

Application Brief

Jewelry Casting with 100% Wax 3D Printed Patterns

Michael Fraser - Advanced Applications Engineer

Mauro Basso - Service Application Engineer



Introduction

With 3D printed wax patterns, you'll reveal your most creative jewelry designs faster, in unparalleled quality and productivity without compromise.

3D Systems' pure wax materials result in 100% ash burnout for perfect quality casting and faster time to part with same-day pattern printing and casting. Our 3D printing solutions have been developed to produce jewelry casting patterns that fit into your standard lost wax casting process for reliable output every time. This enables the quick and cost-effective creation, iteration, and production of all jewelry styles, including the most complex geometries.

Uses and Examples

Lost wax casting is used to produce all types of jewelry—from rings and earrings, to bracelets, pendants, necklaces, and more—and all design styles—from Middle Eastern/Arabic, Fusion and Western, to Pavé and stone setting—each with its own production challenges.

Key Challenges

Consistent Quality for All Designs

Variability in jewelry casting quality is caused by many factors, which can affect surface quality and accuracy. A key success factor of the casting is the quality of the pattern.

Productivity

Defects in the lost wax casting process can cause costly time delays, precious metal waste, and lost productivity.

Flexibility

Not every casting task is the same. The ideal solution will be capable of:

- Design iteration and customization for on-the-fly design changes
- High volume production batches

Wax is the most commonly used material for casting patterns.



The Quality, Quantity, and Speed of 3D Systems' MJP Wax Printing Solution

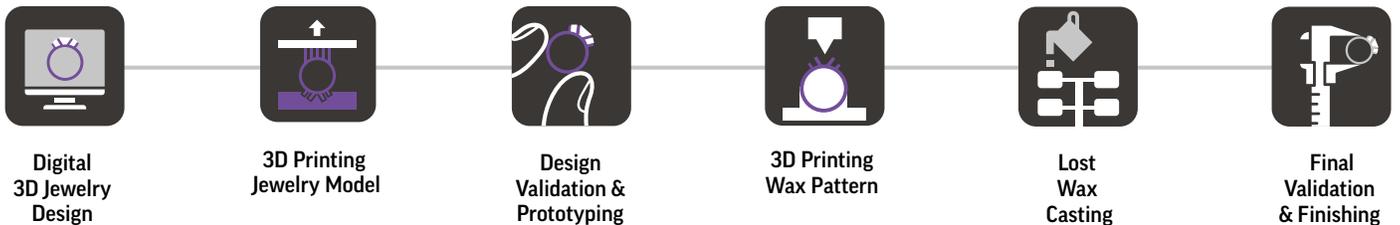
Traditional jewelry making with lost wax casting and mold making has long been a manual, time-intensive process. While the art form produces excellent results, mistakes can be costly with lost time, precious metal waste, and increased labor costs.

Modern jewelry manufacturing with digital design, 3D printing, and a variety of casting materials has completely disrupted the industry. The digital revolution in jewelry manufacturing pushes the limits of design creativity and enables all-new levels of productivity, with uncompromised quality.

3D Systems' wax 3D printing solution using the ProJet® MJP 2500W printer was developed to produce jewelry casting patterns that fit into your standard lost wax casting process and deliver reliable output every time. It enables:

- 100% ash burnout for perfect quality casting with pure wax material
- High-volume production with ease; no corresponding increase in labor
- Same-day pattern printing and casting capability for faster time to part
- Increased design freedom, including the most complex geometries
- Cost-effective creation, iteration, and production of all jewelry styles
- Dissolvable/meltable supports for excellent surface quality and reduced finishing labor and polishing of costly precious metals

Direct Casting of 3D Printed Wax Patterns - Workflow Solution & Best Practices



1. Design for 3D Printing

The advantages of design freedom for custom styles really shine with 3D Systems' wax 3D printing solution. Dissolvable supports help you achieve smooth surfaces and fine details, even on the down-facing orientation. Our wax 3D printing solution helps you produce unique pieces that couldn't be made using traditional methods for pattern creation.

