



## Company Presentation

August 2020

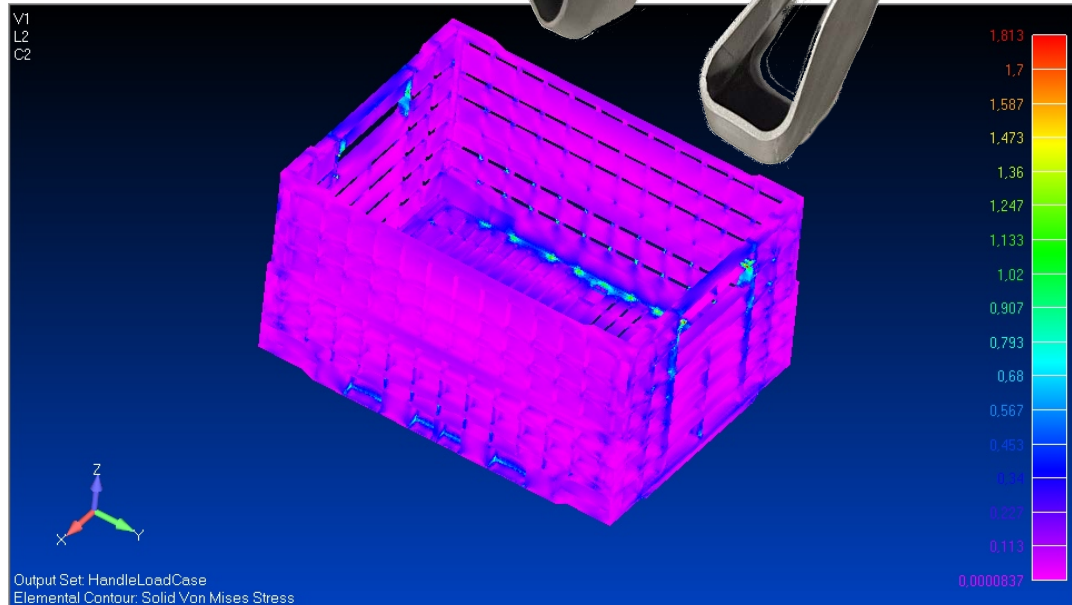
**3D Printing Services for the Industry**

<b>Established:</b>	2019
<b>Company Type:</b>	Société Anonyme (SA)
<b>VAT Nr:</b>	EL801216450
<b>TAX Office:</b>	FAE Athens
<b>Registration Body:</b>	Piraeus Chamber of Commerce & Industry
<b>Registration Nr.:</b>	151962307000
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<i>Managing Director:</i>	Nikos Efentakis <a href="mailto:n.efentakis@metal3d.gr">n.efentakis@metal3d.gr</a> +30 6932 277 966
<b>Bank info:</b>	National Bank of Greece – Branch 653 IBAN GR5101106530000065300361618



Our main business sector is Custom 3D Printing:

- Design (3d-Modelling and Reverse Engineering)
- Engineering (FEA and Assembly Verification)
- 3D Printing of **metal components**
- 3D Printing of **plastic components**
- Post-Processing of 3D printed parts (hardening, CNC Machining, Surface Finishing etc)



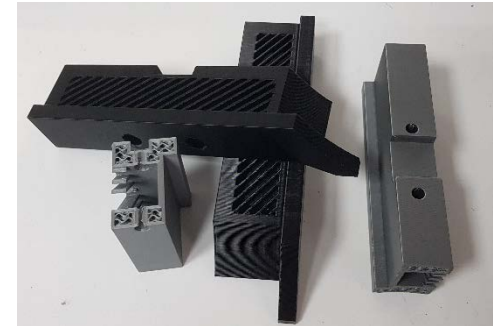
More Suitable applications:



