



3D Printing for Classic Cars

Automotive restoration company relies on ExOne's exclusive binder jet 3D printing to reproduce obsolete parts for classic cars.

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| COMPANY | HV3DWorks LLC |
| INDUSTRY | Automotive |
| APPLICATION | Restorative Parts |
| LOCATION | Pittsburgh, PA |
| PARTNER SINCE | 2016 |



Hood latches 3D printed for Pebble Beach
Concours d'Elegance Competitor



ExOne™
Collaborate. Innovate. Accelerate.

Award-Winning Classic Car Restoration

From local garages to Pebble Beach, HV3DWorks LLC provides 3D printed parts to restore and customize beloved classic cars – relying solely on ExOne’s exclusive binder jetting 3D printing technology to meet customer demands.

The award-winning classic car restoration company is well-positioned, considering that the automotive specialty equipment market was valued at more than \$44.6 billion in 2018, according to the Specialty Equipment Market Association (SEMA). HV3D’s service offerings include 3D scanning, reverse engineering, custom part design, and 3D print management.

But when it comes to the actual manufacturing of parts, HV3DWorks LLC relies almost exclusively on ExOne and its binder jetting technology.



Paul Vorbach, Owner, HV3DWorks LLC

Paul Vorbach launched HV3DWorks in 2016 as an extension of his auto restoration business with former partner Bill Hahn. Paul is a self-described innovator with a passion for cars and automotive restoration and customization. His level of enthusiasm in that regard is almost unrivaled. Almost. That is, until you get him talking about 3D printing and ExOne. That’s a topic that nearly matches his zeal for cars.

“Once we learned about ExOne, and what they were doing with metal 3D printing, I recognized the potential of what we could do for the restoration business if we had the ability to access more of the parts we needed using additive.

Through our partnership and collaboration with ExOne, and the use of the company’s state-of-the-art additive technique, HV3DWorks is definitely on the cutting-edge within our industry.”

**- Paul Vorbach, Owner,
HV3DWorks, LLC**

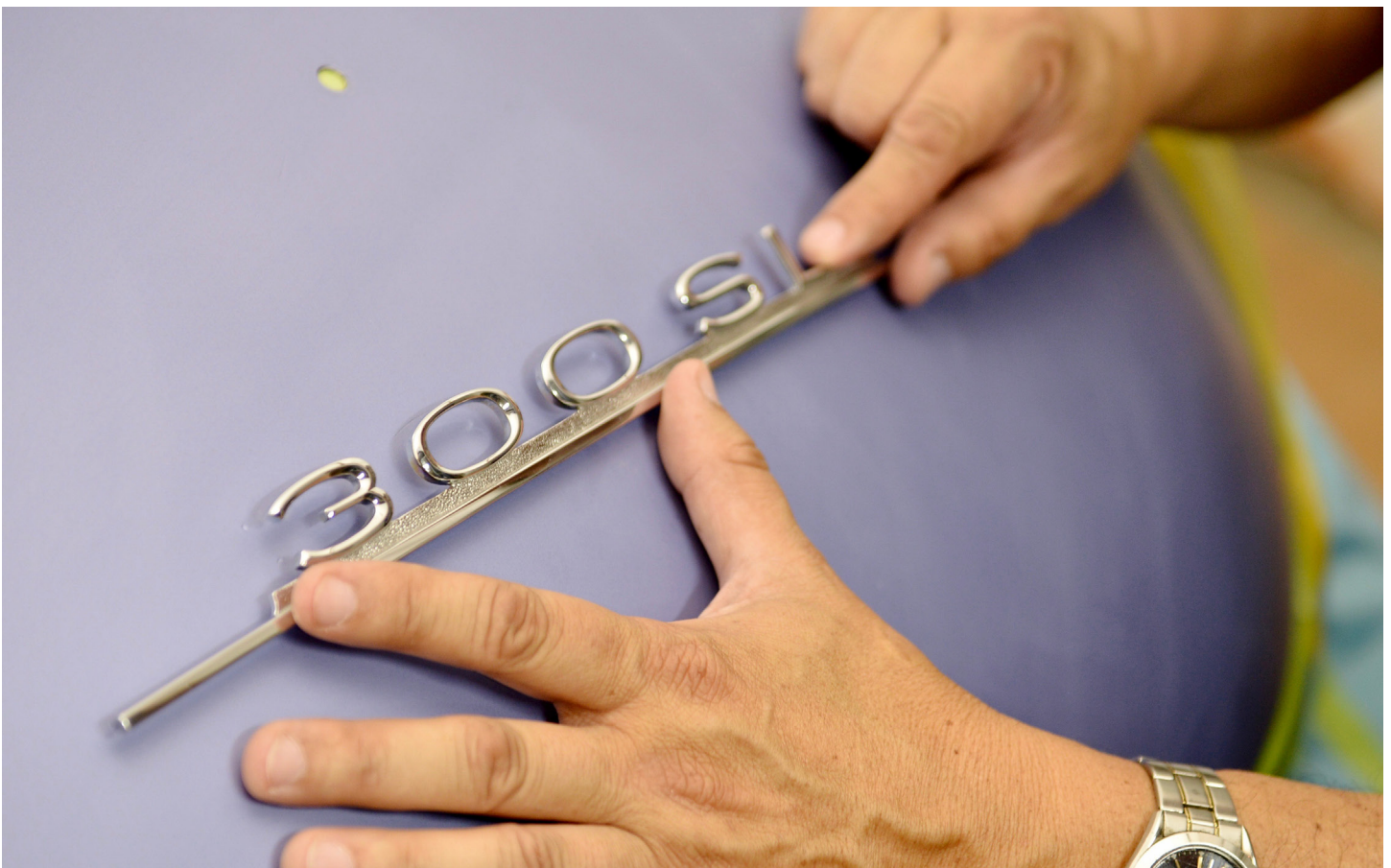
Today, HV3D Works LLC is one of only a handful of companies to adopt and integrate 3D printing technologies for car restoration and customization. His company addresses a growing challenge facing the restoration industry at large: the costliness of quality parts and the outright rarity or unavailability of parts.

