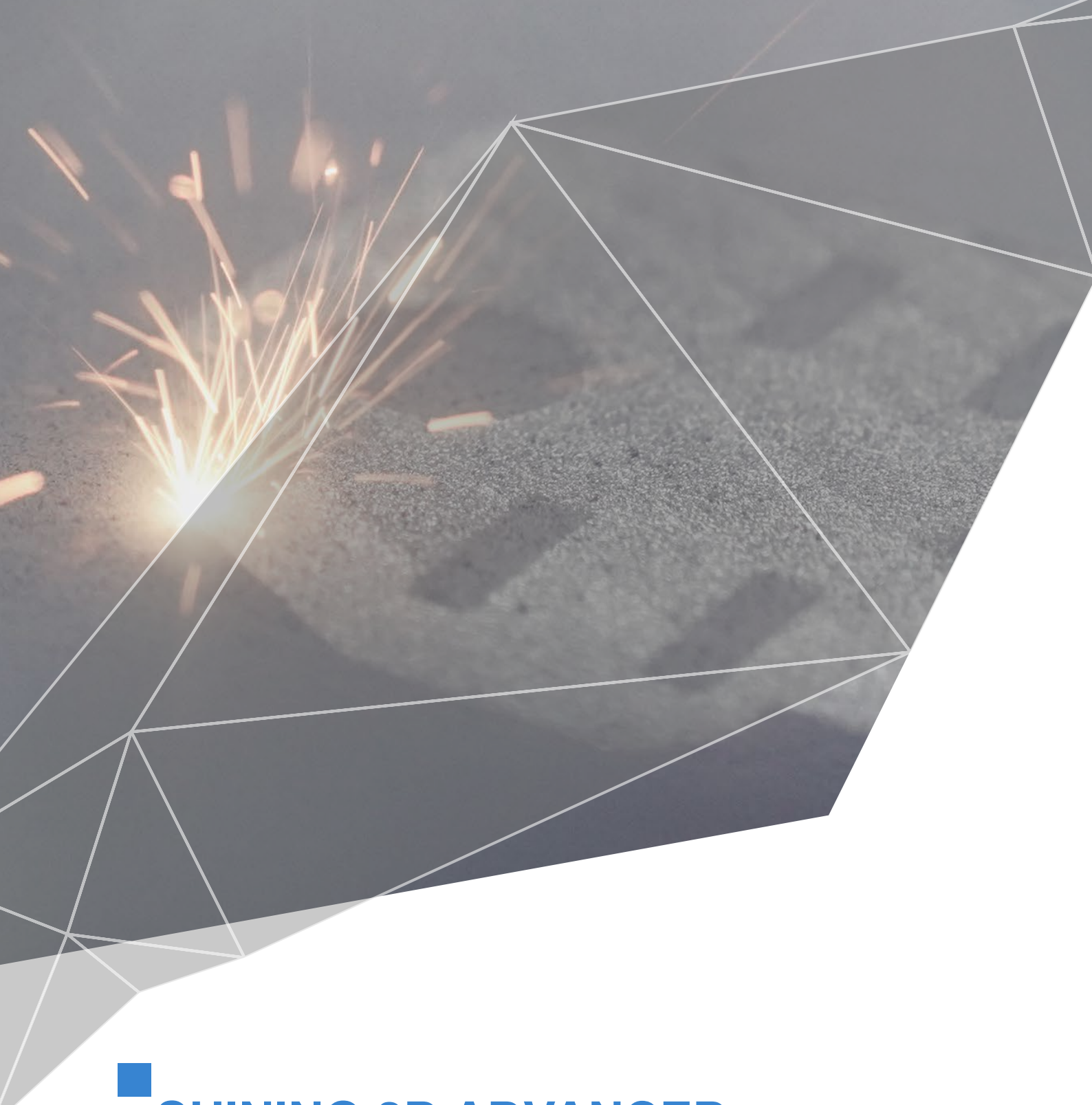


SHINING 3D ADVANCED METAL 3D PRINTING SOLUTIONS

SHINING 3D®

SHINING 3D Metal Additive Manufacturing Technology

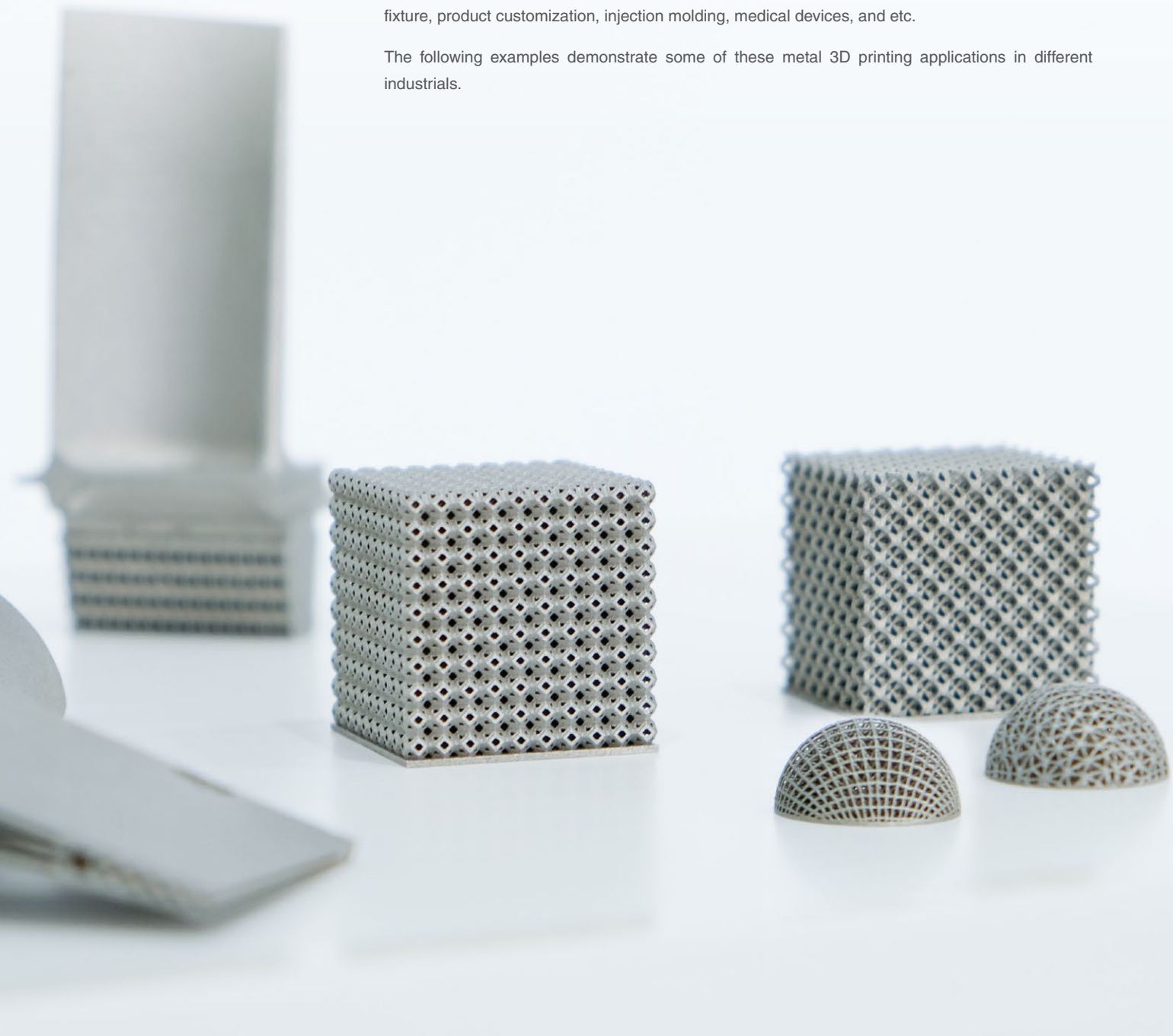
Metal additive manufacturing refers to the technology that produces 3D parts layer by layer using metal powders. This process enables production of complex structure of industrial parts which would be otherwise impossible to manufacture through traditional methods. SHINING 3D provides advancing metal 3D printing solutions to bring higher productivity, product quality and working efficiency for enterprises as well as small businesses

Applications for Different Industries

The continuing development of metal addictive manufacturing has extended its applications in a wide range of industries including aerospace, automotive, tooling, healthcare, dental, consumer products, education, and more.

Applications for metal additive manufacturing including parts production, rapid prototyping, jigs and fixture, product customization, injection molding, medical devices, and etc.