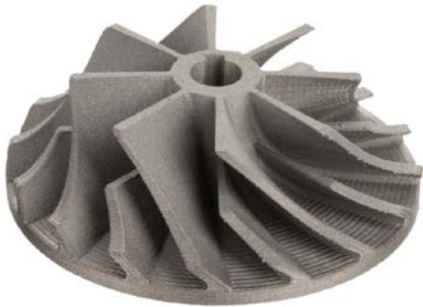
Low Volume Production



Research & Development



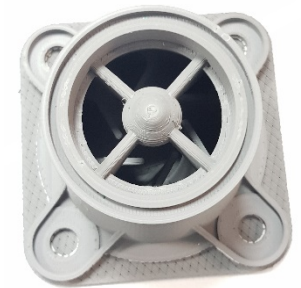
Factory Equipment  
Upgrades



Complicated maintenance parts



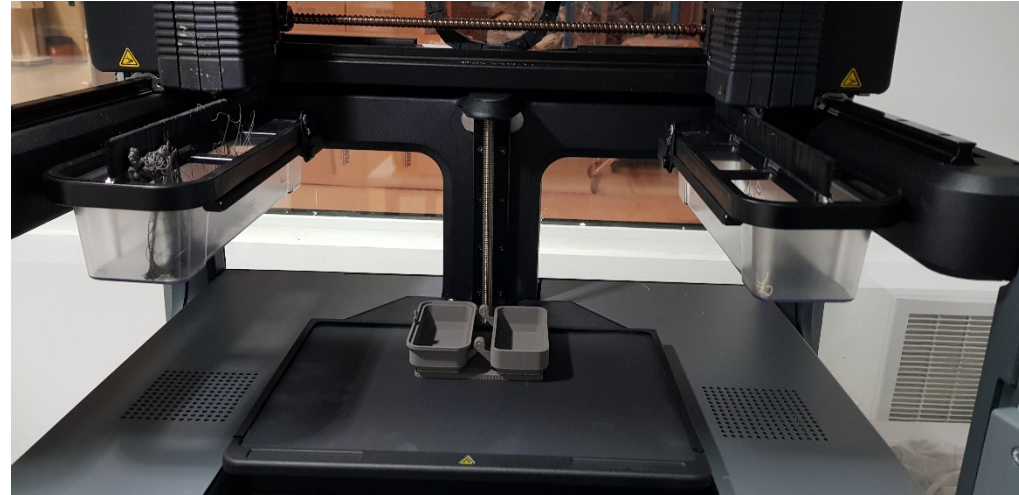
Jiggs and fixtures



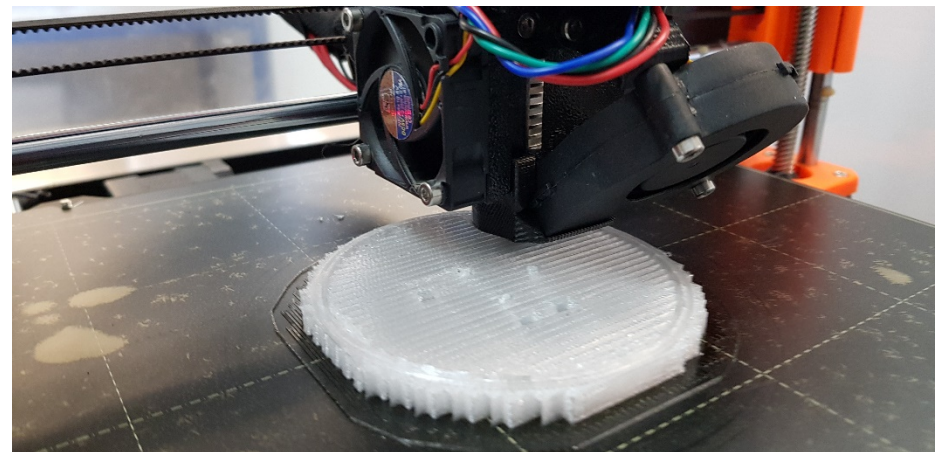
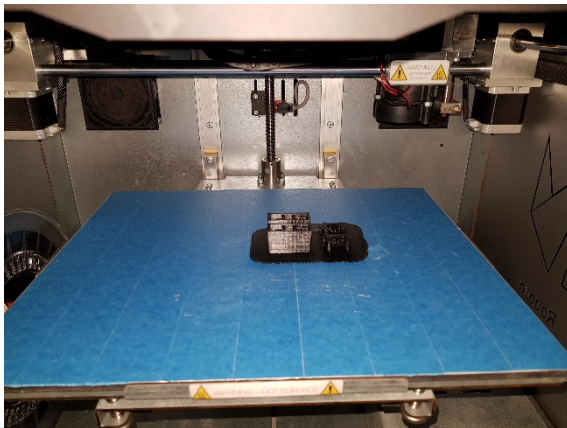
Stainless Steel 316L  
Marine Parts



