Add+it

your addictive manufacturing partner

Kilometro Rosso innovation district

Industry 4.0

The new 3D industrial revolution

Surely you have no doubts about the importance for your company of being in tune with the evolution of technologies; the resources, the attention, the energies that you and your collaborators devote to research and development are an evident sign of this. But are you sure you really know what's going to change in industrial processes with the advent of new additive manufacturing technologies?

More than just an innovation in production methods, more than just a new technology with which the large automotive industrial groups are already experiencing, the era of industrial additive manufacturing will be a real radical change for the entire metalworking industry. many business processes.

It will be a profound change due to the multiple implications within companies and in relations with all economic operators, but at the same time a rapid change because those who are the first to be ready to reap all the benefits will find themselves with an important competitive advantage and destined to grow .

In this scenario that is near to come, the balance of the manufacturing world as we know it will soon be subverted.

Additive Italia

Technological partnership

Additive Italia with its technological partnerships proposes itself as the **interlocutor to start the process of integration of the industrial additive manufacturing** using:

- generative design
- topology optimization
- FEA analysis

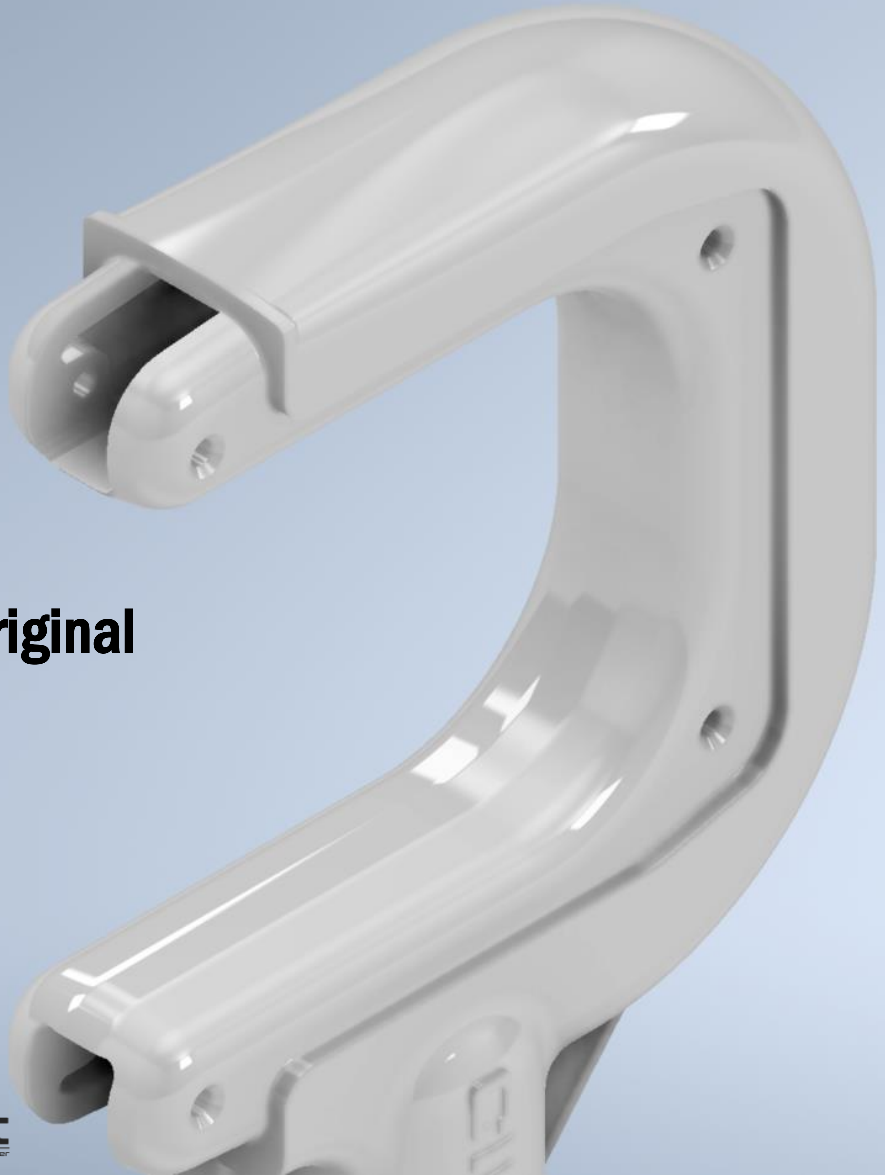
up to the validation of the projects with the creation of prototypes and pilot series thanks to the Desktop Metal ™ Studio System + ™ technology of the which we are among the first users in Europe.