The following examples demonstrate some of these metal 3D printing applications in different industrials.



AUTOMOTIVE & TRANSPORTATION

Metal additive manufacturing technologies bring the automotive and transportation industry a new method of lightweight components manufacturing and small batch parts production. Also, they are ideal for rapid prototyping, accelerating the efficiency of R&D process and save cost.

Advantages

- Integrated and lightweight design
- Direct manufacturing of complex structures
- Product Customization
- Shorten product development
- Easy maintenance

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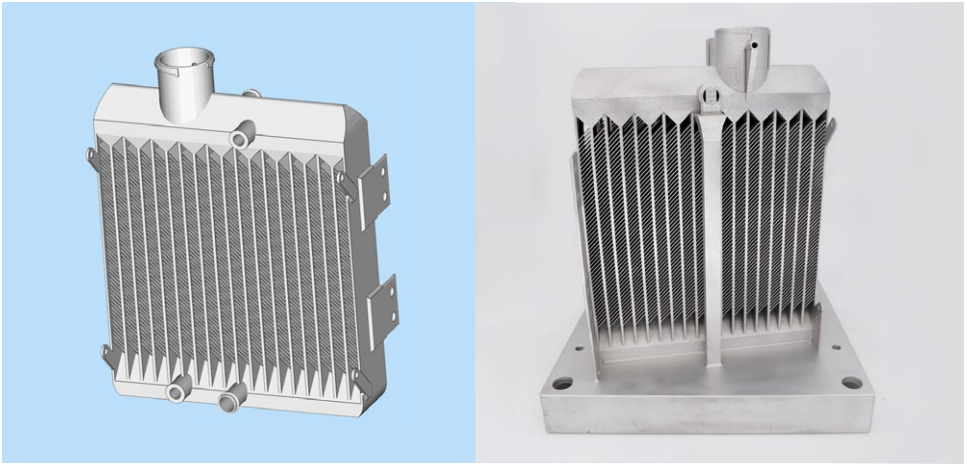
METAL 3D PRINTER PRODUCT MODELS

Racing Car’s Cooling System Production

SHINING 3D sponsored the racing team from the Harbin Institute of Technology (Weihai), China, and helped them win the third place for the ‘Formula Electric Race’ at the 2018 Formula Student China in Zhuhai. The racing team together with engineers from SHINING 3D optimized and modified the race car’s cooling system through additive manufacturing technology.

