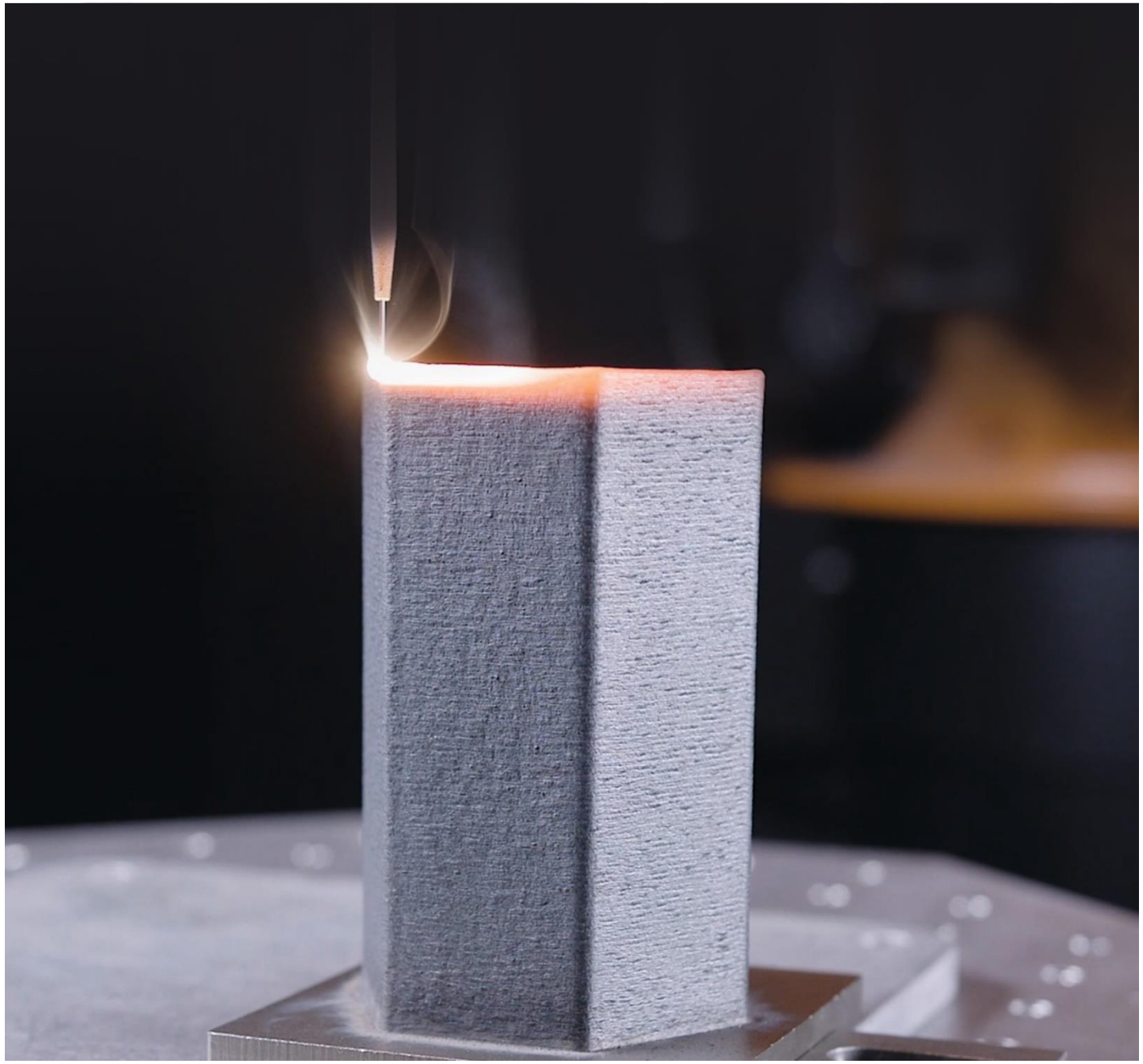
LASER-BASED ADDITIVE MANUFACTURING AND 3D PRINTING WITH WIRE INNOVATIVE SYSTEM TECHNOLOGY MAKES IT SIMPLE, FLEXIBLE AND CLEAN