https://www.desktopmetal.com/news/press-release-eu-launch/

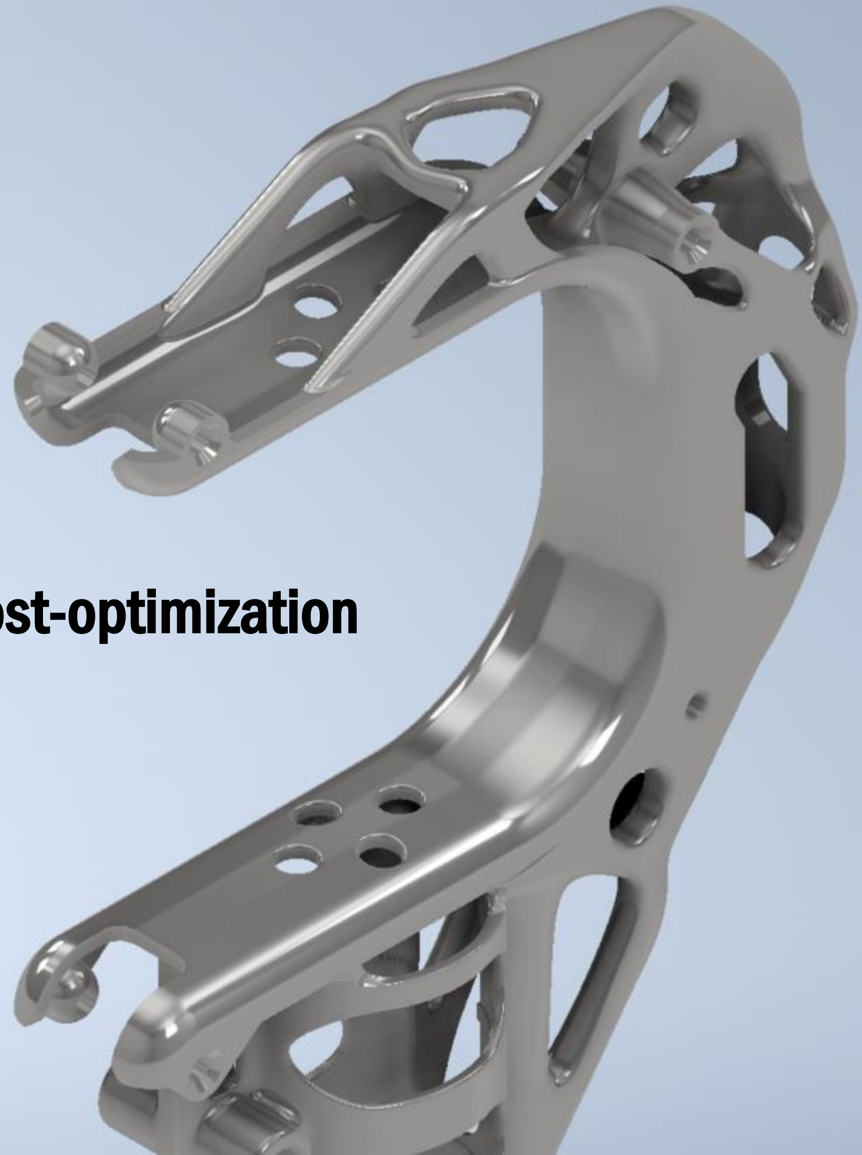
CIFARELLI

Topology optimization

Agricultural shaker hook SC800



Original

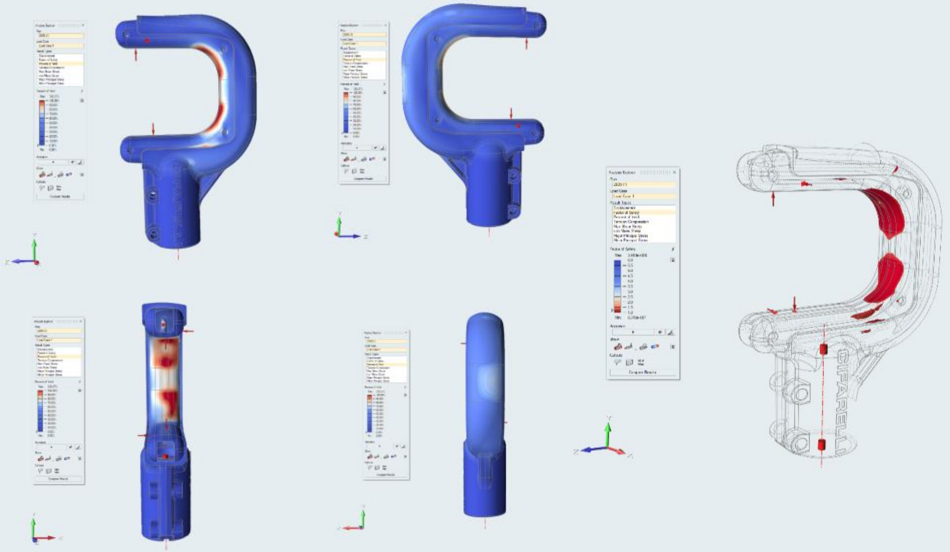


Post-optimization

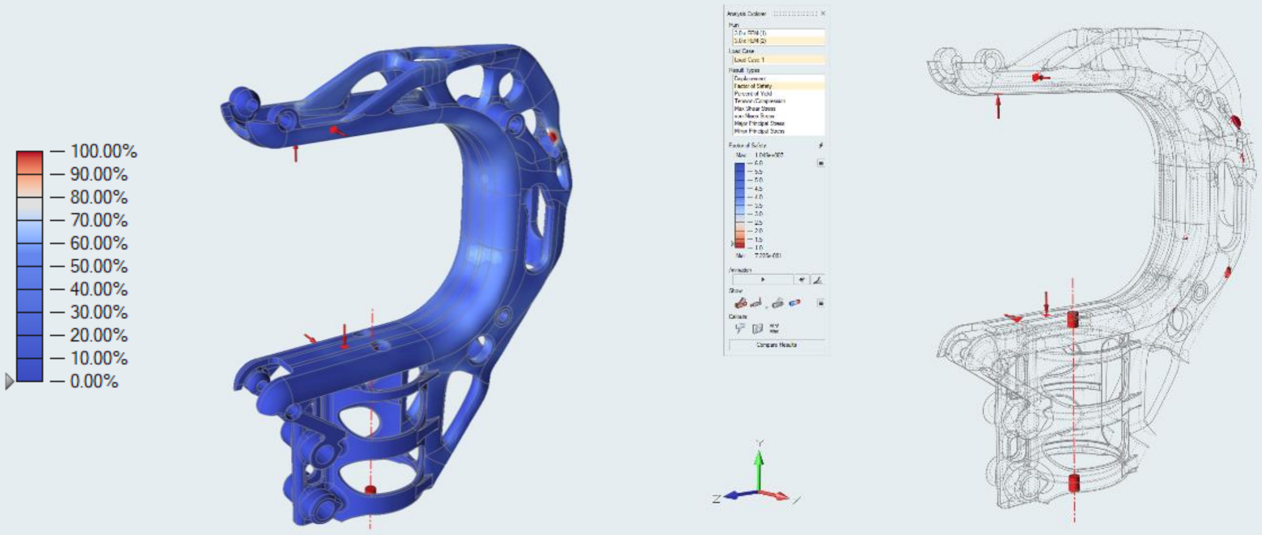
FEA analysis

Agricultural shaker hook SC800

Original



Post-optimization



Prototype validation

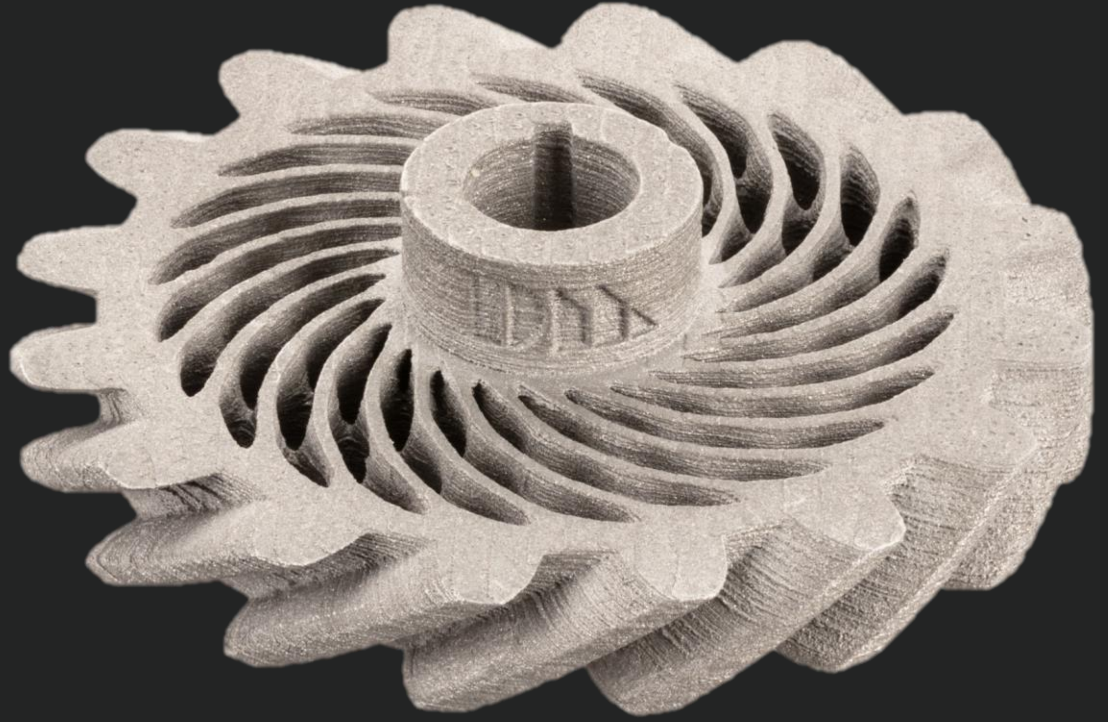
Pinion E3 Orion

Original produced by lost-wax casting

3D printed part

Metal Additive Manufacturing

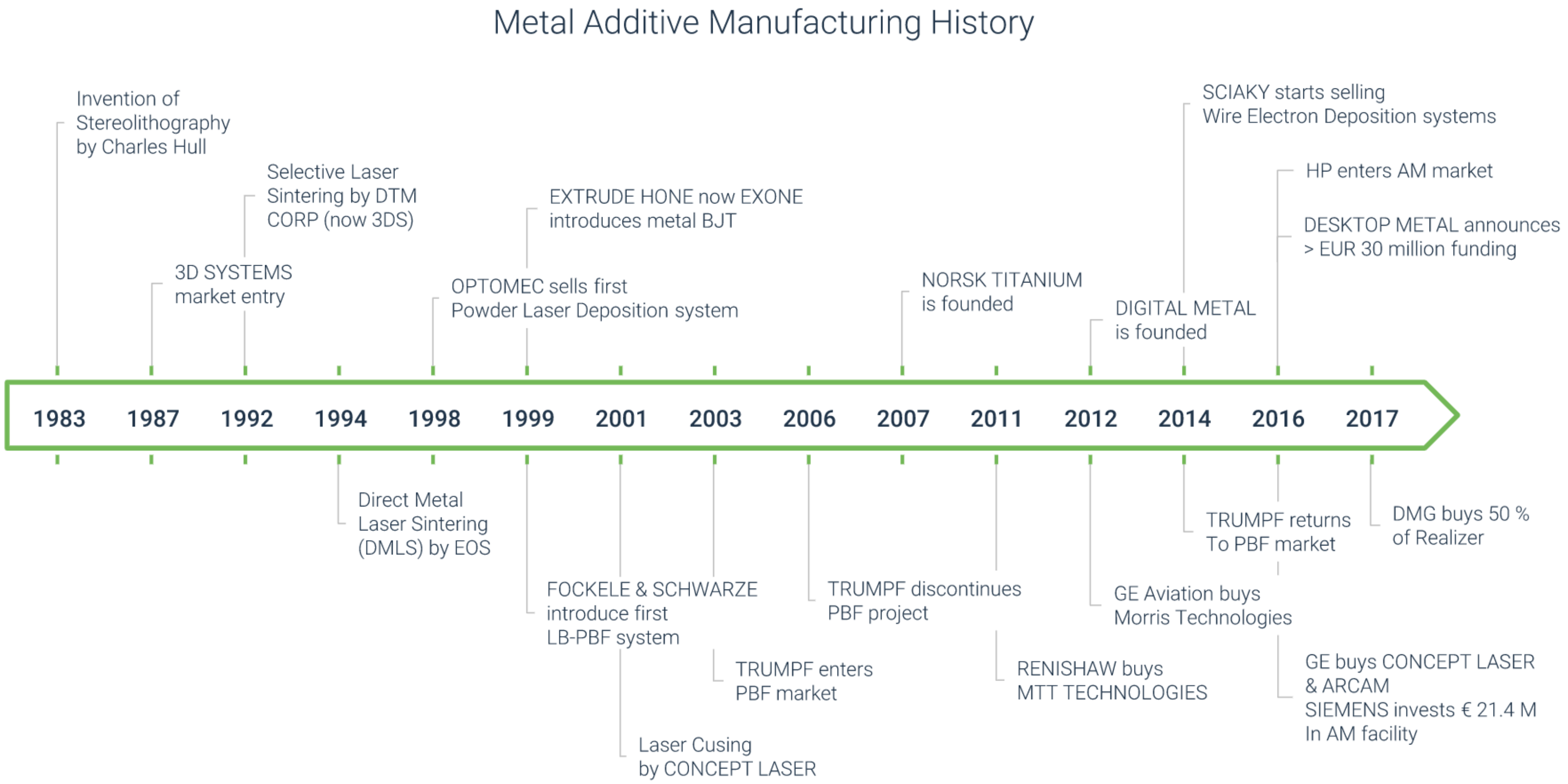
Overview of existing technologies



Metal Additive Manufacturing - MAM

Existing technologies

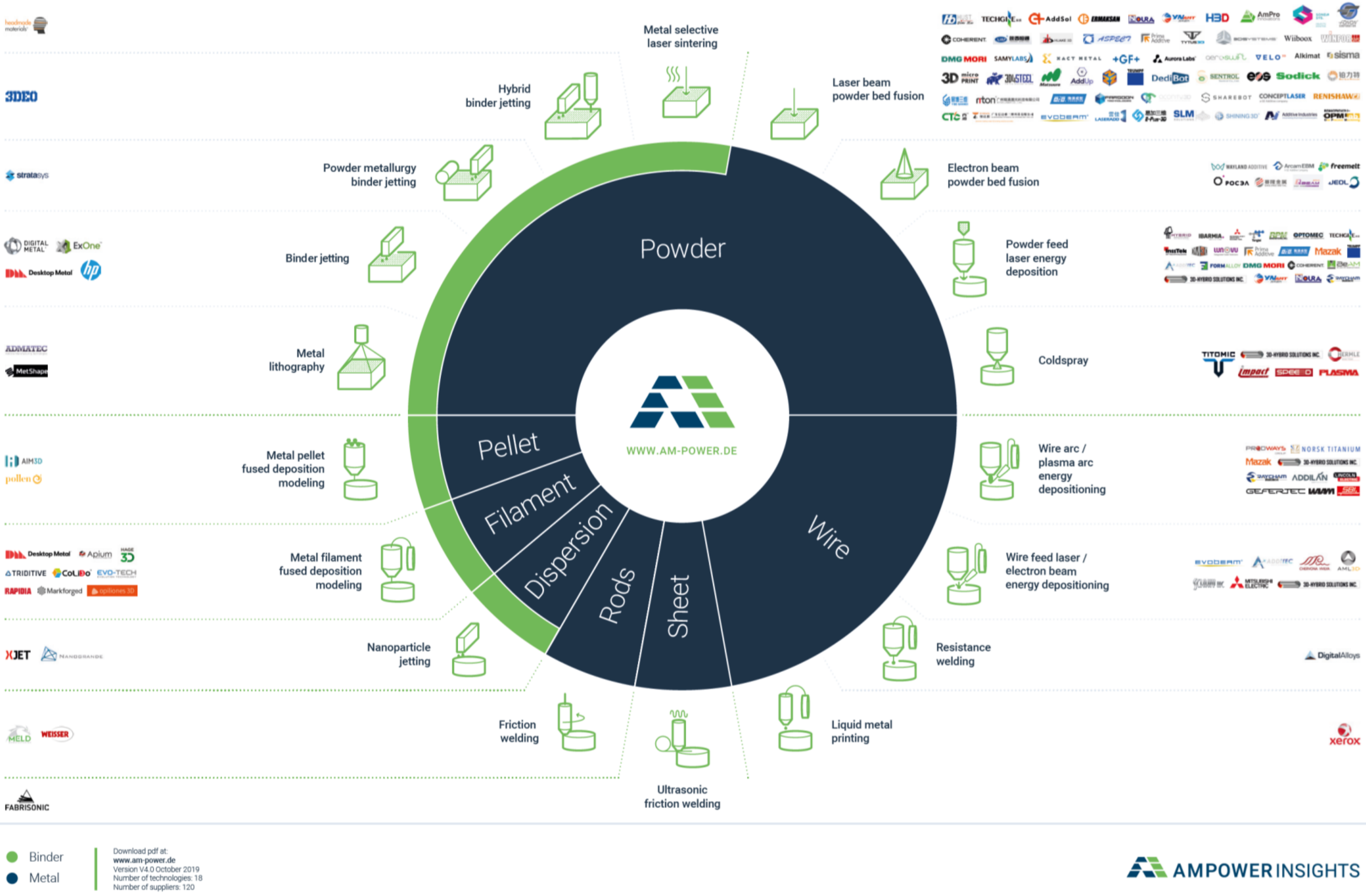
Additive manufacturing can boast a history of over 30 years. Starting primarily as a prototyping technology, in the past 5 years it has gained a huge boost for use in industrial applications, especially in the world of metallic materials.