Condenser and Cooling Jacket

The racing car's cooling system is an important factor that impacts its performance. The original condenser was manufactured by conventional processing, which needed to weld several parts together. The process was not only tedious but can also cause coolant to leak. Through an integrated and optimized design, the team 3D printed a new condenser with SHINING 3D’s metal 3D printer EP-M250. Testing showed that the temperature of newly designed condenser was reduced by about 10°C compared to the previous condenser used before in previous races in Japan. The heat dissipation performance had been significantly improved.



3D data of the optimized condenser and the metal 3D printed racing car part

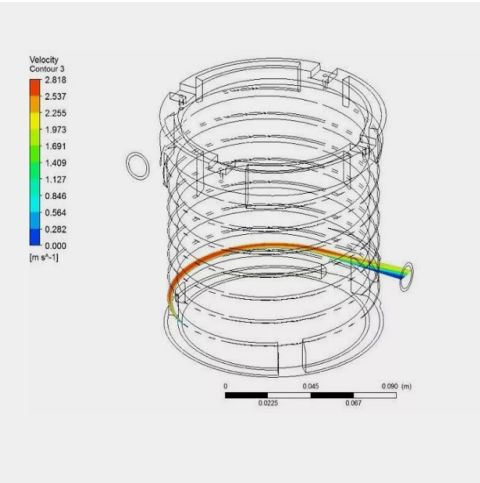
Cooling jackets produced by traditional technology required the assembly of two parts: one is processed by an aluminum alloy CNC machine and the other is 3D-printed in plastic. The complexity of this process impacts not only how it is manufactured but also water tightness and intensity of internal structure has to be guaranteed. The 3D printed motor cooling jacket can meet the strict cooling demand, while also taking a shorter time to produce, with a higher water tightness and structural integrity.

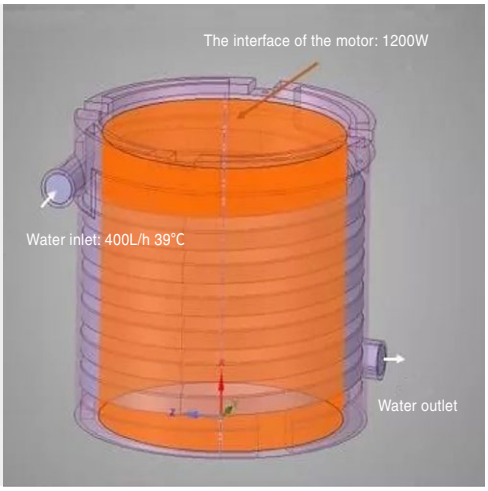
Product Modification Workflow

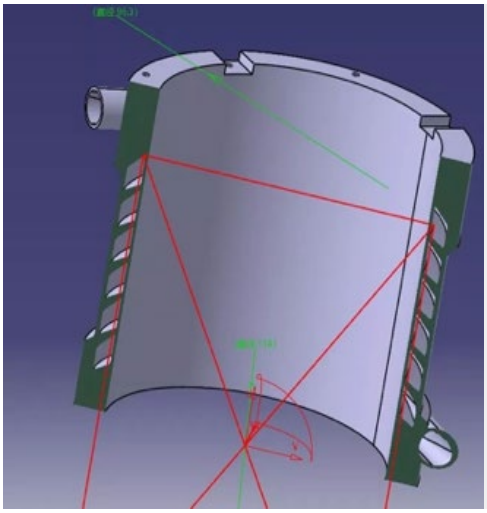
❶ · Design and simulation

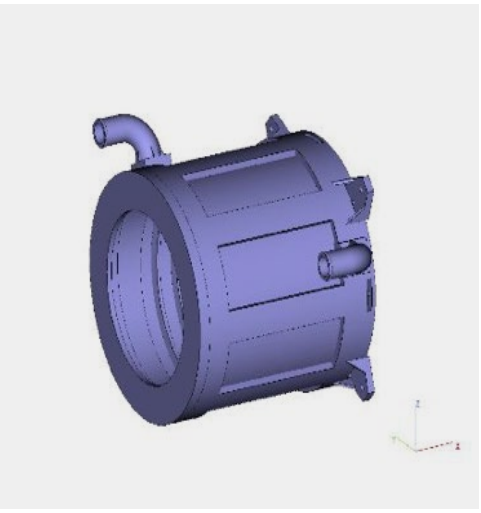
For the actual working conditions of motors and characteristics of 3D printed metal parts, one has to consider a multitude of factors, including average power and heat dissipation of the motor, heat flux density of racing car and local temperature. The cooling jacket needs to satisfy basic intensity requirements, increased temperature differences between inlet and outlet, and reduce its weight while achieving easy maintenance.