- Metal 3D Printing with Bound Metal Deposition (BMD®) technology

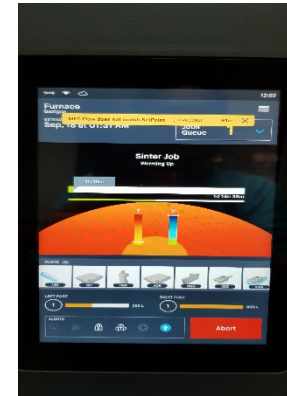
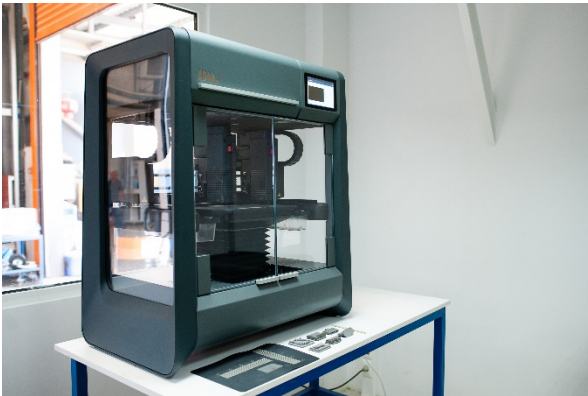


- Plastic 3D Printing (FDM and SLA)



We had carefully analyzed the currently available technologies in this field and we had chosen to invest in this very first step in the Studio System+ from Desktop Metal (USA) and the **Bound Metal Deposition (BMD®)** technology.

BMD is the newest, but also the most mature technology in this field. BMD substantially relies on MIM (Metal Injection Molding), a mature and proven production technology for metal parts since the beginning of 90's.



1. **17-4PH (EN 1.4542)**

A versatile stainless steel featuring substantial mechanical properties (ultimate tensile strength 1042MPa) and hardness (HRC 37). 17-4PH can be furthermore through hardened (up to 48HRC) and also plasma nitride.

2. **316L**

Characterized by its corrosion resistance and performance at both high and low temperatures, 316L is a fully austenitic stainless steel. It is used often in applications involving chemical processing, salt water environments, and household or industrial fixtures.

3. **H13**

It is a chromium hot-work steel, which is widely used in hot and cold work tooling applications. Due to its excellent combination of high toughness and fatigue resistance. H13 is used more than any other tool steel in tooling applications. H13 can be through hardened up to HRC 56.

4. **AISI 4140**

One of the most versatile carbon steels. It is characterized by its toughness, high fatigue strength, and abrasion and impact resistance, making it a great all-purpose steel for industrial applications.





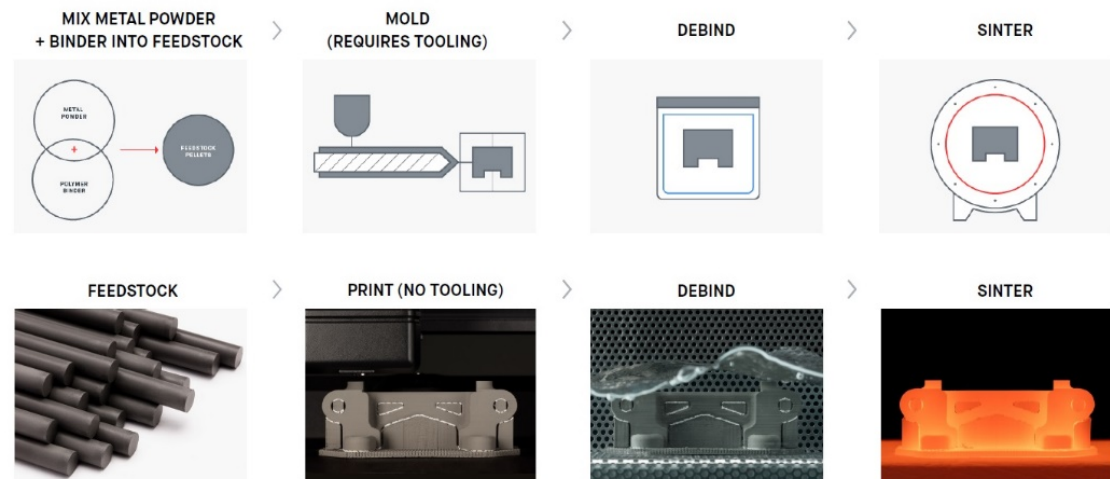
# Printing Technology – BMD process ancestor: Metal Injection Molding