Add+it
your additive manufacturing partner

Metal Additive Manufacturing - MAM

Existing technologies



Main processes

Melting and sintering processes

Melting

1 step: **PRINTING**

Sintering

2 step: **PRINTING + SINTERING**

Deposition method:

- Direct
- Powder bed

Source of energy:

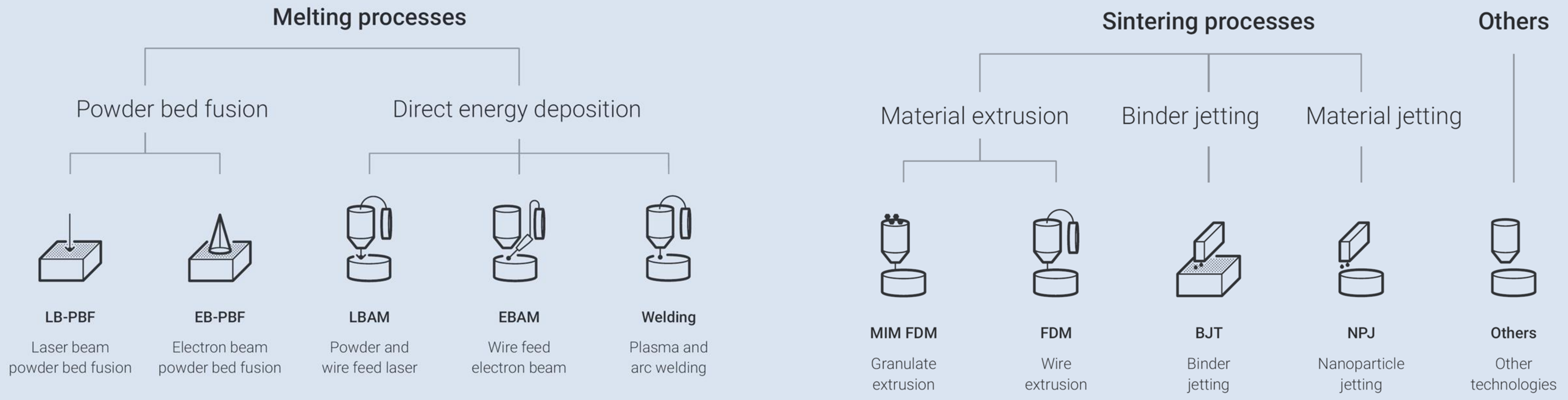
- Laser
- Electron or Plasma

Deposition method:

- Direct
- Powder bed

Feedstock:

- Powder
- Rod/Wire

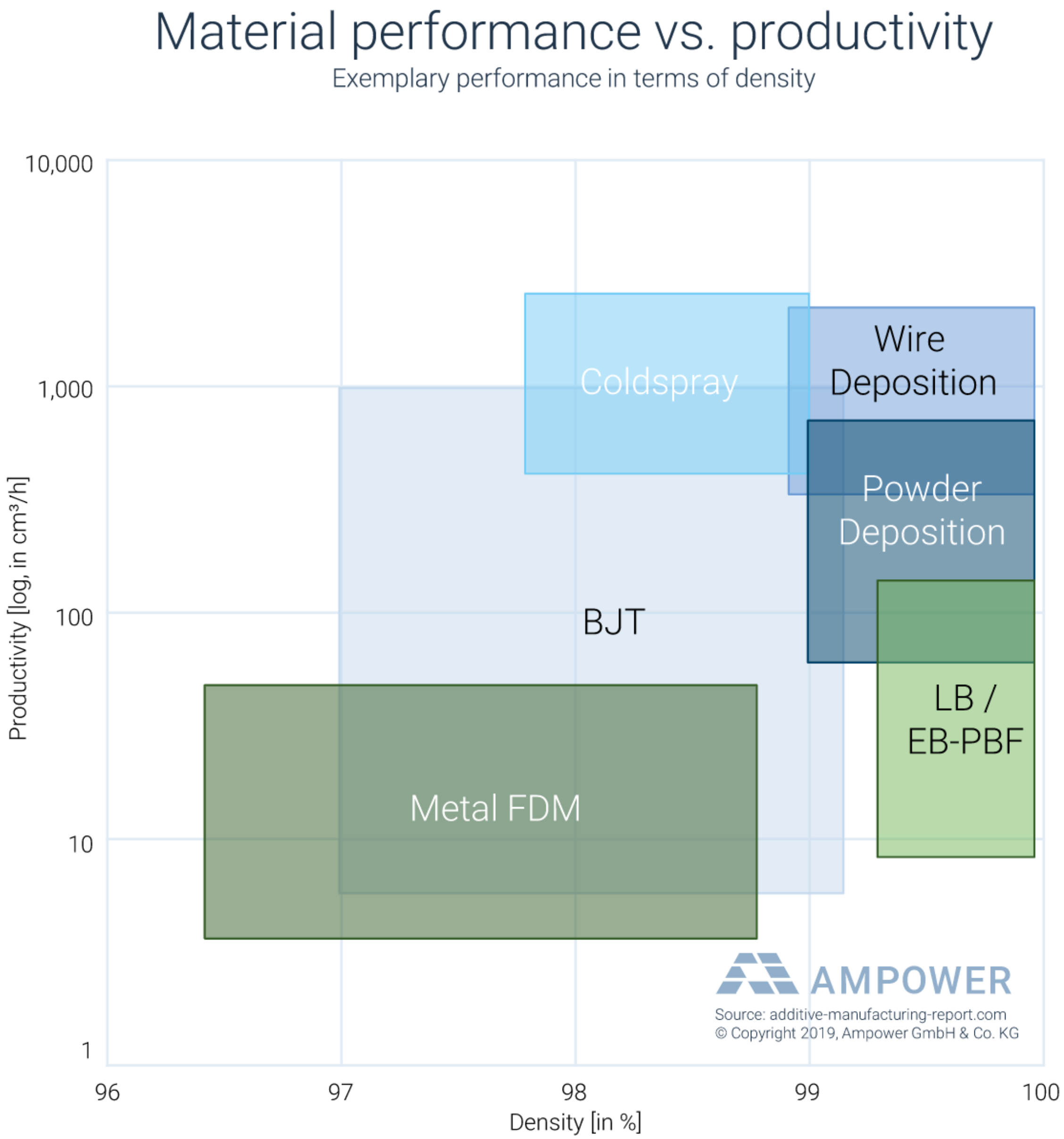


Industrial approach
The future of sintering technologies

For industrial metal applications, the currently most dominant and consolidated process is that based on powder bed fusion by laser beam or commonly called:

Selective Laser Melting – SLM

However, with the introduction of AM technologies based on sintering, such as BINDER JETTING (BJT) or Metal FDM, this domain could change.