Through the simulation of water flow, the engineers spare no efforts to improve design schemes, redesign the cooling jacket and finally obtain the ideal 3D data.









❷ · 3D printing and post processing

After finishing the design, SHINING 3D's EP-M250 metal 3D printer was used for printing in aluminum alloy. After a series of post-processing such as heat treatment and sandblasting, the cooling jacket was delivered to the racing team.

Assembly and testing

After assembling and testing the printed motor cooling jacket and the motor, the racecar successfully roared onto the track and won third place in Zhuhai.

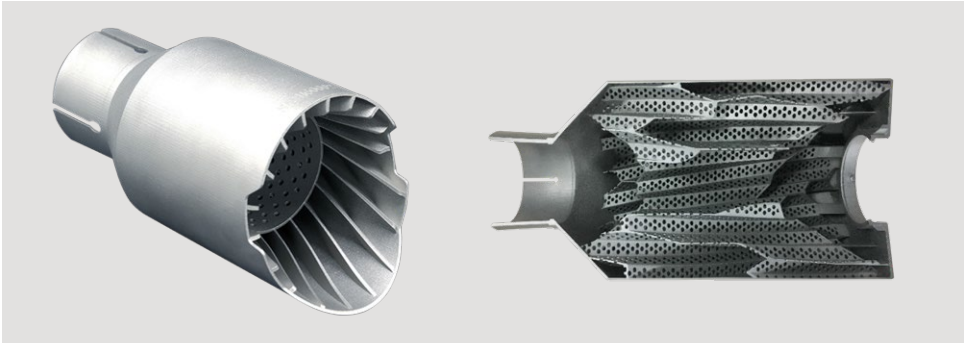



SHINING 3D successfully created motor cooling water jackets and condenser parts for the racing team, by taking advantage of metal 3D printing in product design and molding. During the design and manufacturing stage of racing cars, metal 3D printing gives designers more flexibility and freedom to create. Not being limited to manufacturing process, it realizes small and complex structure manufacturing together with sound stability and lightweight body, elevating the overall performance. Metal 3D printing will also greatly promote the development of traditional auto market with its low cost, high efficiency and high quality.

Small Batch Production and Rapid Prototyping of Metal Automotive Parts

SHINING 3D has been working closely with automotive companies and car shops, to help them adopt additive manufacturing in order to fulfill the customization demands, increase productivity and reduce the cost.

Recently SHINING 3D helped a client to design and manufacture a customized exhaust pipe. The customized 3D printed auto exhaust pipe was directly applied to a Ford Mustang car. Through the optimization of the structure design, the 3D printing exhaust pipe has more powerful acoustic wave, reduced the weight to about 67% while guaranteeing the power of engine under different working conditions.

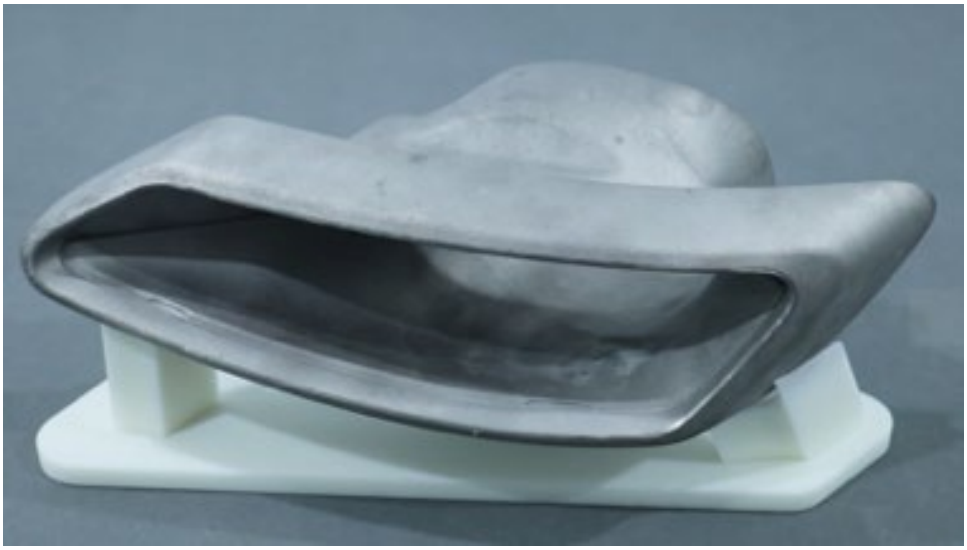


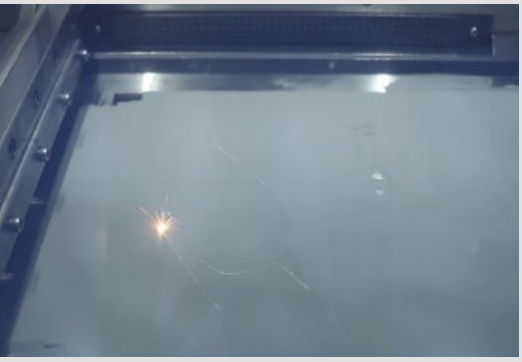
Customized Ford Mustang metal 3D printed exhaust pipes

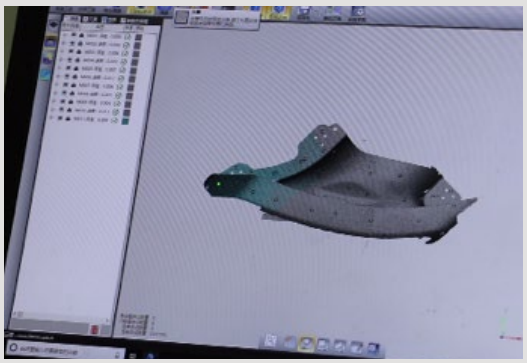
SHINING 3D also helped an automotive company to design, produce and test an auto exhaust pipe prototype.