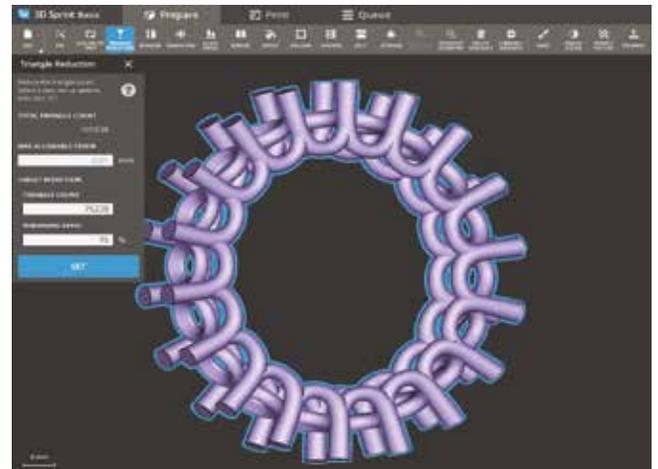
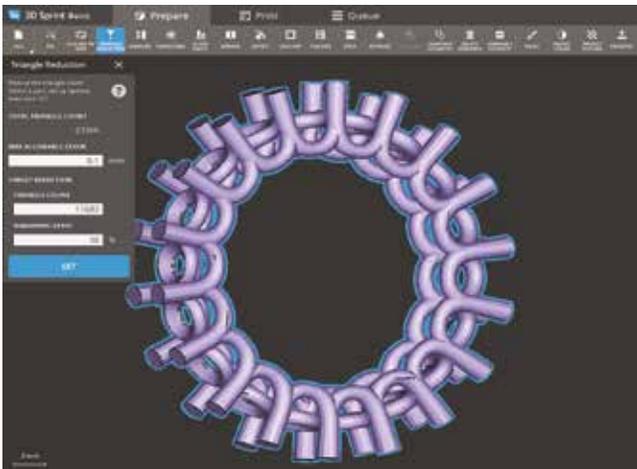


2. File Preparation

Optimized part set-up is straightforward and fast with 3D Sprint®, our print file preparation and optimization software. It includes automatic support generation and recommendations for part placement and orientation. Easy-to-use tools like Triangle Reduction and the STL Fix Wizard help you achieve high quality and accurate printed patterns.

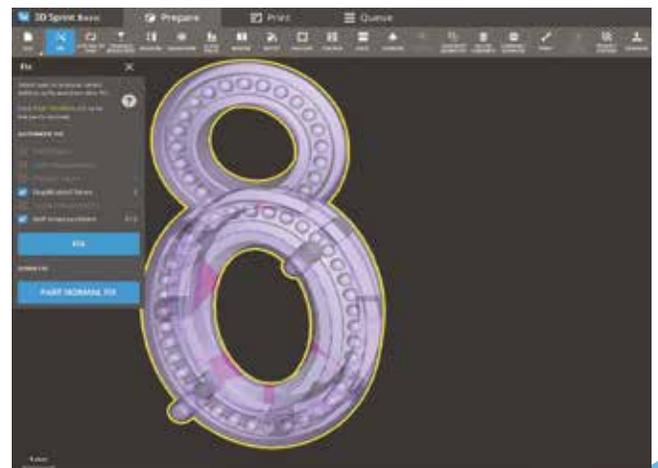
TRIANGLE REDUCTION

STL files can be large when exported with a high number of triangles. The Triangle Reduction tool in 3D Sprint's preparation tab can be very useful. Adjust the remaining ratio to make sure to maintain the surface shape.



STL FIX WIZARD

The automatic FIX Wizard Tool in 3D Sprint's preparation tab will help you when a part is marked in red or yellow. Fixing STL file(s) ensures a successful build and good pattern quality.



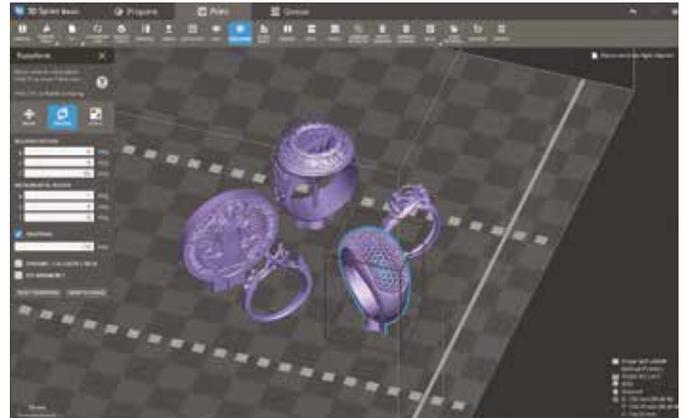
3. Printing Set Up & Parameters

3D Sprint software provides fast and easy tools for print preparation, including part orientation and shrink compensation.

PART ORIENTATION

The best ring orientation is always vertical. If the side walls, front and back, are too rough, turn these 45-degrees.