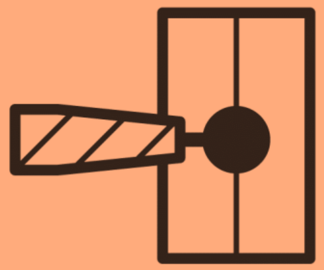
Approccio industriale

Additive manufacturing base on sintering, why?

Additive technologies based on sintering processes refer to a metallurgical process known and well established over the years.

Metal Injection Molding

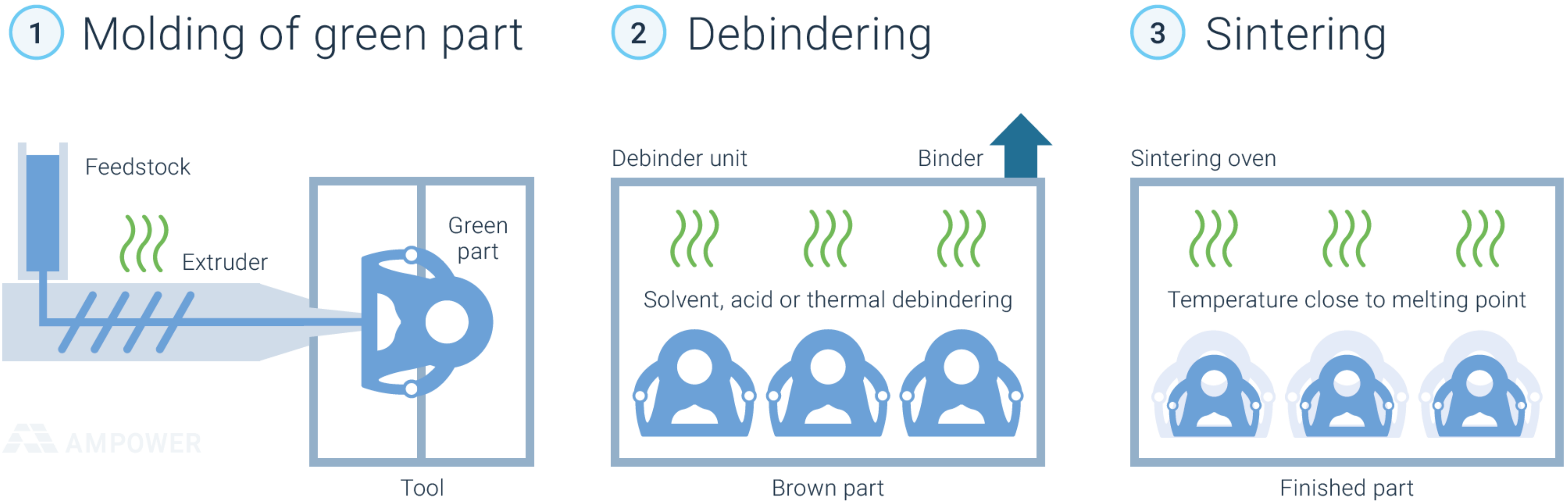
MIM



MIM

Industrial approach

The **MIM** process is based on three steps:



The new AM technologies differ only in the first step: **PRINTING**

The formation of the *green* part uses the **layer production principle** of additive production.

Industrial approach
Which technologies?

Sintering processes

- Material extrusion
  - MIM FDM – Granulate extrusion
  - FDM – Wire extrusion
- Binder jetting
  - BJT – Binder jetting
- Material jetting
  - NPJ – Nanoparticle jetting

MIM FDM	FDM	BJT	NPJ
Granulate extrusion	Wire extrusion	Binder jetting	Nanoparticle jetting

Industrial approach

R&D Prototyping
Metal FDM

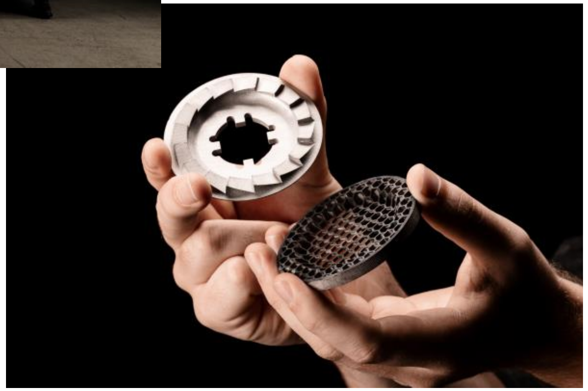
Metal FDM

Industrial Production
Binder Jetting

BJT

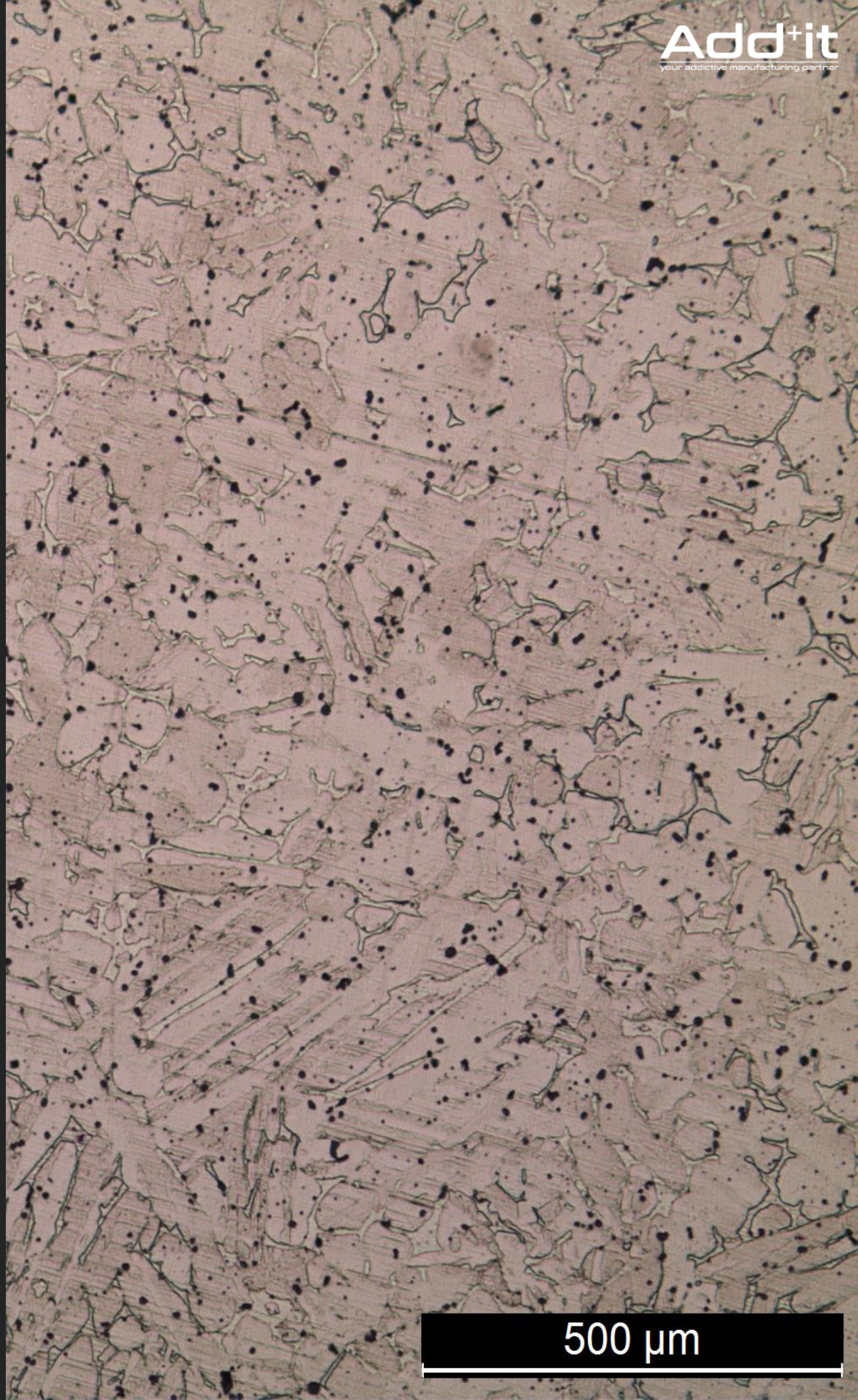
Desktop Metal - Studio System+

Desktop Metal - Shop System and Production System

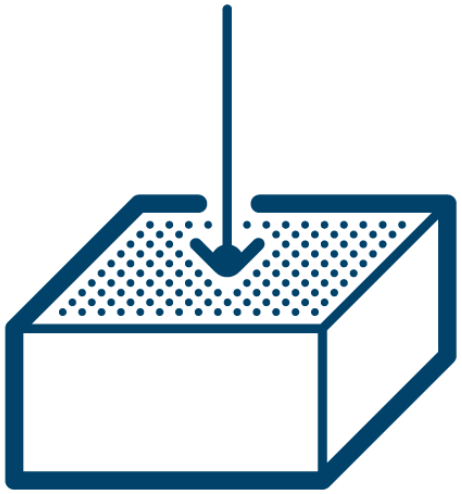


Metal Additive Manufacturing Materials

New scenarios



Materials
New scenarios



LB-PBF

Availability and performance of materials are a key factor for new AM applications.

At the moment only **LB-PBF** technology offers a wide range of metallic materials with alloys based on aluminum, titanium, nickel, steel and precious metals, as well as other developing materials such as magnesium.

Materials

High quality MIM alloys

The adoption of the technologies based on sintered materials brings with it new benefits such as the introduction of new classes of materials that cannot be processed until now.

In principle, all MIM alloys can be used for sintering based AM technologies. Especially new materials such as pure copper and some carbides are interesting candidates for future applications, since they currently have some limitations with LBPBF technologies.