With binder jet 3D printing from ExOne, he can now offer distinct advantages over traditional methods or molds, handling the complex geometries of automotive parts, and even intricate emblems, with ease.

ExOne's proprietary binder jet 3D printing is a relatively mature method of 3D printing in which an industrial printhead deposits a liquid binder onto a thin layer of powdered particles, layer by layer, until an object is formed. ExOne binder jet systems currently 3D print more than 20 metals, ceramics and composite materials.

"It is my mission at HV3DWorks LLC to bring 3D printing technology to my fellow restorers, builders, and car enthusiasts," said Vorbach. "With ExOne as a partner, my goal of making 3D printing for car people by car people is becoming a reality. Our opportunities have definitely broadened to grow the business."

**More than 250
parts for classic
cars have been
3D printed by
ExOne for
HV3DWorks
customers.**



HV3DWorks Recreates Obsolete Hood Latches for Pebble Beach Competitor with ExOne 3D Printing



CHALLENGE

A client restoring a 1921 Kissel Gold Bug Speedster for the 2018 Pebble Beach Concours d' Elegance in Monterey California, needed to have a full set of four hood latches recreated. The time constraint and one-off nature of the parts concluded there would not be an opportunity to utilize traditional manufacturing processes to meet the deadline.

SOLUTION

The client sent a borrowed hood latch to serve as a design guide. The parts were quickly modeled and produced in 316 Stainless Steel and infiltrated with bronze using ExOne's metal 3D binder jetting technology. Turnaround time on the parts was under 4 weeks which provided enough time for chrome plating and installation before the vehicle was transported to California. The vehicle won "Best in Class" at the show and was featured on Motor Trend TV's "Long Road to Monterey" program.

THE EXONE ADVANTAGE

ExOne's ability to produce high-quality components directly from design files significantly minimized production time, allowing Paul to meet the customers' deadline. The 316 Stainless Steel infiltrated with bronze was an ideal material choice for strength and durability.

PROJECT DETAILS

HIGHLIGHTS

- Part: 1921 Kissel Gold Bug Speedster hood latches
- Process: Binder jet 3D printing on an ExOne M-Flex 3D metal printer
- Material: 316 Stainless Steel infiltrated with bronze

KEY BENEFITS

- Production Time: Four weeks, including CAD design, 3D printing and pre-plating.
- Original Part Cost: Part was obsolete and could not be found
- 3D Printing Cost: \$225 per latch set (*\$400 final price after post-production work*)
- Performance Benefit: 3D printed pieces have strength and durability

HV3DWorks Uses ExOne Binder Jet 3D Printing to Replace a Damaged 65-Year-Old Fuel Pump



CHALLENGE

A customer in Australia needed to have a Corteco fuel pump body reproduced for use on a 1951 Alfa Romeo 6c 2500 engine. The original fuel pump was over 65 years old, made of pot metal and was cracking in several areas.