Thorsten Lorenz | 26.09.2024

CONTENT



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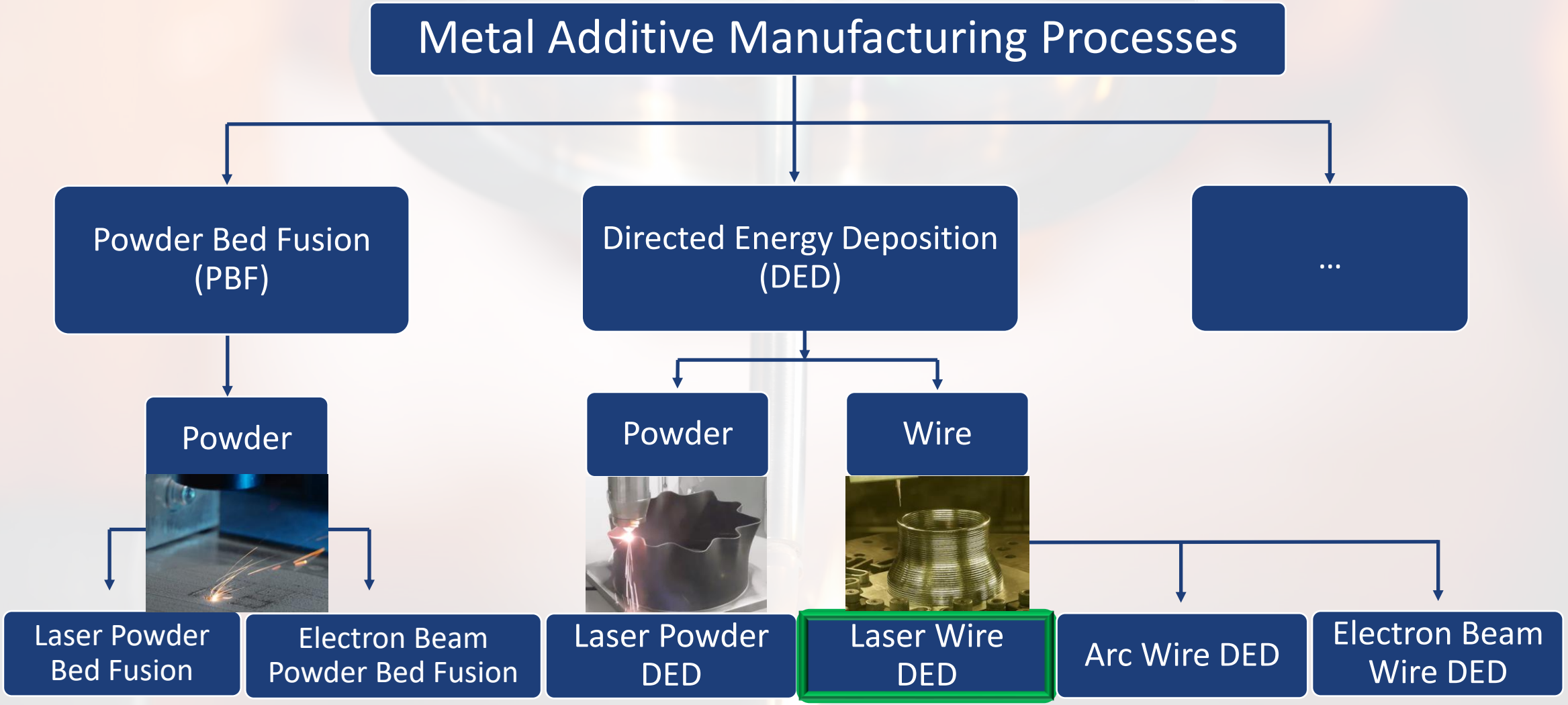
LASER WIRE DED TECHNOLOGY