Reduction of costs

Technologies based on sintering allow the use of low-cost metal powders in the MIM sector, opening up an ecosystem of high-quality alloys with a mature supply chain and well-studied process controls.

Materials

Compatibility with reactive metals

The inert process atmosphere of the system ensures maximum safety and quality by controlling the oxygen content within the process, making it possible to print with reactive metals such as aluminum, titanium and other high-performance alloys.

13	26,982
Al	
Aluminium	

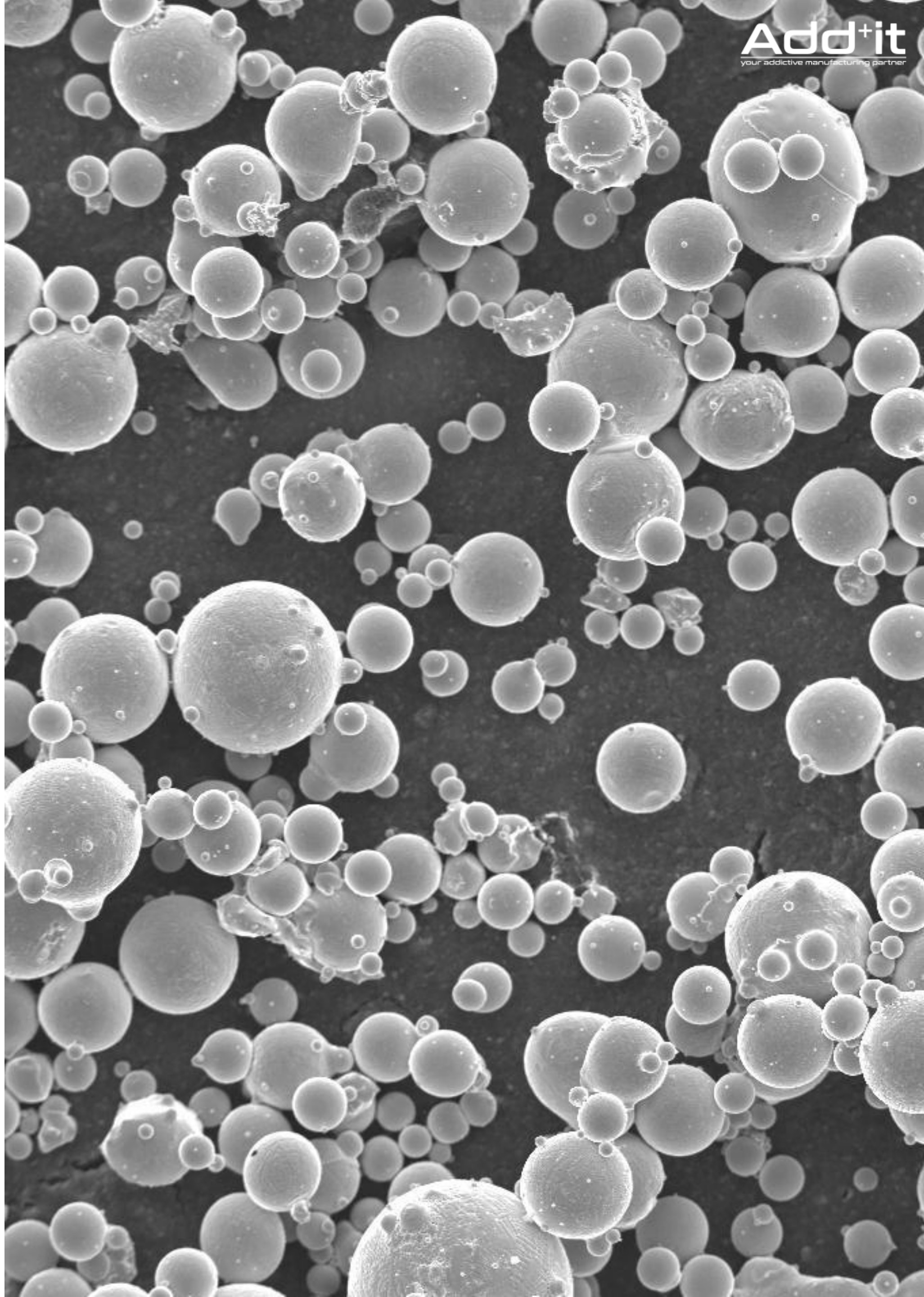
22	47,867
Ti	
Titanium	

Materials

Open platform - development of customized alloys

- Manufacturers can purchase metal powders directly from suppliers and manually adjust key process parameters, modifying them to meet specific needs. This allows for greater quality control as well as control over their supply chain.

- Possibility by the Desktop Metal research team to develop new materials upon customer request, specially designed for FDM and BJT technologies.



Materials
New scenarios

To date, the materials available for Desktop Metal FDM technology are:

- **Stainless steel: 17-4PH, 316L**
- **H13 tool steel**
- **4140**

Coming in 2020:

- **Alloy 625 (Inconel)**
- **Pure copper**


316L stainless steel


17-4 stainless steel


H13 tool steel


Alloy 625


AISI 4140

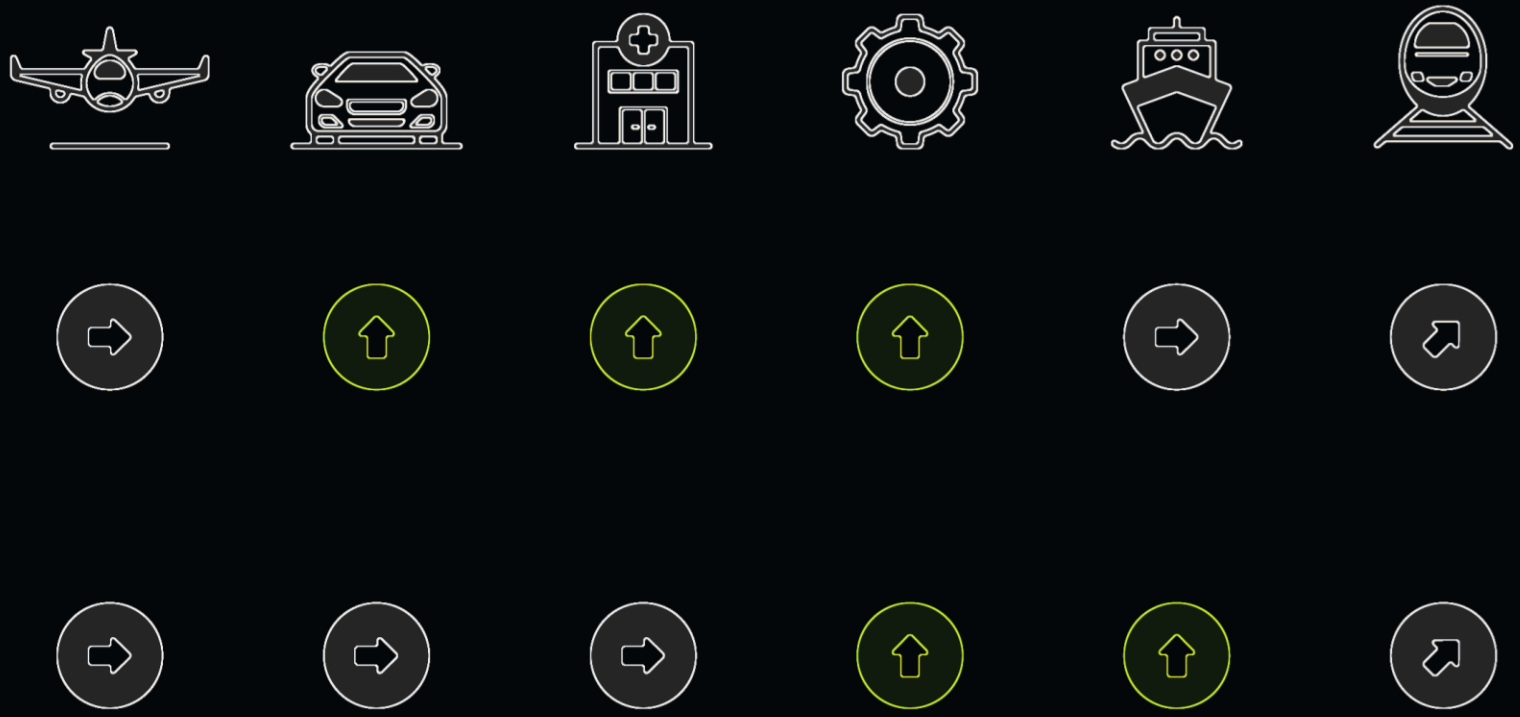

Copper

Materials
In development phase for BJT

- **Alloy Steel:** 4140 (Chrome Moly) 4605 (FN02)
- **Aluminium:** 2024 - 6061
- **Carbide:** WC-3Co
- **Copper:** Copper - Bronze
- **Heavy Alloy:** Tungsten Heavy Alloy - Veloxint® HardMetal
- **Low Expansion:** CarTech Invar 36® - CarTech Kovar®
- **Super Alloy:** CarTech® 625 - Cobalt Chrome F75 - Hastelloy® X - MP35N (Ni Co Cr Mo)

- **Stainless Steel:** 15-5 (PH) - 303 (Austenitic) - 316L Duplex - 410 (Martensitic) - 420 (Martensitic) - 430 (Ferritic) - 440 (Martensitic) - HK30Nb - Nitronic19 (Duplex) - CarTech BioDur® 108
- **Magnetics:** CarTech Hiperco 50®
- **High Performance Steel:** Maraging Steel 18Ni300 - Veloxint Stainless
- **Titanium:** Ti64 – commercially pure Ti
- **Tool Steel:** A2 – D2 – M2 – S7
- **Basf:** Catamold

