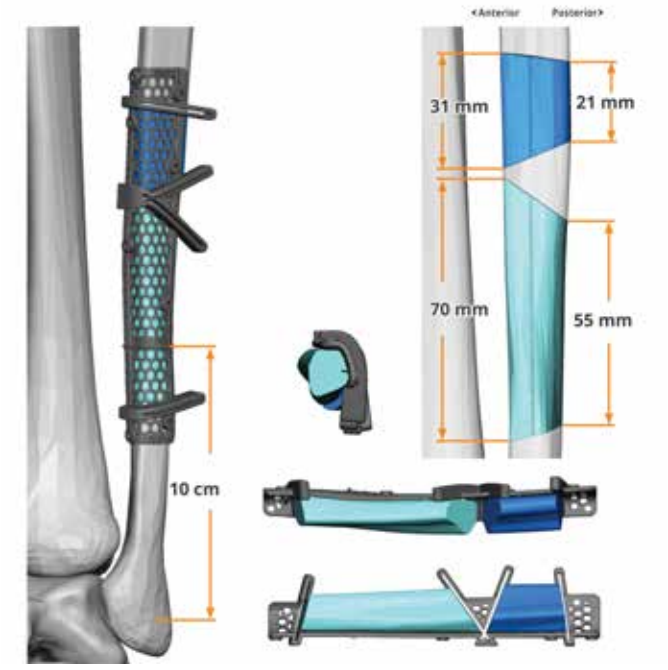
Expedite Production of Titanium Patient-Specific Surgical Guides with NoSupports™

Additive Manufacturing (AM) has enabled device manufacturers to provide personalized implants and instrumentation to surgeons, which in turn, helps improve patient outcomes. The most widely adopted AM process for manufacturing patient-specific implants and guides for craniomaxillofacial and orthopaedic surgeries is Direct Metal Printing (DMP). Rapid delivery of high-quality, patient-matched implants and guides is the key for success. Today, advanced DMP innovations such as NoSupports strategies combined with design for AM (DfAM) practices enable you to produce reliable mass personalized devices faster without compromising on part quality.



Fibula cutting guide designed with VSP® Reconstruction.

Fibula cutting guide

The titanium 3D printed fibula cutting guide is a patient-specific device that helps the surgeon achieve accurate cutting of the fibula, as displayed in the adjacent image. This patient-specific guide is designed and manufactured with 3D Systems' FDA-cleared VSP® workflow, maintaining tight dimensional tolerances to assure proper fit with the patient's anatomy and provide accurate alignment during surgery. The entire design-to-delivery workflow is completed within a short lead time of two weeks.

3D SYSTEMS

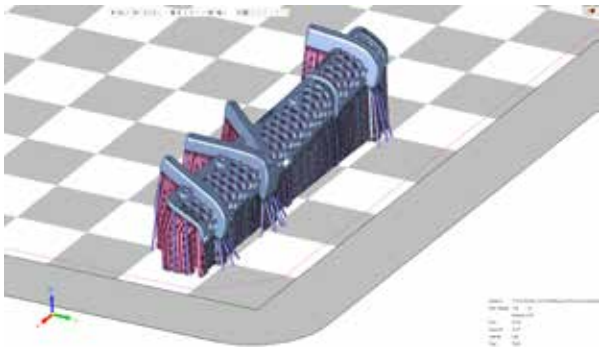
Optimize the build design

CHALLENGE

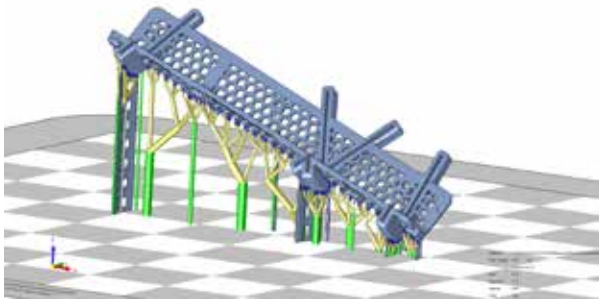
The fibula cutting guide exhibits tall and narrow features, which are prone to deform and thus challenging to 3D print. The traditional DMP build design of the guide requires a substantial amount of support structures to cope with residual stresses, as shown in the right-hand image. This results in labor-intensive support removal and manual finishing, leading to an increased risk for dimensional deviations of critical guide features that require accurate fitting with the patient's anatomy.