SOLUTION

The customer sent the original fuel pump to serve as a design guide. The parts were modeled and initially produced in plastic to confirm fit and finalize the design. Once the design was approved, the parts were printed in 316 Stainless Steel infiltrated with bronze. What's more, the part was improved with the addition of some internal wall thickening and fillets. The customer owns a business that specializes in carburetors and fuel system parts for vintage automobiles and will be able to leverage this design in the future.

THE EXONE ADVANTAGE

ExOne's ability to produce high-quality components directly from design files significantly minimized production, allowing Paul to meet the customers' deadline. The 316 Stainless Steel infiltrated with bronze was an ideal material choice. The replacement fuel pump was produced for less than half the cost of an original on the open market, if one could even be found.



PROJECT DETAILS

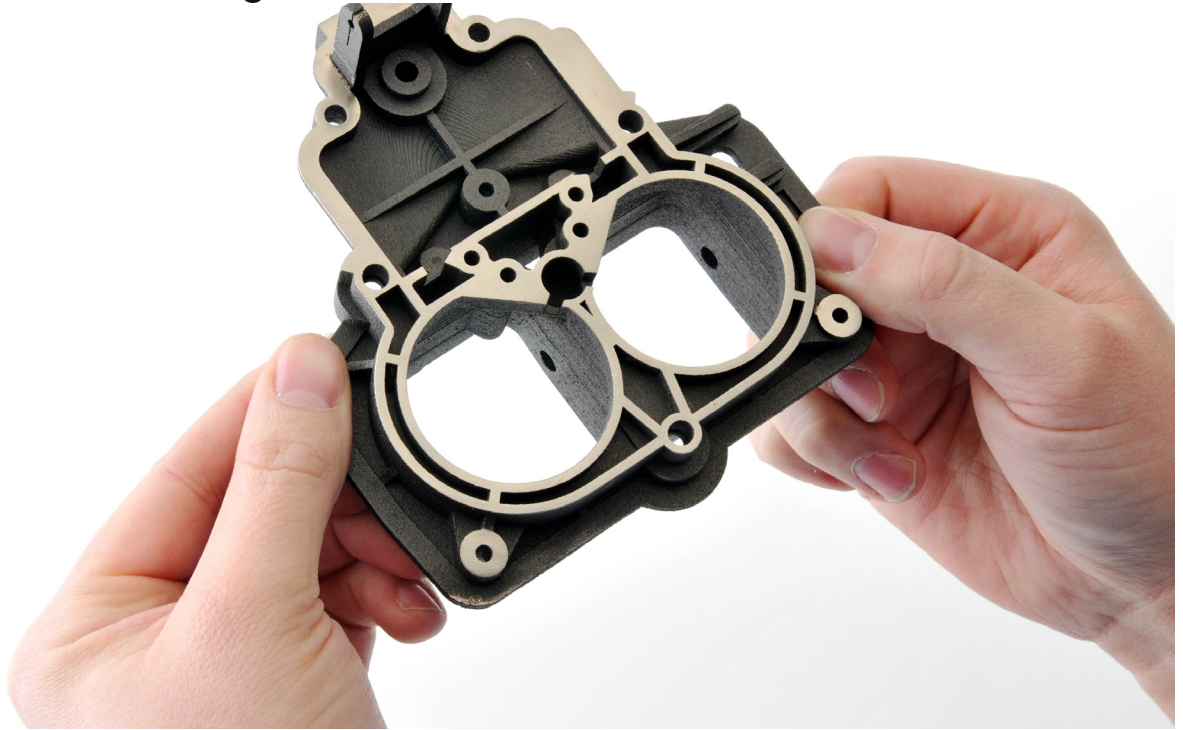
HIGHLIGHTS

- Part: Fuel pump body for a 1951 Alfa Romeo 6c 2500 engine
- Process: Binder jet 3D printing on an ExOne M-Flex 3D metal printer
- Material: 316 Stainless Steel infiltrated with bronze