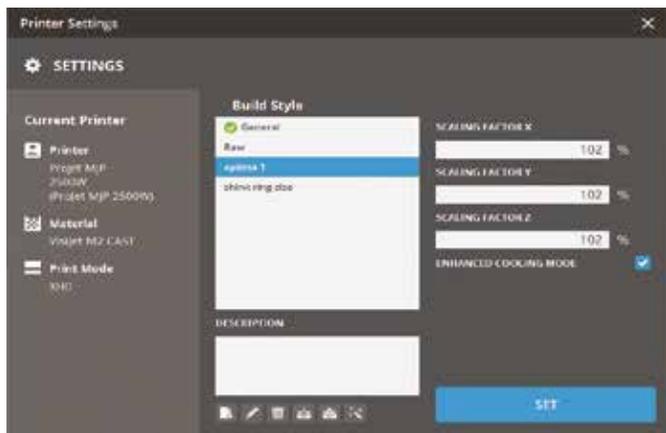
A best practice for achieving an optimal part orientation is to run a test print, especially for intricate and complex designs.



SHRINK COMPENSATION

Accounting for shrink compensation is important to ensure the proper dimensional output.

3D Sprint automatically applies a default shrink compensation. Custom shrink compensation is also an option. Custom shrink compensation settings can be saved within your profile.



4. Post-Processing

There are several post-processing methods to remove supports from MJP 3D printed wax patterns. The below steps are our recommended procedure for processing 3D printed Visijet® M2 CAST patterns with Visijet Support Wax Remover and a magnetic stirrer hot plate. Visijet Support Wax Remover is a post-processing fluid for safe and easy removal of supports from MJP wax patterns. Please refer to the complete recommended procedure [here](#).

1. Remove printed patterns from platform
2. Heat bath of Visijet Support Wax Remover to 35°C (95°F)
3. Carefully place patterns into solvent until support wax dissolves
4. Remove patterns from solvent and rinse with 30-35°C (86-95° F) water

5. Solution Components

PRINTER

- The ProJet MJP 2500W 3D printer adjusts to your workflow, from short-run batches to high-volume production, to deliver 100% wax jewelry patterns.

MATERIAL

- Visijet M2 CAST is a 100% wax material that produces durable, high-quality jewelry patterns for reliable performance and results using existing lost-wax casting processes and equipment.

SOFTWARE

- 3D Sprint is 3D Systems' advanced, single-interface software for intuitive file preparation, editing, printing, and management.
- 3D Connect™ Service provides a secure, cloud-based connection to 3D Systems' service team for proactive and preventative support to improve uptime and deliver production assurance for your system.

POST-PROCESSING

- Visijet Support Wax Remover is a post-processing fluid for safe and easy removal of supports from 3D printed wax casting patterns.
- Post-processing equipment (for example, magnetic stirrer) and related supplies

6. Critical Success Factors

Once the 3D printed wax patterns are post-processed, they are ready to cast using your standard casting process.

Visijet M2 CAST melts like standard casting waxes, with negligible ash content for defect-free castings. It is durable for handling and casting fine features, and its high-contrast, deep purple color allows for easy visualization of fine details.

Composition	100% Wax
Color	Deep Purple White
Density @ 80 °C (liquid)	0.80 g/cm ³
Melting Point	61-66 °C
Softening Point	40-48 °C
Volumetric Shrinkage	2 % (from 40 °C to RT)
Linear Shrinkage	0.70 % (from 40 °C to RT)
Needle Penetration Hardness	12
Ash Content per ASTM 2584	< 0.05 %



Solutions Comparison

	Projet® MJP Wax Printers	Figure 4® Jewelry (castable plastic)	Injected Wax
Castability	• • • • •	• • • •	• • • • •
High Throughput	• • • • •	• • •	• • • • •
Fast Turnaround	• • • •	• • • • •	• •
Feature Detail	• • • • •	• • • •	• • • •
Surface Finish	• • • •	• • • • •	• • • •
Initial Investment	\$ \$ \$ \$	\$ \$ \$	\$ \$ \$ \$ \$
Design Freedom	• • • • •	• • • •	• •
Ease-of-Use / Labor	• • • • •	• • • •	•
Cost per Pattern	\$ \$ \$ \$ \$	\$ \$ \$ \$	\$ \$

“The Projet MJP Series is the keystone of our manufacturing process. It’s a real wax printer. This means that there is no possibility of casting faults due to ashes or a cracked shell due to thermal expansion.”

—Charles-Olivier Roy, Founder, Vowsmith

What's Next?

Learn more about the ProJet MJP 2500W solution for 3D printing 100% wax casting patterns.

Talk to an expert about your
jewelry manufacturing needs

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