Metal 3D printing “Bound Metal Deposition” method has been inherited from Metal Injection Molding (MIM).

MIM produces metal components in three steps. Initially a mixture of metal powder with a thermoplastic binder is injected in a mold in a process similar to injection molding. From this stage we get the so called “**green body**” of the part.

In a subsequent step, the binder is removed, leading to a brittle part known as “brown body”. Finally the “brown body” is sintered and the final sound metal part is produced.

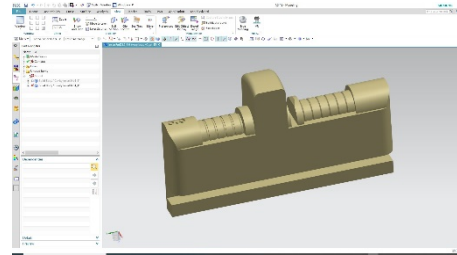
## MIM vs. Bound Metal Deposition™ (with the Studio System™)



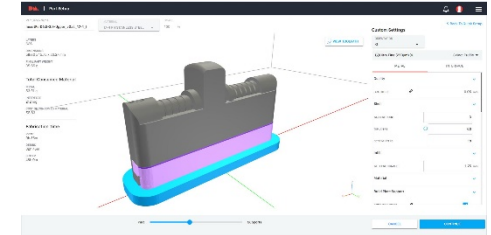


## Bound Metal Deposition

BMD shares the same stages with MIM, with only a major difference on the first stage. The “green body”, instead of being molded, **it is built by a 3D printer**.