TECHNOLOGY COMPARISON

* Does not include all metal AM processes



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TECHNOLOGY COMPARISON

Criteria	Laser DED Wire	Laser DED Powder	PBFM (Powder Bed Fusion)
Application Variety	**3D Printing (on existing 3D parts), repair, cladding**	3D Printing (on existing parts), repair, cladding	3D printing on flat surfaces
Size of work envelope	Standard up to 2x4x1,5m	Standard up to 2x4x1,5m	
Cost, material handling, complexity	**Lowest Cost, No powder handling, easy to use**	Machine + equipment for powder handling	Machine + equipment for powder handling
Post processing	Surface finish	Surface finish	De-powdering, support structure removal, surface finish
Hybrid manufacturing	CNC integration possible	CNC integration possible	Only on flat surfaces
Build rate (e.g. Aluminum)	**Up to 3.000 cm^3/h (8kg/hr)**	Up to 1.500 cm^3/h (4kg/hr)	Up to 200 cm^3/h (0,5kg/hr)
Environmetal pollution	No	Health issues / Some materials may be toxic	Health issues, can reach lungs / Some materials highly toxic
Hazard of explosion	No	Medium	High
Minimal wall thickness / Accuracy	1,0 mm	0,8 mm	**0,3 mm / Small laser spot and support structure**
Quality Control	**Wire speed, wire contact, LWM, OCT, pyrometer**	Powder stream control not possible, LWM, OCT	Powder stream control not possible
Material efficiency	**100%**	90%	Re-cycle and mixing depending on particle size
Material availability	**Global Standard**	No global standard	No global standard

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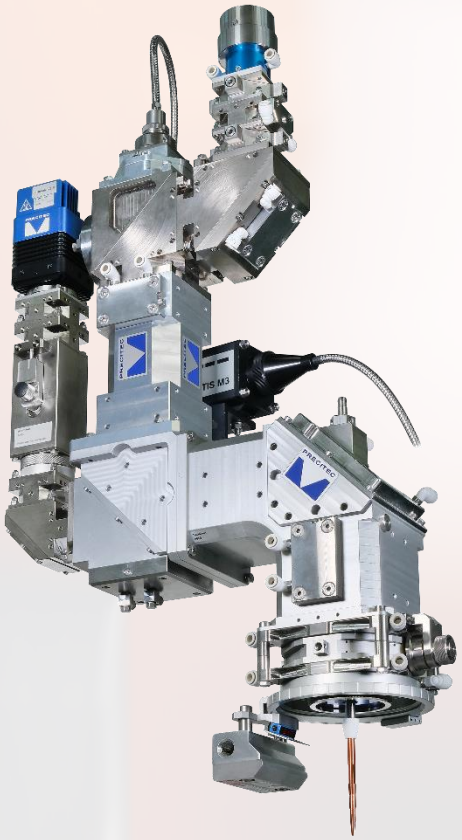
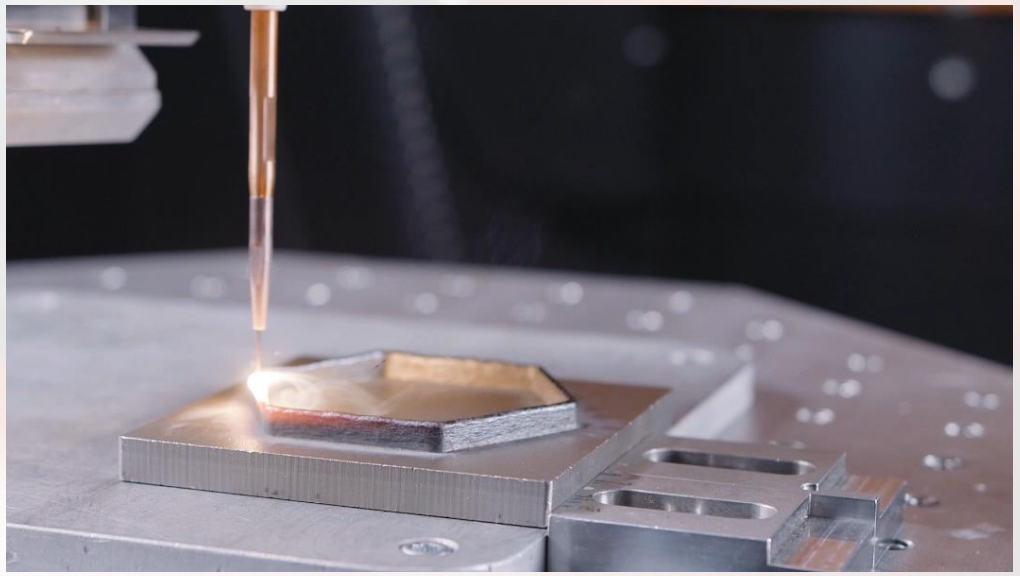
COAXPRINTER – A NEW APPROACH FOR AM

