

AMPOWER IN A NUTSHELL

Based in **Hamburg**, Germany, operating **globally**

15+ fortune 500 companies trust in AMPOWER advice

Core team unites more than **85 years of experience** in Additive Manufacturing

Consultancy for Additive Manufacturing

Global network of Additive Manufacturing experts and thought leaders

More than **100** international **Projects** in Additive Manufacturing

Founded in **2017**, owned and operated **by founders**

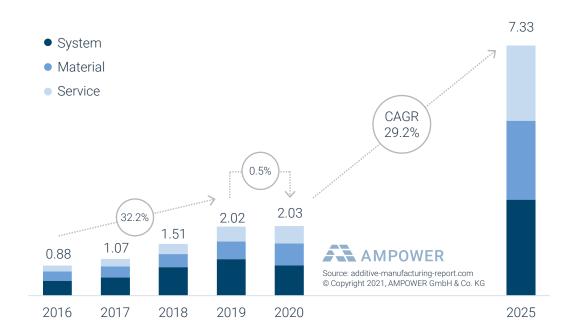
Publications with 35.000+ readers setting references in Additive Manufacturing community

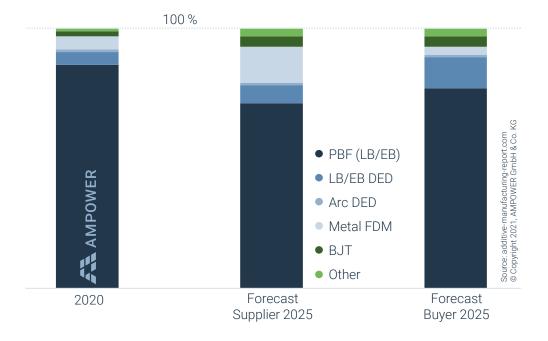


SINTER AM TECHNOLOGIES WITH ABOVE MARKET GROWTH RATES

Metal Additive Manufacturing market 2020 and supplier forecast 2025 [EUR billion]

Installed metal base by technology 2020 and supplier vs. buyer forecast 2025 [share of units]

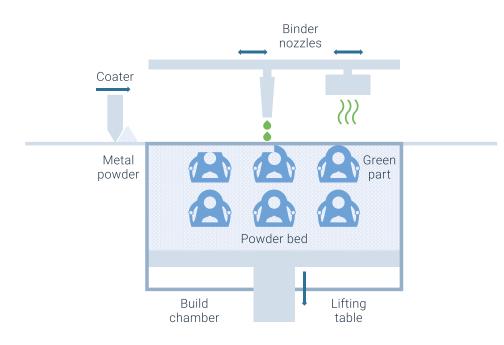




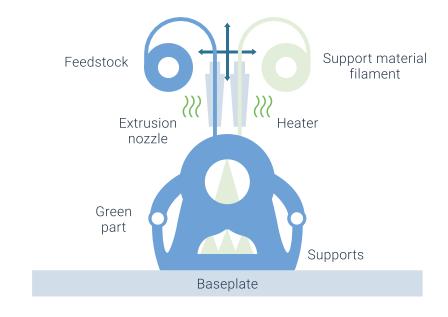


GREEN PART TECHNOLOGIES

Binder Jetting



Metal FDM/FFF





DEBIND AND SINTER PROCESS STEPS

- First stage binder
- Second stage binder
- Metal powder
- Grain intersections

First stage binder removal



Backbone binder removal



Intermediate sinter stage



Green part



Brown part



Sintered part





MATURITY OF BJT AND METAL FFF

AM Maturity Index 2020

BJT

applications

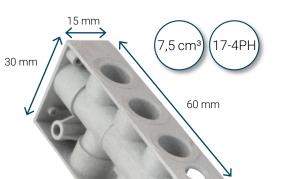
LB-PBF Widespread Time until industrial use industrial use Index reached Less than 2 years Powder Laser Deposition 2 to 5 years Industrial use Wire Electro More than 5 years Deposition EB-PBF Industrialization Index Wire Electric/ Filament FDM Plasma Arc Coldspray Deposition **Binder Jetting** First Friction Deposition Wire Laser Deposition Ultrasonic Welding Pellet FDN Resistance Weldin Prototype Powder Metallurgy Jetting Nano Particle Jetting system Liquid Metal Printing Metal Lithography Mold Slurry Deposition Metal SLS Proof of concept Technology Maturity Index Metal FDM

2 years expected until significant industrial use 10 years expected until PBF Level reached