SOLUTION OUTCOME

Today, 3D Systems' NoSupports strategies allows printing of complex overhang regions with far less or even without any support structures. Combining NoSupports with DfAM practices on part orientation allows to overcome the fibula guide design challenges. The right-hand image shows the optimized build design, which reduces the support volume by 82% compared to the design with traditional supports.



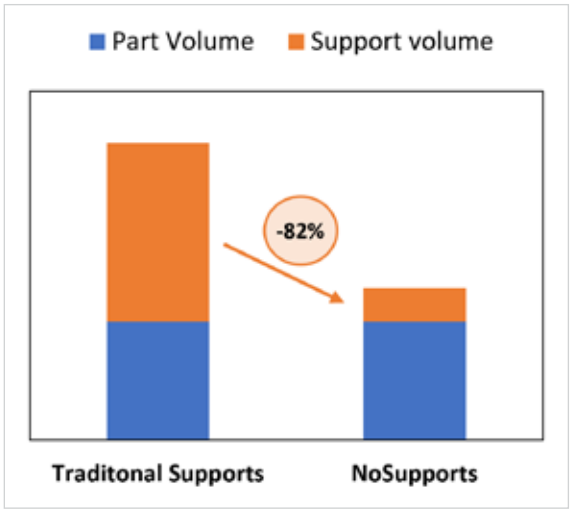
Build design with traditional supports.

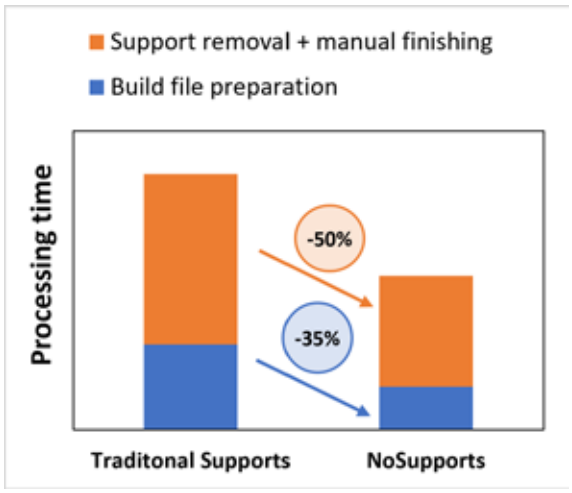


Optimized build design using power supports and NoSupports strategies.

Improve the production process and product reliability

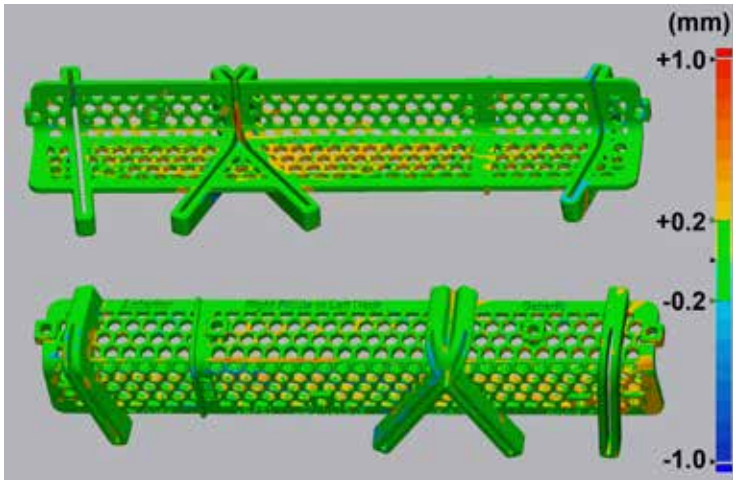
The optimized build design using DfAM and NoSupports yields an improved process and streamlined workflow. The part-to-support volume ratio changes drastically from 1:2 for the design with traditional supports to 3:1 for the optimized design using NoSupports. The optimized design yields an 82% saving of support volume, reduces the build preparation time by 35% and the post-processing time by 50%, including support removal and manual finishing. As the critical guide features remain free of supports, the risk for dimensional deviations caused by manual finishing is reduced substantially. The improved process and less manual intervention in the workflow increase the first-time success rate and the reliability for mass customization of patient-specific fibula guides. This leads to a reduction in the time and costs associated with production and post-processing without compromising on part quality.





Achieve better dimensional repeatability

The drilling holes and cutting slots are critical features of the fibula guide. These features have tight dimensional tolerances to assure proper fit with the patient's anatomy and surgical instruments during surgery. Hence, a dimensional fit check on the finished guide is performed at the end of the workflow. The optimized design yields superior dimensional repeatability thanks to the part re-orientation, improved surface uniformity using NoSupports and reduced manual intervention during surface finishing. A dimensional scan of the finished guide with optimized production design is shown in the adjacent image.