INTRODUCTION





- Advantages of wire vs powder:
  - 100% material efficiency
  - low feed stock material costs
  - hazard-free material and process handling

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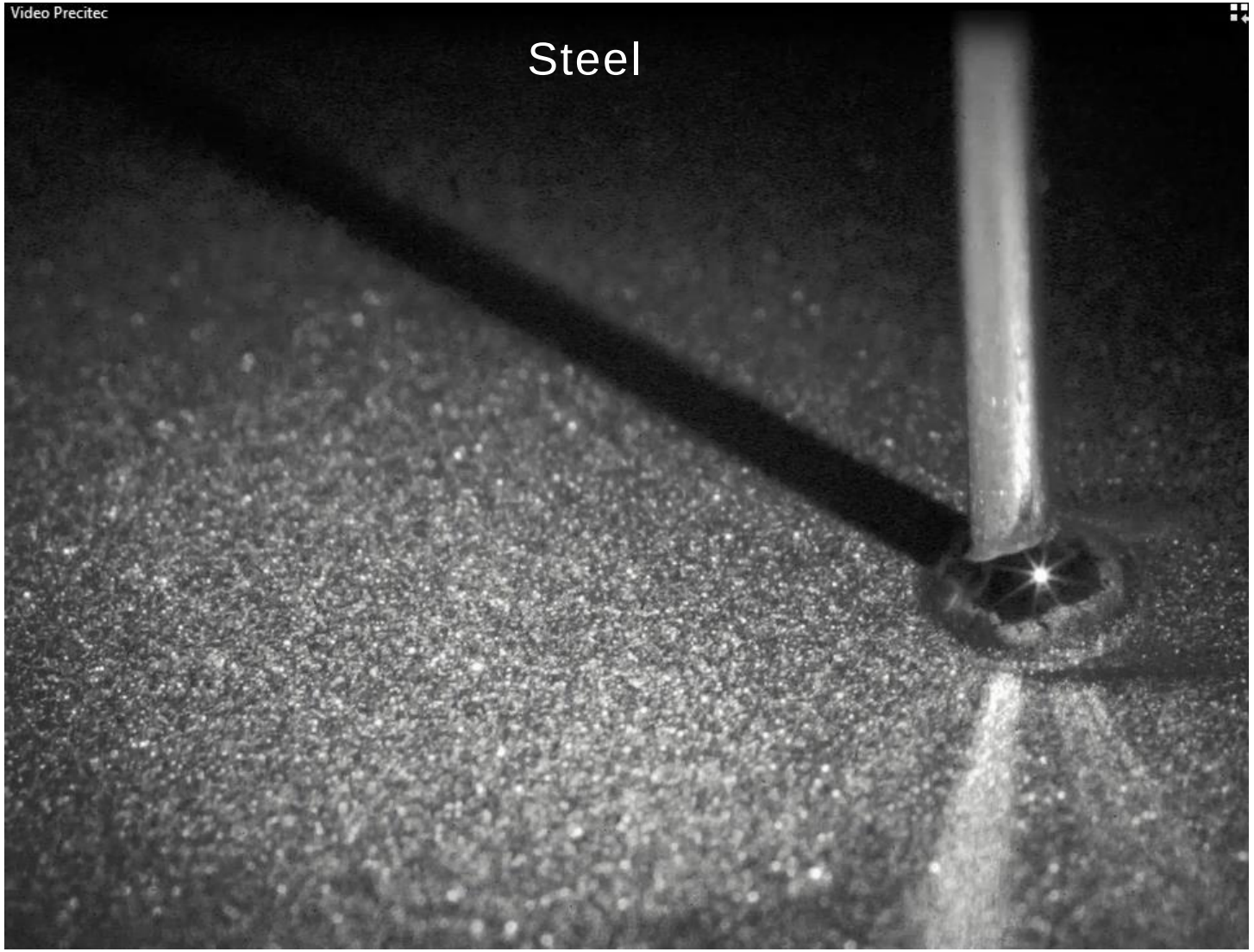
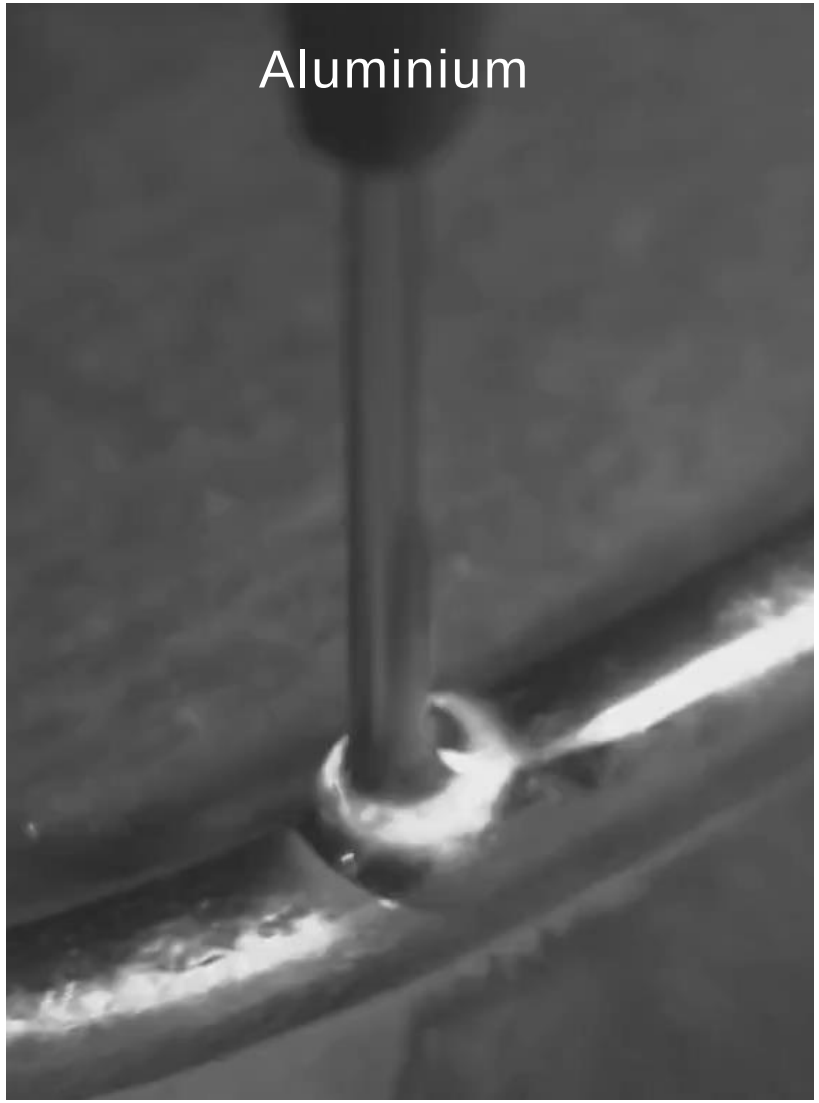
DIRECT ENERGY DEPOSITION