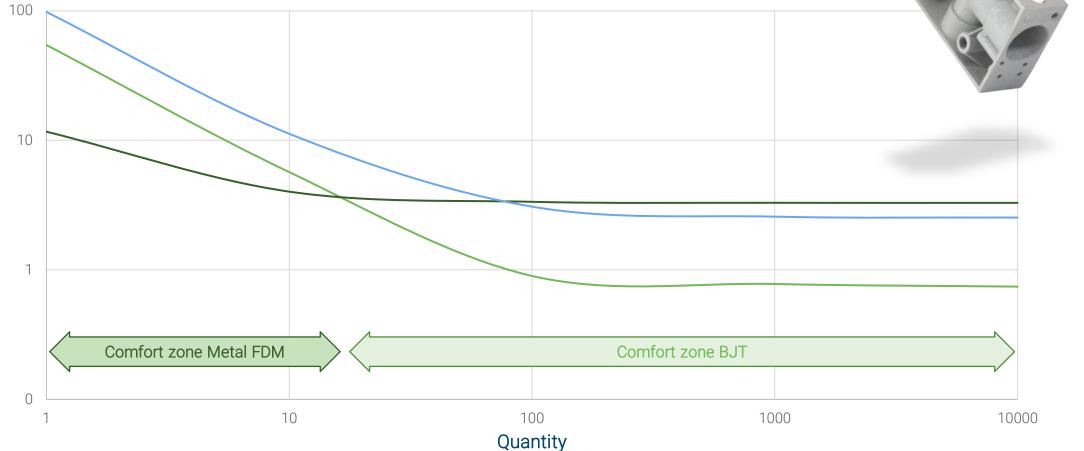


COST AS THE MAIN POTENTIAL FOR SINTER-BASED TECHNOLOGIES

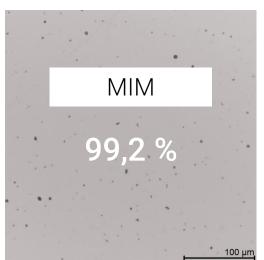
- PBF (Quad system)
- Metal FDM (OEM)
- BJT (Medium build volume)

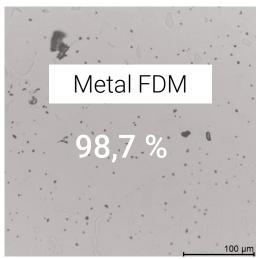


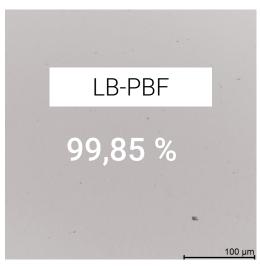
Cost per cm³

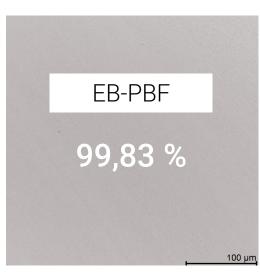


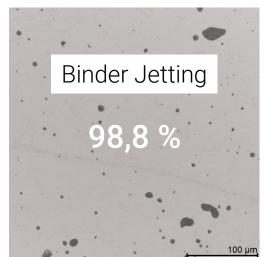
MATERIAL PROPERTIES





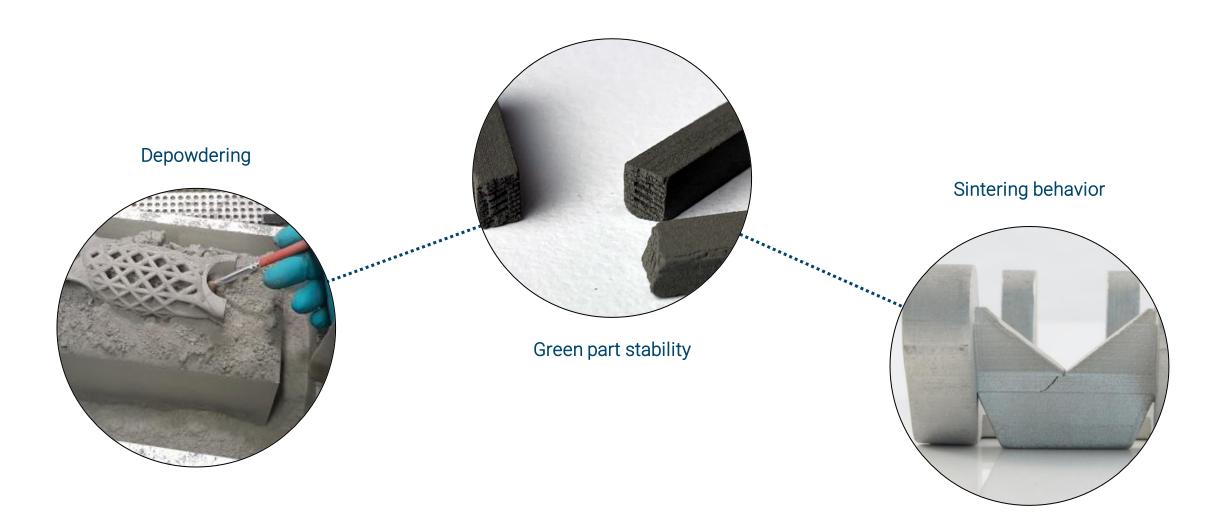






Sinter-AM technologies can achieve similar density values to metal injection molding but do not reach PBF level

CHALLENGES REMAIN





Empowering your AM business.

Thank you for your attention!

Matthias Schmidt-Lehr schmidt-lehr@am-power.de +49 159 04209421