Materials
Application fields



Binder Jetting


BJT

Metal FDM


Metal FDM

3D printing technology

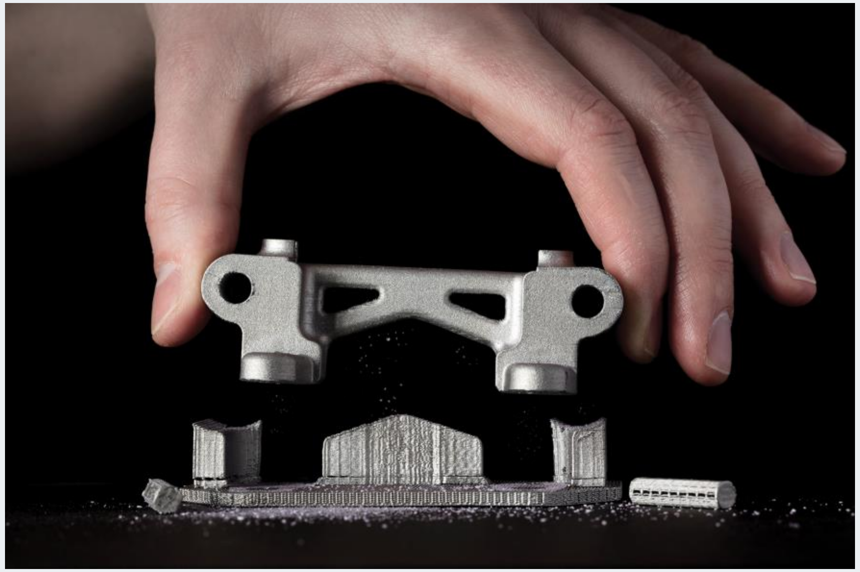
Studio System+ by Desktop Metal™

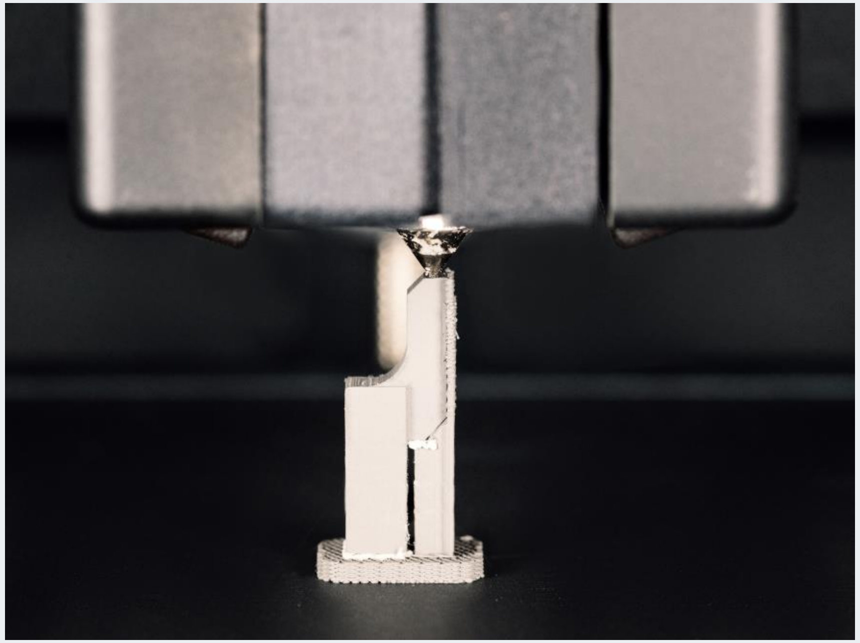
R&D Prototyping

Metal FDM

BOUND METAL DEPOSITION – (BMD)
Metal FDM 3D printer

Desktop Metal

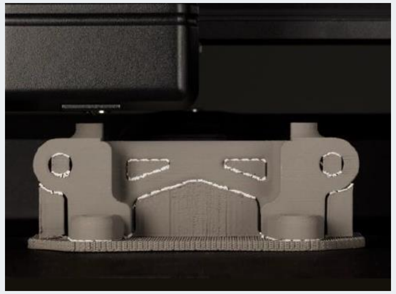




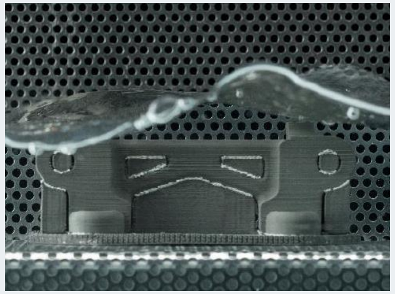
3D printing technology
Studio System⁺ by Desktop Metal™

Feedstock

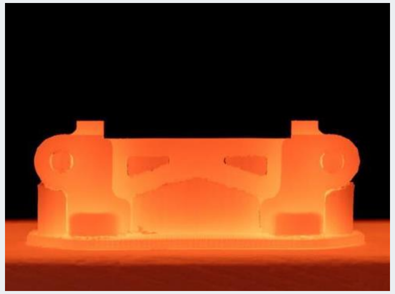
Print (no tooling)