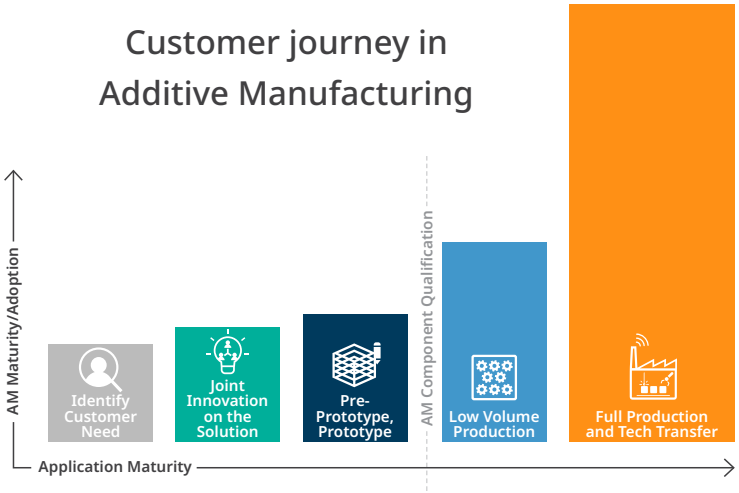
Count on validated DMP technology for serial production

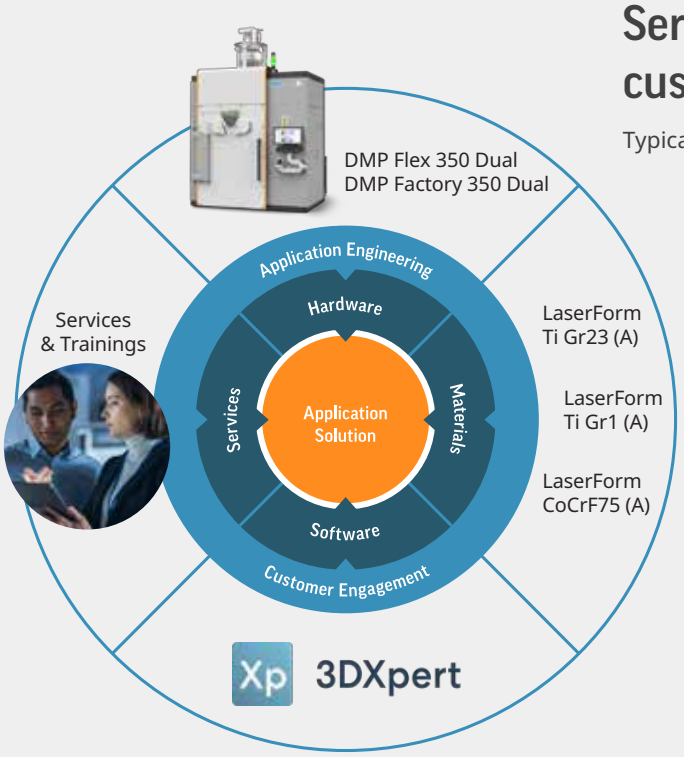
Medical device manufacturers have consistently produced high-quality implantable devices for more than a decade using 3D Systems' DMP platforms. The DMP Flex 350 Dual and DMP Factory 350 Dual achieves the lowest oxygen levels on the market (< 30 ppm) with the unique vacuum chamber, enabling best-in-class titanium printing and powder reuse. The robust DMP architecture yields excellent repeatability and reliability, while meeting stringent quality and regulatory requirements of the global medical device industry.

Gain the advantage with 3D Systems' end-to-end solution

We combine validated technologies and materials with advanced software and comprehensive consulting services to offer tailored end-to-end solutions for metal medical device manufacturing.

Customer journey in Additive Manufacturing





Service and training modules for healthcare customers throughout their AM journey

Typical timeline

1	Applications Screening	1 day
2	Design for Metal AM Training	1 day
3	Application Development	6-18 months
4	Application Support	1-day modules
5	Gap Assessment for Validated DMP Production	1 day on-site
6	Validation and Qualification, Certification Support for FDA Clearance	5-18 months
7	Contract Manufacturing for Pilot Production	5-18 months
8	DMP Technology Transfer	Customer/ Application driven

Accelerate and de-risk the development of your next application

Find out how 3D Systems' Application Innovation Group (AIG) and its team of experts can help you develop an application, reduce costs and increase productivity.
Schedule a free consultation today:

3dsystems.com/consulting/application-innovation-group

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