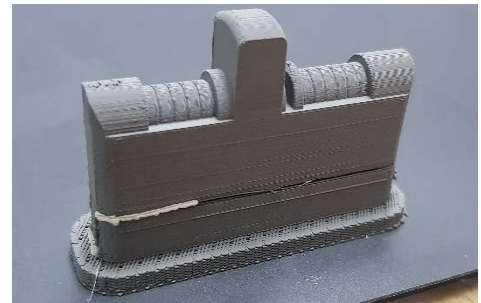
3D Computer Model



Prepared for Printing



Debinded ("brown") parts



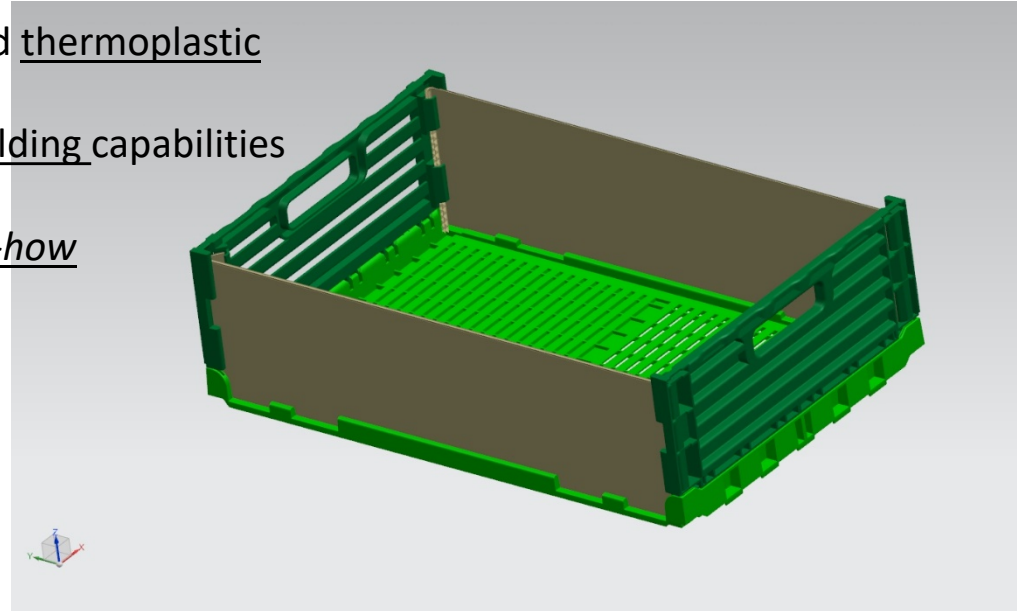
Printed ("Green") Part



Final sintered metal component

We had also combined:

- our *deep knowledge* in mold design and thermoplastic materials,
- the mold construction and injection molding capabilities of N. Bazigos SA, and
- Our 3D Printing Technologies and know-how

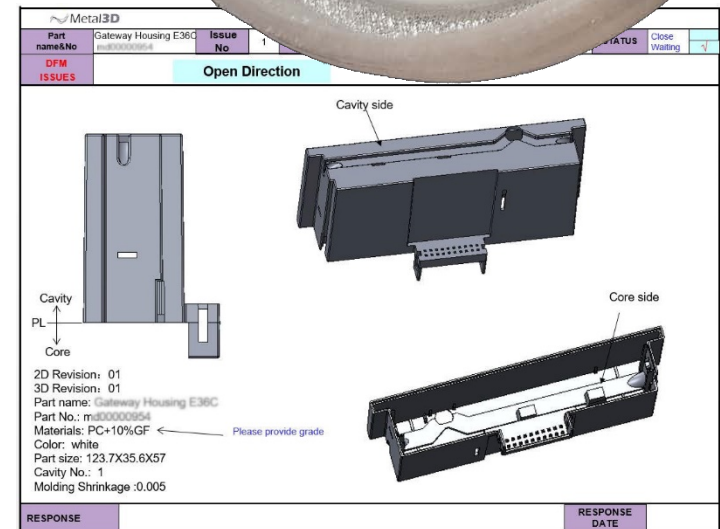
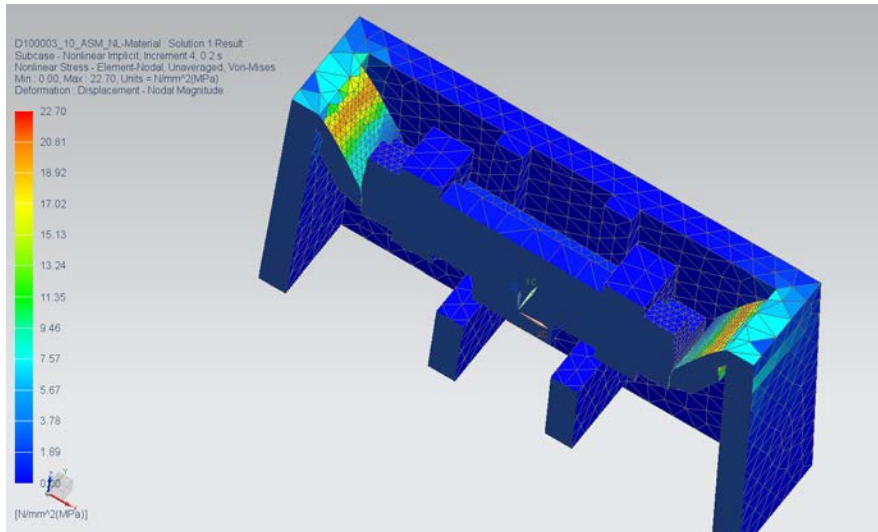


To offer special services in the field of **injection molding**, in the following areas:

- Design and Prototype of injection moldings
- Soft Tools and Small Series Production
- 3D printed cavity inserts for soft and serial tools
- Inserts for serial molds incorporating Conformal Cooling Channels

## Design and Prototyping

- 3D Printed Prototypes from FDM or SLA technologies
- Part Design, Molding Evaluation, FEA Analysis
- Design for Manufacturing (DfM)