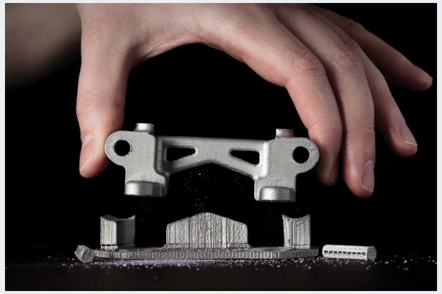
Debind



Sinter



Manual support removal



Metal FDM 3D printer

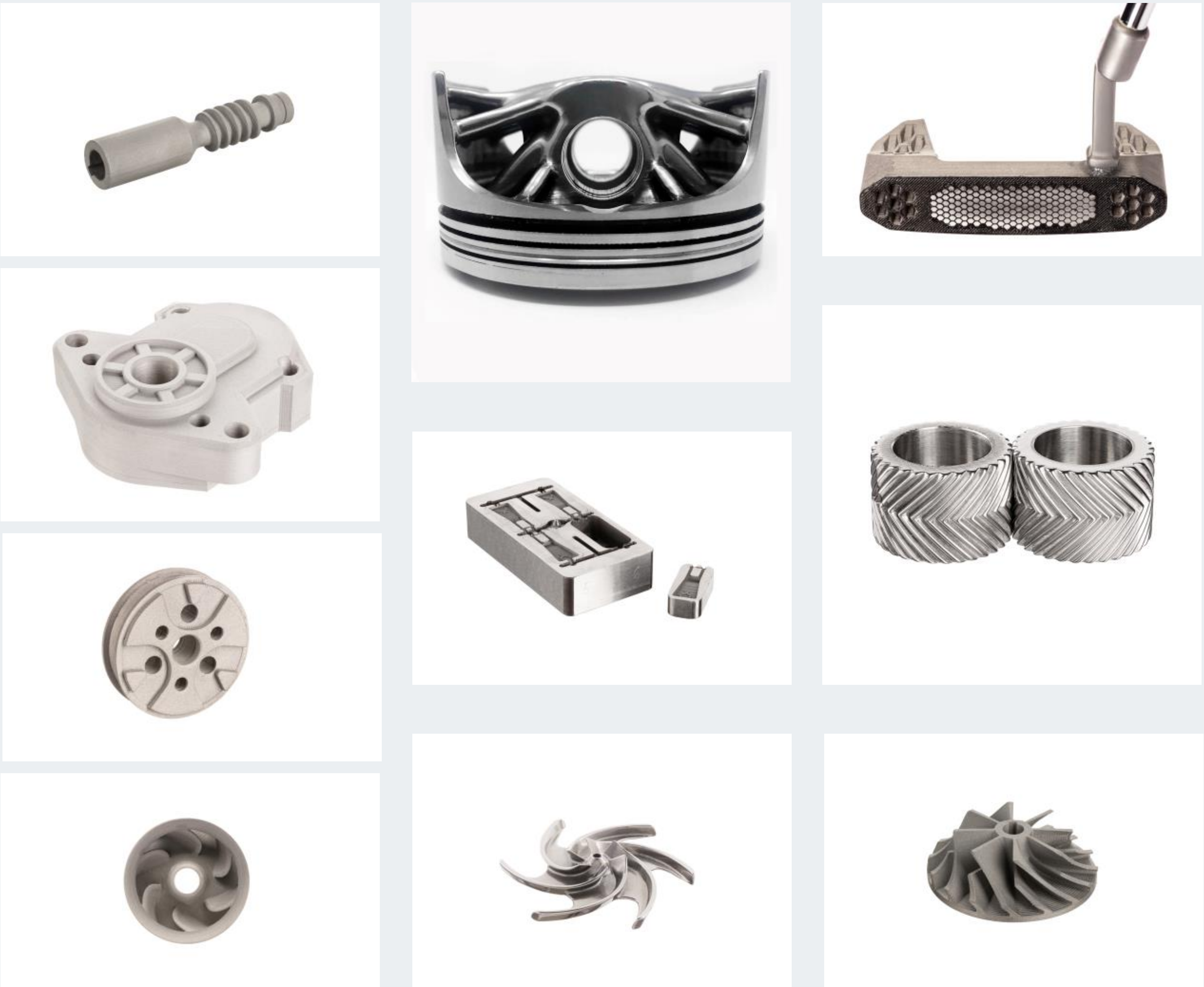
Debinder

Sintering furnace

The promise of metal 3D printing

Studio System+ by Desktop Metal™

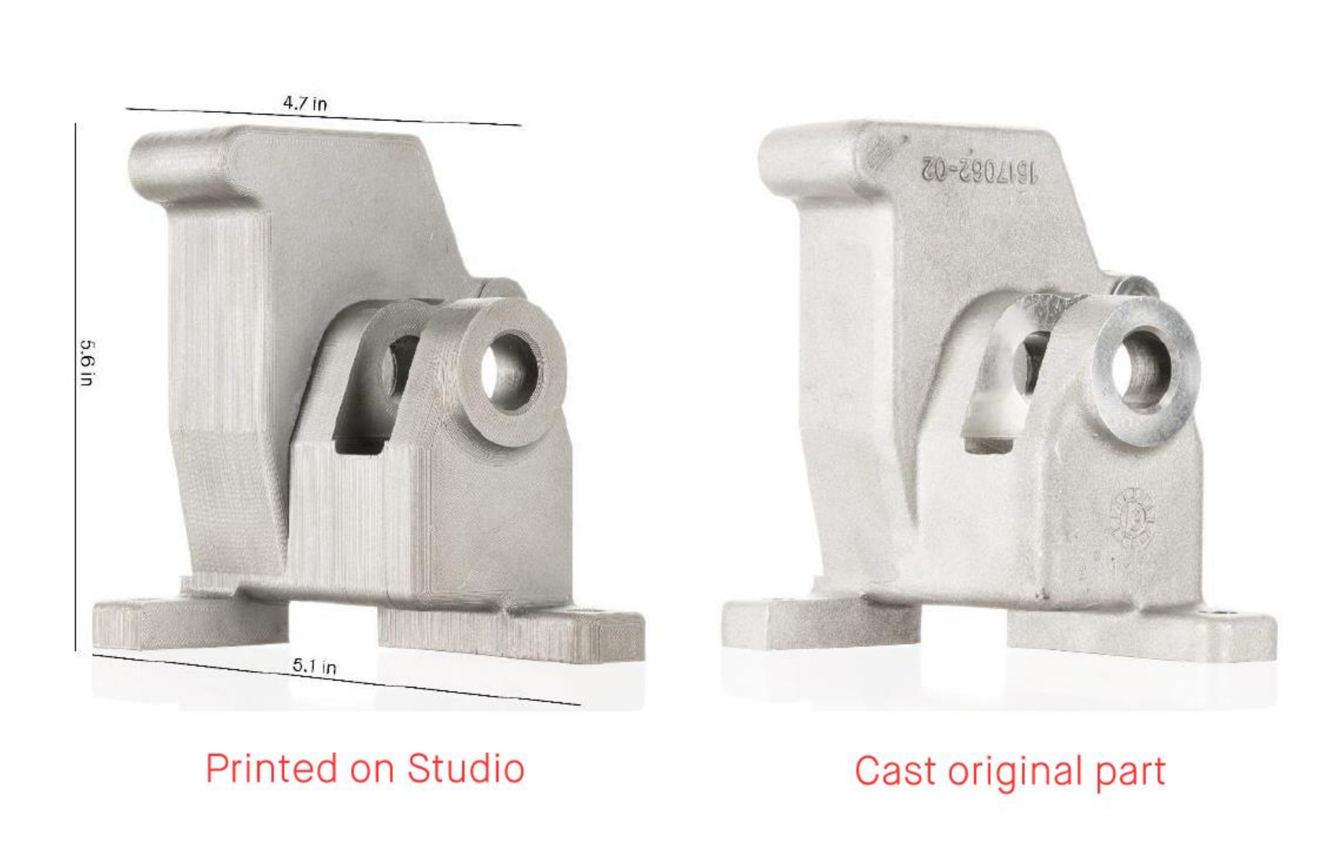
- RAPID PROTOTYPING
- PART CONSOLIDATION
- COMPLEX GEOMETRIES
- DESIGN CUSTOMIZATION
- RAPID TOOLING
- ON-DEMAND MANUFACTURING
- SUPPLY CHAIN RE-ENGINEERING



The promise of metal 3D printing

Studio System+ by Desktop Metal™

- **BUILD VOLUME : 300x200x200mm**
- **RESOLUTION: accuracy and surface finish similar to casting**
- **Dimensional capabilities to +- 0.8%**
- **Critical dimensions can be achieved via post-processing (e.g. CNC, EDM, grinding, etc.)**
- **Fully compatible with traditional finishing operations (tumbling. Media blasting, plating, etc.), welding, heat treating, etc.**



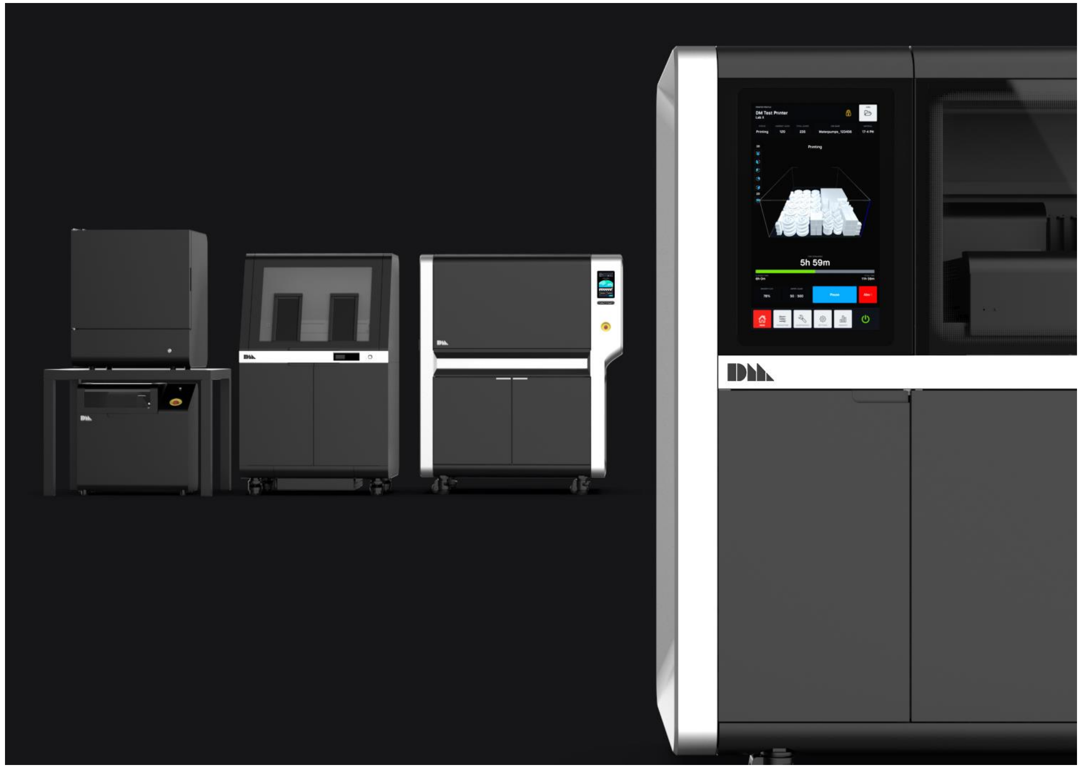
So... what about mass production?

Waiting for the industrial production systems already booked in 2017 and scheduled for installation in 2021, there is a fast train leaving and it will not make stops, it is a good time to choose Additive Italia as a travel companion. Take the opportunity to get to know us, open your company's doors today to the great growth and innovation opportunities of industrial additive manufacturing so as not to chase them tomorrow.

Binder Jetting technology

Industrial-mass production system 2021

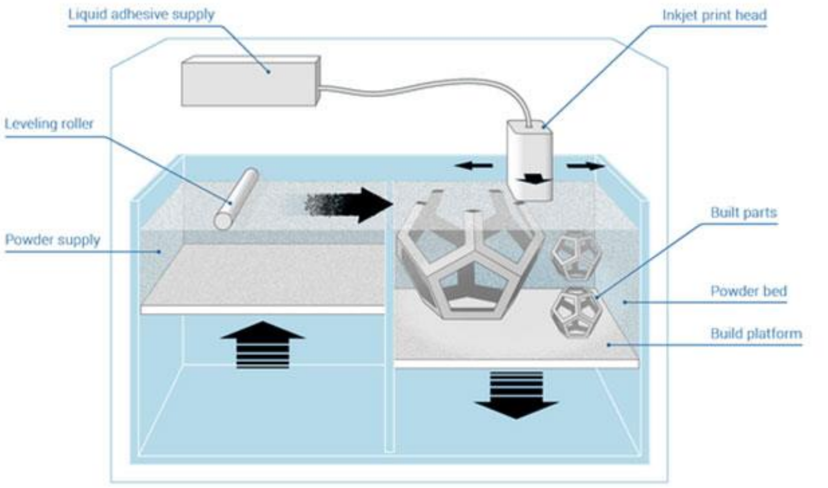
Shop System™



Production System™

Binder Jetting technology

Industrial-mass production system 2021



The Binder Jetting process as illustrated above | Credits: Additively

PRINT - for each layer, the printer spreads metal powder across the build bed, and precisely jets a binding agent to bond loose powder and define part geometry. Layer by layer, metal powder and binder is deposited until the entire build volume is packed with bound parts and surrounding loose powder.

DEPOWDER - once an entire build is complete, the build box is removed and placed in a powder station for bulk and fine depowdering with the help of a hand-held air pick. Loose powder is removed from the parts and recovered via a built-in powder recycling system with powder sieving.