KEY BENEFITS

- Production Time: 10 weeks, including CAD design, 3D metal printing and post production impregnation and thread clean-up
- Machine and Polishing Time: 4 hours
- Original Part Cost: Estimated \$2,500, if the part can even be found
- 3D Printing Cost Savings: \$1,000, saving the customer \$1,500
- Updated design not possible with traditional manufacturing methods

HV3DWorks Reproduces a Carburetor for a Vintage Ferrari with ExOne 3D Printing



CHALLENGE

The client was in need of replacement parts for the top section of a Weber 40 DFI-6 carburetor for a vintage 1969 Ferrari 365 GT 2+2 V-12 engine. The original carburetor had stripped threads and was leaking fuel. The client owns a maintenance and restoration business for vintage automobiles and had searched for quite some time for replacement parts before turning to HV3DWorks LLC.

SOLUTION

The customer sent the original carburetor top to serve as a design guide. The part was modeled and initially produced in plastic to confirm fit and finalize the design. Once the design was approved, the parts were produced in 316 Stainless Steel infiltrated with bronze using ExOne's metal 3D binder jetting technology.

THE EXONE ADVANTAGE

ExOne's ability to produce high-quality components directly from design files significantly minimized production time, allowing Paul to meet the customers' deadline. The 316 Stainless Steel infiltrated with bronze was an ideal material choice.

PROJECT DETAILS

HIGHLIGHTS

- Part: Weber 40 DFI-6 carburetor top for 1969 Ferrari 365 GT 2+2 V-12 engine
- Process: Binder jet 3D printing on an ExOne M-Flex 3D metal printer
- Material: 316 Stainless Steel infiltrated with bronze

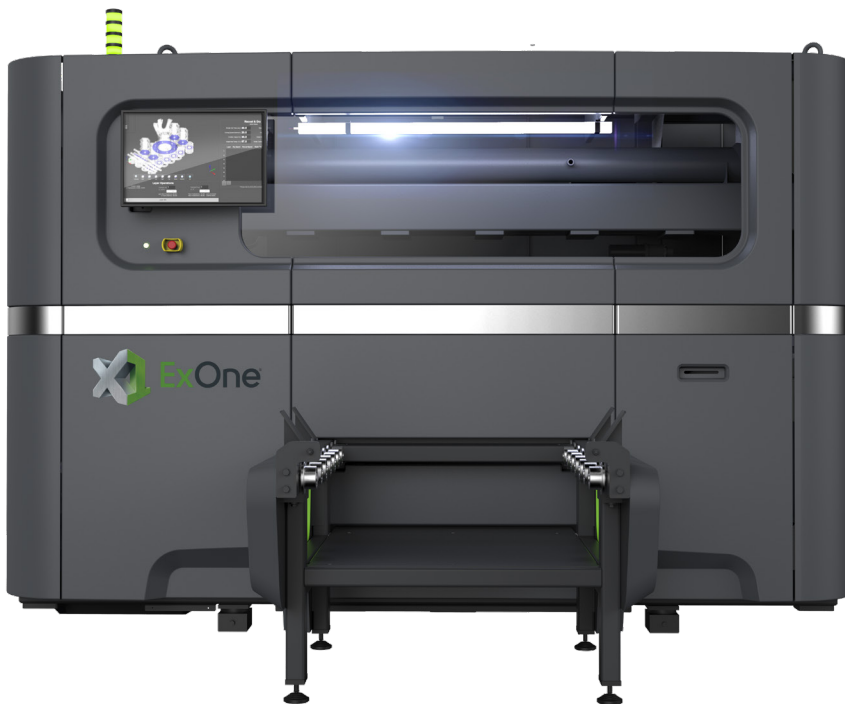
KEY BENEFITS

- Production Time: 12 Weeks, including CAD design, 3D metal printing and post-production impregnation and thread clean-up
- Original Part Price: \$2,500
- 3D Printing Cost Savings: \$1,300
- Performance Benefit: 3D printed pieces have good strength and durability
- Design not possible with traditional manufacturing methods

**LET'S SOLVE THE TOUGHEST PROBLEMS.
AND CHANGE THE WORLD.**



ExOne™
Collaborate. Innovate. Accelerate.



Meet the X1 160Pro™ metal 3D printer – ExOne's tenth and largest metal 3D printer. Featuring the exclusive Triple ACT system for delivering industry-leading part density and repeatability with binder jetting technology.