## Injection Molding. Soft Tools and Small Series Production.

- Mold Design
- Optimum combination of:
  - State-of-the-art traditional moldmaking techniques
  - Additive Manufacturing Techniques (i.e. Metal and Plastic 3D Printing of mold components)
- Mold Bases for interchangeable cavities
- Small Series Production by Standard Injection Molding





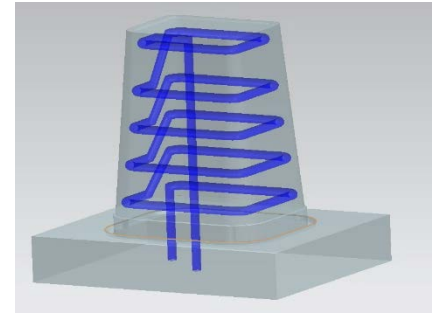
## Injection Molding. 3D printed cavity inserts for soft and serial tools.

To improve delivery time, we can also 3D print inserts for injection molding tools. Metal inserts can be either printed from 17-4PH Stainless Steel or from H13 mold steel. Through hardening and surface hardening is possible for both steels.



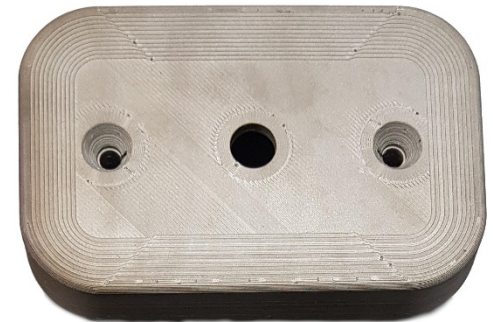
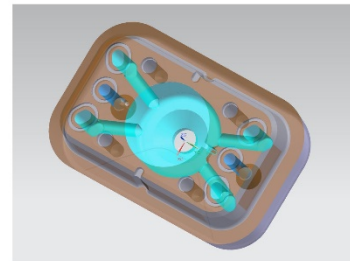
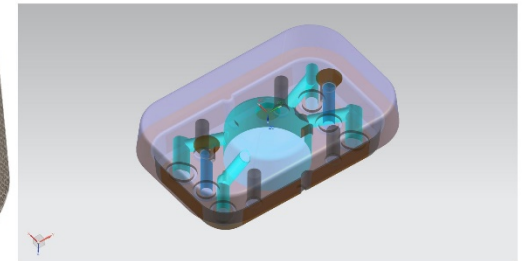
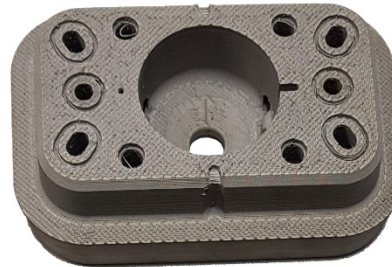
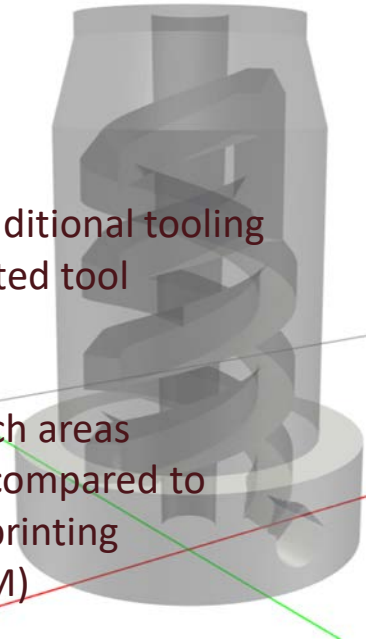
## Injection Molding. Inserts for serial molds incorporating Conformal Cooling Channels.

We deliver the printed inserts as workpieces for final finishing by our customers,  
In cooperation with N. Bazigos SA, we can deliver the finished inserts ready for assembly into the mold.



### Advantages:

- Fast tool construction
- Fast amortization of additional tooling costs, due to the elevated tool productivity
- Improved part quality
- Cooling of hard-to-reach areas
- Substantially cheaper compared to competitive metal 3d printing technologies (like DSLM)





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