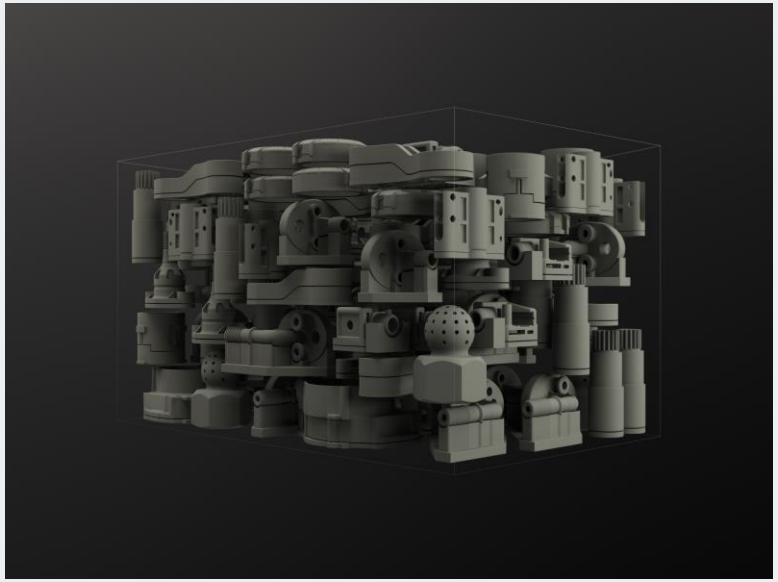
SINTER - depowdered parts are placed onto trays in a shop-safe, high-throughput furnace for batch sintering. With an external gas hookup, temperatures reaching 1400ºC, and the ability to process high-strength binders, the system furnace is able to deliver quality and reliable sintering in a shop-friendly format.

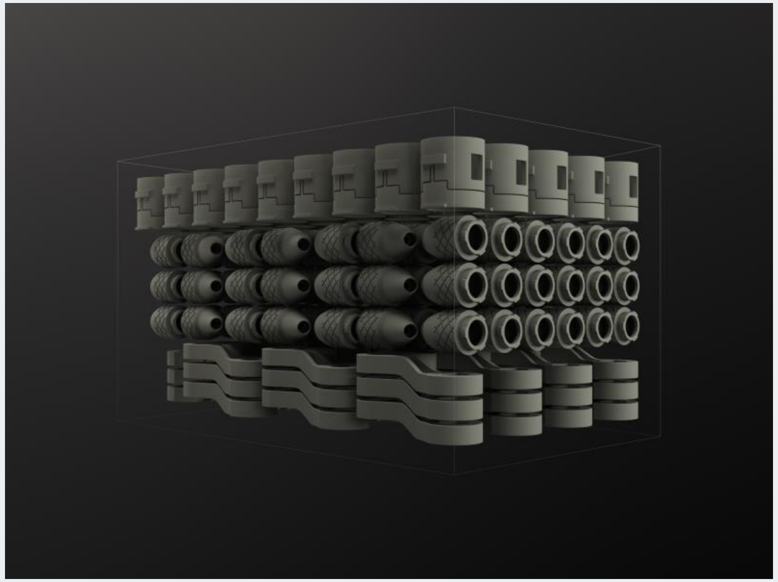
Binder Jetting technology

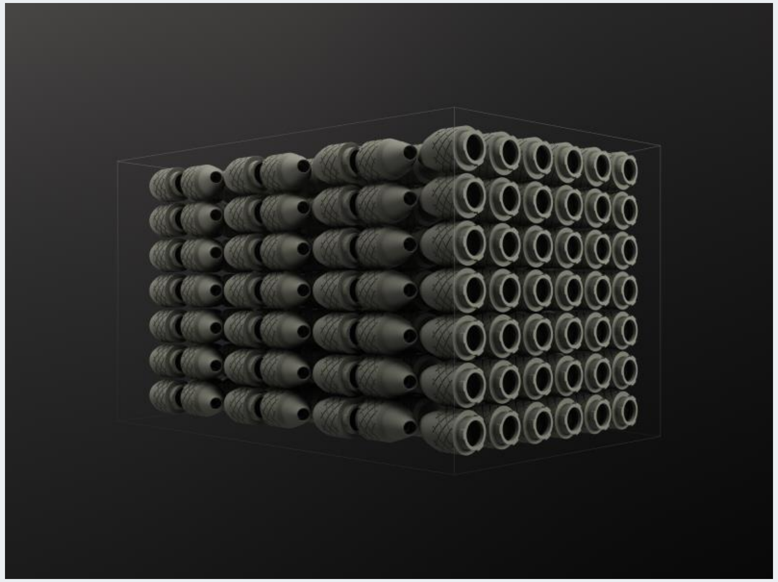
Industrial-mass production system 2021

Produce various part geometries simultaneously without the need for multiple setups.

Produce hundreds of near-net-shape parts every day with dramatically reduced labor costs and expanded geometric flexibility.





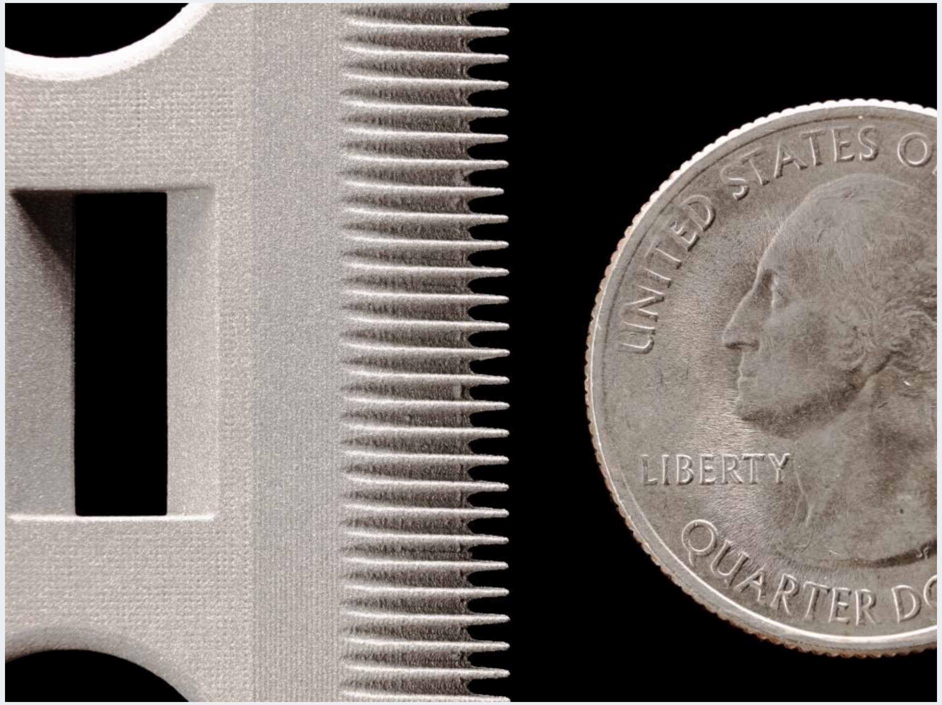


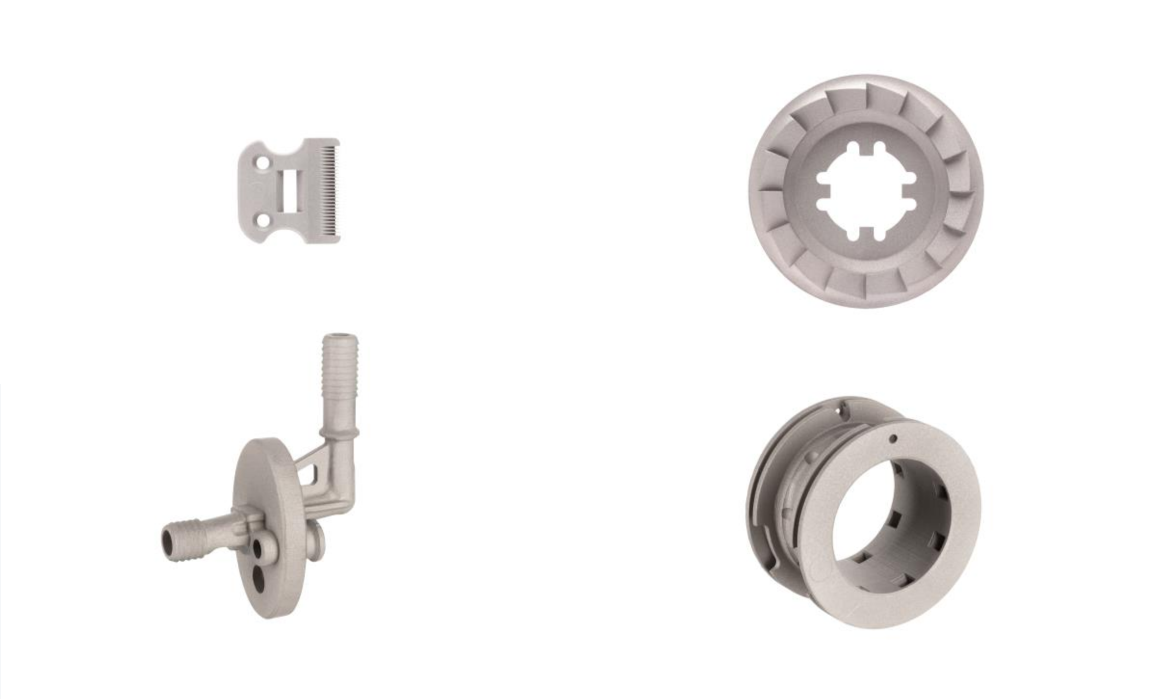
Binder Jetting technology

Industrial-mass production system 2021

Near-net shape parts

Print customer-ready, high-resolution parts with incredibly fine feature detail. Achieve surface finishes as low as 2-3µm Ra out of the furnace, and <0.1µm Ra with mass finishing. The binder jetting system produces fully dense, solid parts, no debind or infill required.





Additive Italia srl

Your additctive manufacturing partner

resident partner at Kilometro Rosso innovation district

Additive Italia srl – via Castello Rescanzi, 5 – 24030 Almenno San Bartolomeo BG – Italy - e-mail info@add-it.tech – Web http://www.add-it.tech - PEC additiveitalia@legalmail.it capitale sociale € 10'000,00 i.v. – VAT – PI IT0429680168 – REA BG 451964