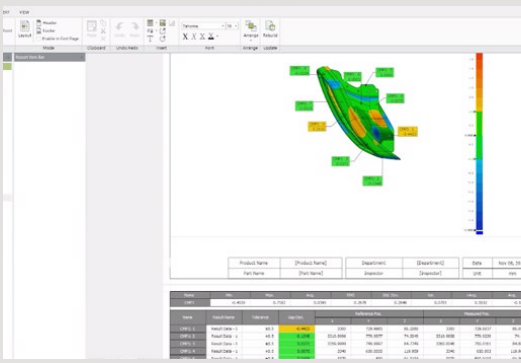
By taking an additive manufacturing and 3D inspection approach, it decreased the period from design to installation to just one week, resulting in significant reductions in production time, risks and costs. The additional benefits brought by innovative technologies enable new, lightweight design with more freedom, meeting increasing customized demands in automotive industries. about 67% while guaranteeing the power of engine under different working conditions.

APPLICATIONS









The working process of 3D Printing, post processing and 3D Inspection of the auto exhaust pipe

TOOLING

Metal additive manufacturing technology nowadays is a great complement in injection molding, die casting and stamping die. 3D printed metal molds and inserts with the conformal cooling channels greatly increase the cooling efficiency and improve produced parts' quality.

Advantages

· Shortened production time compares to traditional methods with long molding cycles and low yields.

· Reduces costs for the overall process and speeds up product iteration.

· Higher heat dissipation capacity than standard injection molding.

· Improved product quality that helps to avoid local deformations in molds.

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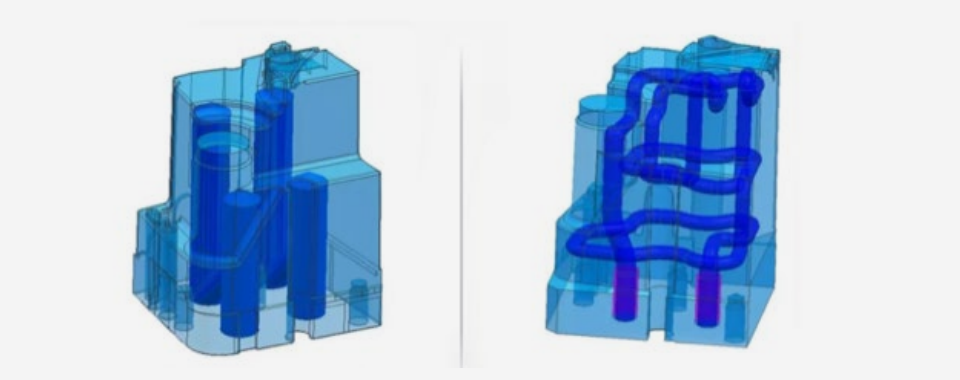
METAL 3D PRINTER PRODUCT MODELS

Injecting Molding

Metal 3D printing allows for design and manufacturing molds with complex conformal cooling channel. This can reduce scrap, improve quality of parts and increase the cooling efficiency. SHINING 3D provides a complete solution from 3D design to 3D printing for molding applications, greatly increasing productivity.

Demonstration of conformal cooling channel inside the metal 3D printed injection molds



Traditional cooling channels vs. conformal cooling channels

· In the production of traditional molds, drilling can only produce straight waterways, which means that the shape of the waterway is limited and far from the surface of the mold. While 3D printing enables precise complex lattice and waterway construction. Designed in CAD software, the distribution of waterway is based on the geometry of the parts.

· Compared to the traditional mold, 3D printed mold with conformal cooling channels have a higher heat dissipation efficiency, shortening production cycle and improving production efficiency.

· The parts are often easily bent and deformed due to the high temperature in traditional manufacturing. With the uniform hear dissipation of the waterway, the 3D printer mold can manufacture zero-defective products, effectively improve product quality and reduce scrap.

· 3D digitizing and 3D printing enable a lightweight construction of the mold and reduce costs. At the same, bridging mold can be design and manufactured based on the existing mold through 3D digitizing and printing technologies.

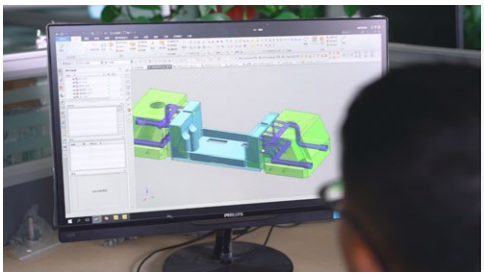
Mold Development Workflow

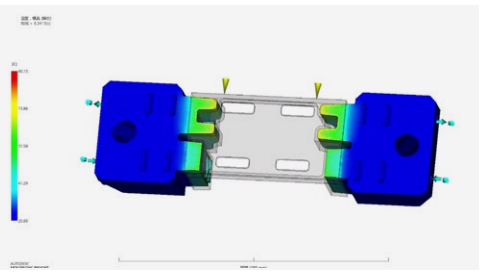
❶ · Mold design

CAD design mold in SIEMENS NX software.

