automatic solution to optimize 3D printer productivity while maintaining high quality print results.

Solution : In 3DXpert 17, the automatic assignment process of parts to laser heads has been dramatically enhanced. Automatic assignment can find the best fit assignment that optimizes utilization of the tray area while balancing the loads of the different laser heads.

The automatic assignment process solves the utilization issue and offers tightly packed trays, printed at the highest quality with no smoke interference, and optimal workload balancing between the printing heads. These automatic balancing enhancements are available on the latest 3D Systems' multi-laser printers (DMP Flex 350 Dual, DMP Factory 350 Dual and DMP Factory 500).

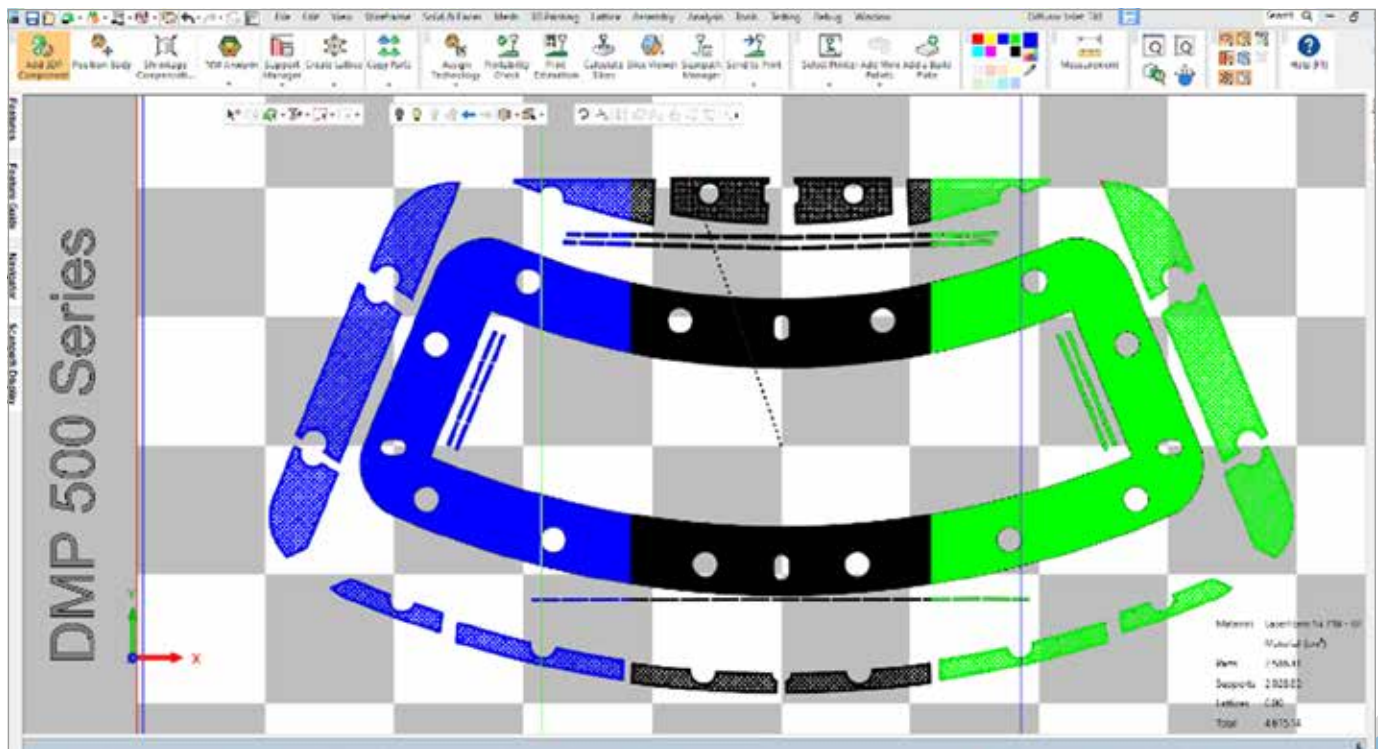


Figure 7: Slicer viewer – automatic balancing with three laser-heads

Find out more at: www.3dsystems.com/software/3d xpert

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