❷ · Simulation

Using NX's simulation module to generate the analysis of molds' waterway scheme, simulation of temperate change in the mold cycle. Based the result, optimize the design.





❸ · 3D Printing

Using EP-M250 metal 3D printer, with up to 262*262*350mm building volume and high-precision printing, to manufacture high-quality the conformal cooling waterway molds.

❹ · Metallographic analysis

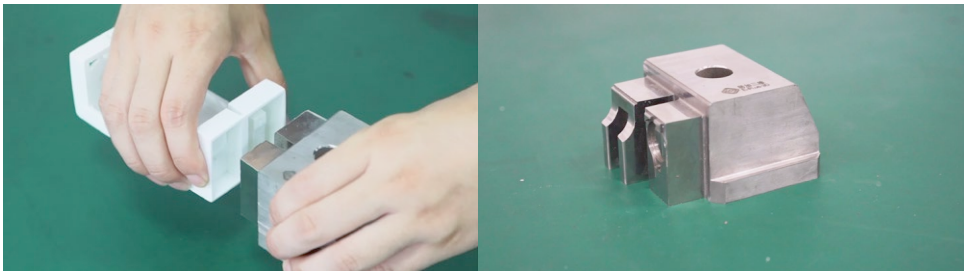
Samples were taken for metallographic analysis to ensure that the print molds met quality standards.

❺ · Post-processing

Post-treatment such as heat treatment, de-support, surface treatment, etc.

❻ · Product Deliver

After the plastic product has ben cooled, remove it from the mold.



MEDICAL

SHINING 3D provides integrated solutions in dental, rehabilitation, orthopedic industries, offering technical support for public health. Metal additive manufacturing technology is applied to produce titanium spine, skull and hip cup, manufacture cobalt-chromium alloy dental restorations, partial frameworks, etc.

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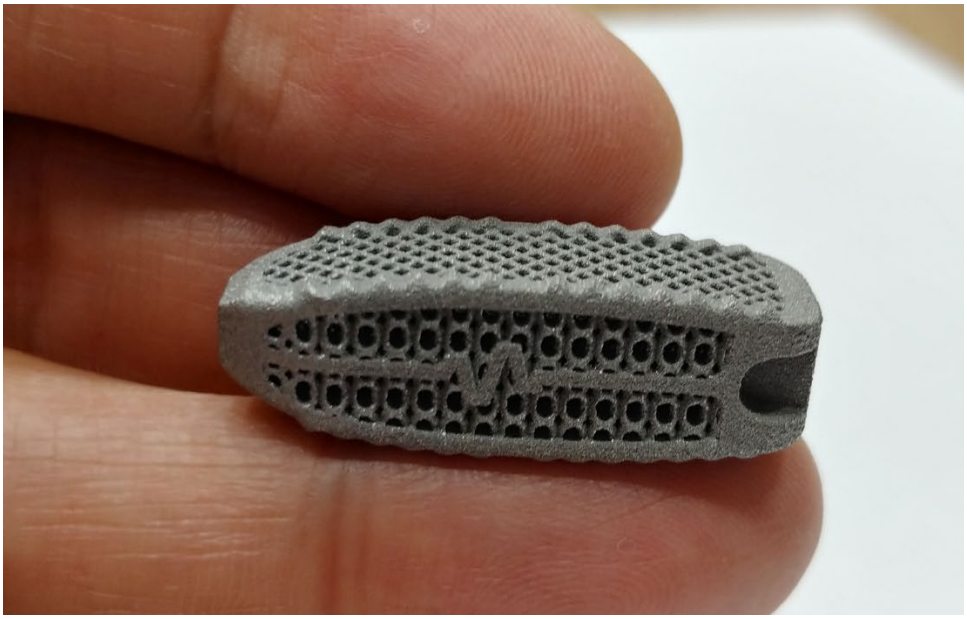
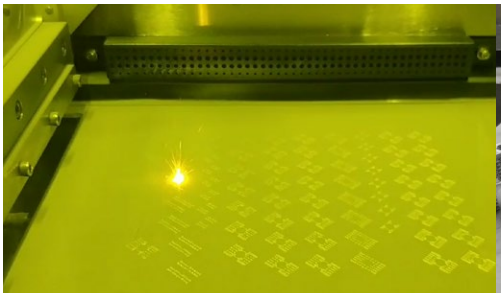
METAL 3D PRINTER
PRODUCT MODELS

Spinal Implant Additive Manufacturing

In the past, the surgery often used titanium mesh to fill in autologous or allogeneic bone as an interbody support material. However, once the titanium mesh is displaced compressing the spinal cord, the patient is at risk of paralysis. While metal 3D printing technology can produce implants with the surface of 3D polygonal structure and a mechanically optimized lattice. The spongy microporous structure combined with the topological frame structure facilitates the growth of bone cells, and finally achieves bone fusion, which has stronger bearing capacity than the conventional titanium mesh.

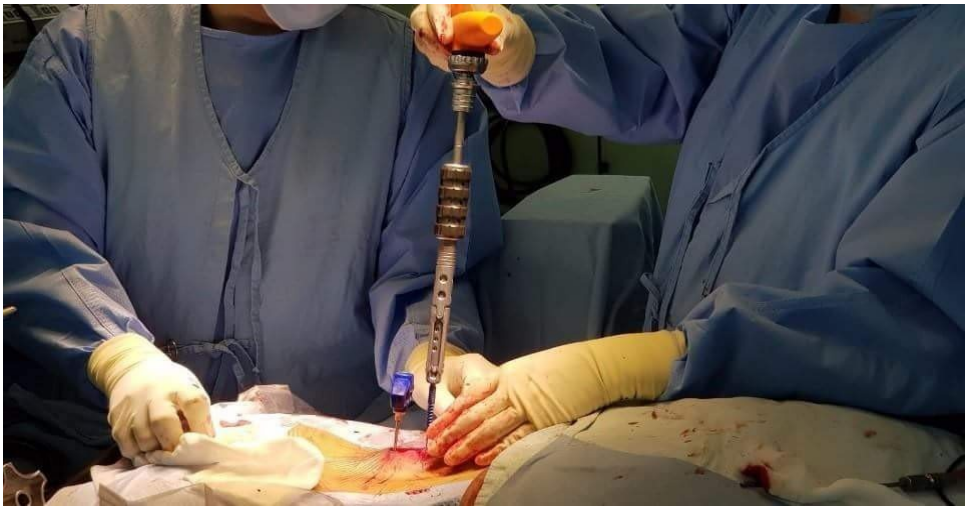


MANTIZ, a medical device company, is using the EP-M250 metal 3D printer from SHINING 3D to manufacture Titanium 3D printed cages and use them in the implant surgery. The entire process to make the shape of implants is done in-house by MANTIZ. The cages are designed to specification; size, material, shape and porosity are all vital to the effectiveness of the implant. The completed design for the cages is uploaded into the printer's software where it is prepped for printing. Using the EP-M250's large print bed they are able to print over 50 individual implants in one build. Once implanted, the surrounding bone and tissue begin to fuse with the implant creating a solid structure in the patient's spine.

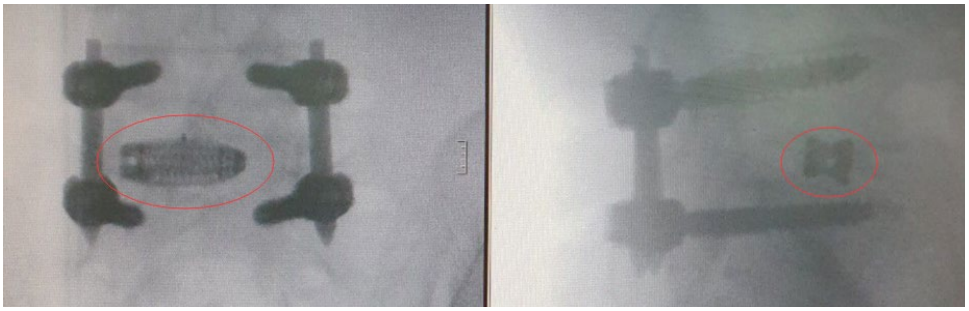


Metal 3D printing process in the chamber

3D Printed Cages for Implant



In Surgery



Implanted Cages

The inventor of PANTHER 3D printed cage system in MANTIZ, Hongwon Yoon (CTO of MANTIZ), said "We have completed the development of more improved Titanium 3D printed cage implant using EP-M250 metal 3D printer. The mechanical test results prove the safety and functionality of our implants. The average closed porosity of 3D printed titanium solid part is 3%. It leads to accelerated protein and mesenchymal stem cell attachment for bone fusion."

■ Titanium 3D Printed Cochlear Hearing Aids

Metal 3D printing has influenced the hearing aid industry for years. A customer has been using SHINING 3D's metal 3D printer EP-M250 for printing Titanium cochlear hearing aids.

Advantages

· For patients

1）Avoid discomfort caused by individual's allergy to plastic.

2）Increased intensity makes it safer for the hearing impaired people.

3）The thin-walled shell (as thin as 0.2mm) made of titanium alloy is half thinner than the shell manufactured through the traditional method; the overall size is significantly reduced.

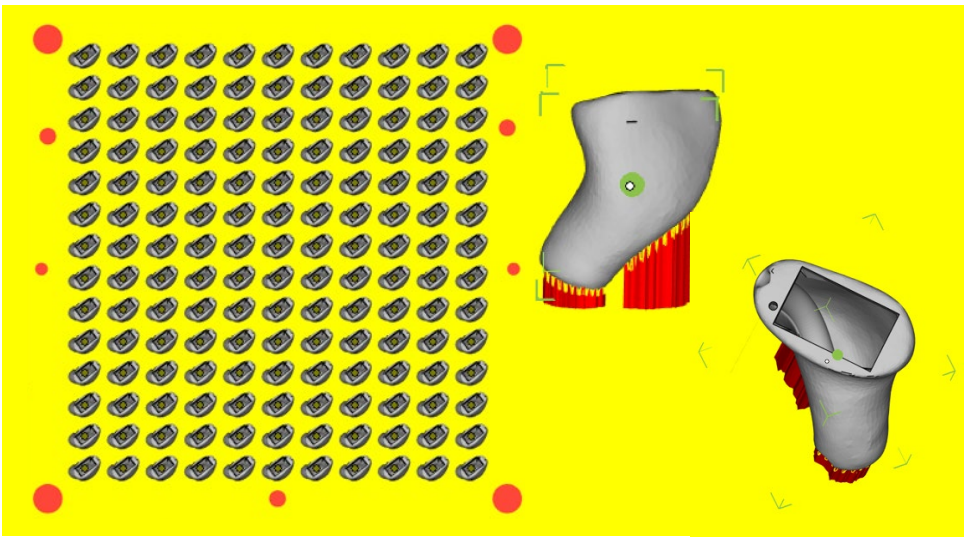
4）The matching success rate of the deep ear canal products is increased by 64%.

5）Make the hearing aids invisible; provide more space for add-ons such as battery receivers in order to reduce blocking and improve comfort.

· For hearing aids manufacturers

Adopt digitizing design and 3D printing technology to improve the quality of hearing aids, reduce the dependence technicians and production process, and gain a high-profit market.

Hearing Aids Development Workflow



Design:

Use 3D scanning technology to obtain ear modulus data, and then make it out of vacuum to get the hearing aids shell. During design process, use thin-walled structure to reduce the volume.

3D Print:

The metal 3D printer EP-M250 was able to print 150 sample per plate, with the layer thickness of 30μm. The whole print time cost 30 hours while the total cost of printing materials was only about 400 USD.

Post-Processing:

It required wire cutting and substrate smoothing after 3D printing. While it took about 10 minutes to remove one set's support and 20-30 hours to polish each batch including 400-500 pieces. The single cost of a hearing aid is within 4 USD only through additive manufacturing.

METAL 3D PRINTER PRODUCT MODELS

For various industries, metal 3D printing technologies have grown at an explosive pace. SHINING 3D metal 3D printers are designed to work for existing industries, bringing a fast and cost-effective method of production. With multiple choices of different building volumes, speed and materials, you can always find the right Metal Power Bed Fusion (MPBF) system for your business.

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METAL 3D PRINTER
PRODUCT MODELS

EP-M250 Pro

Dual-laser 3D Printer (Metal Powder Bed Fusion)

The EP-M250 Pro is a dual-laser metal 3D printer that uses advanced metal powder bed fusion (MPBF) technology. It is capable of easily and quickly converting CAD data into high-performance, complex structure metal parts. The 3D printer is ideal for medium sized parts and small batch production.

Specifications

Laser

Fiber laser, 500W (single or dual-laser optional)

Layer Thickness

20-100μm

Dimension (W*D*H)

3500x1300x2300mm

Build Volume (X*Y*Z)

262x262x350mm

Material

Titanium Alloy, Aluminium Alloy, Nickel Alloy, Maraging Steel, Stainless Steel, Cobalt Chrome, Copper Alloy and more.

EP-M250

3D Printer (Metal Powder Bed Fusion)

EP-M250 can directly manufacture medium size arbitrary complex structure (lattice lightweight, integrated or topology structure) and achieve close to 100% density metal parts.

Specifications

Laser

Fiber laser, 200W/500W (single or dual-laser optional)

Layer Thickness

20-100μm

Dimension (W*D*H)

2500x1000x2100mm

Build Volume (X*Y*Z)

262x262x350mm

Material

Titanium Alloy, Aluminium Alloy, Nickel Alloy, Maraging Steel, Stainless Steel, Cobalt Chrome, Copper Alloy and more.

EP-M150

3D Printer (Metal Powder Bed Fusion)

The EP-M150 is a compact MPBF metal printer designed for small and complex industrial part production. A variety of materials can be printed for various applications including medical, jewelry, metal material development, and more.

Specifications

Laser

Fiber laser, 200W/ 500W (single or dual-laser optional)

Layer Thickness

20-100μm

Dimension (W*D*H)

1750x780x1900mm

Build Volume (X*Y*Z)

Φ150mm x 120mm

Material

Titanium Alloy, Aluminium Alloy, Nickel Alloy, Maraging Steel, Stainless Steel, Cobalt Chrome, Copper Alloy, etc.

**Notice: SHINING 3D reserves the right to explain any alteration of the specifications and pictures.*

SHINING 3D

About SHINING 3D

SHINING 3D, founded in 2004, is pioneering independent research and the development of 3D digitizing and 3D printing technologies. SHINING 3D provides professional solutions covering “3D Digitizing – Intelligent Design – 3D Printing” for various industries including industrial manufacturing, healthcare & life sciences, product customization, and STEM education. SHINING 3D is well-positioned in the market and has the capacity to handle large sales volume, offering powerful 3D technologies, and provides strong support service. SHINING 3D’s mission is to enable flexible production of high performance, complex structural products, and make 3D imaging and manufacturing technologies accessible to all; from large multi-national corporations worldwide to at home hobbyist. As the leader among Chinese 3D printing companies, SHINING 3D has currently extended a strong international influence with customers in more than 70 different countries in Asia Pacific, Europe, North America, South America, Africa and the Middle East.

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