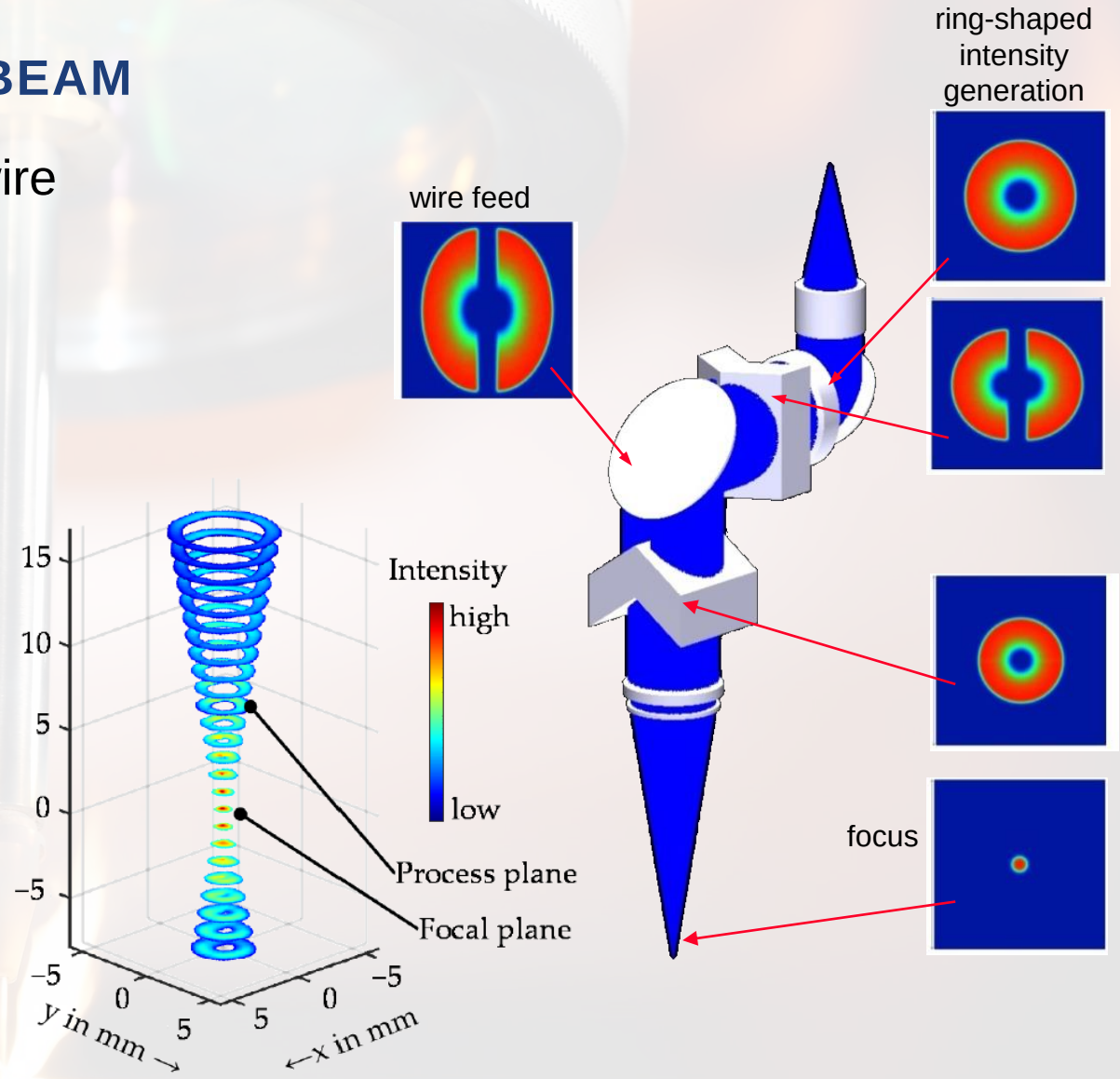




LASER DED-WIRE – A DEEPER LOOK INTO THE BEAM PATH

COAXPRINTER UNIQUE RING- SHAPED BEAM

- direction-independent laser 3D printing with wire
- unique ring-shaped beam
- coaxial feeding of the wire
- 100% material efficiency and high energy absorption by the wire allows high built rate
- ring beam caustic enables a large process window and variation of working distance
- controlled preheating of the wire
- better accessibility due to narrow beam cone



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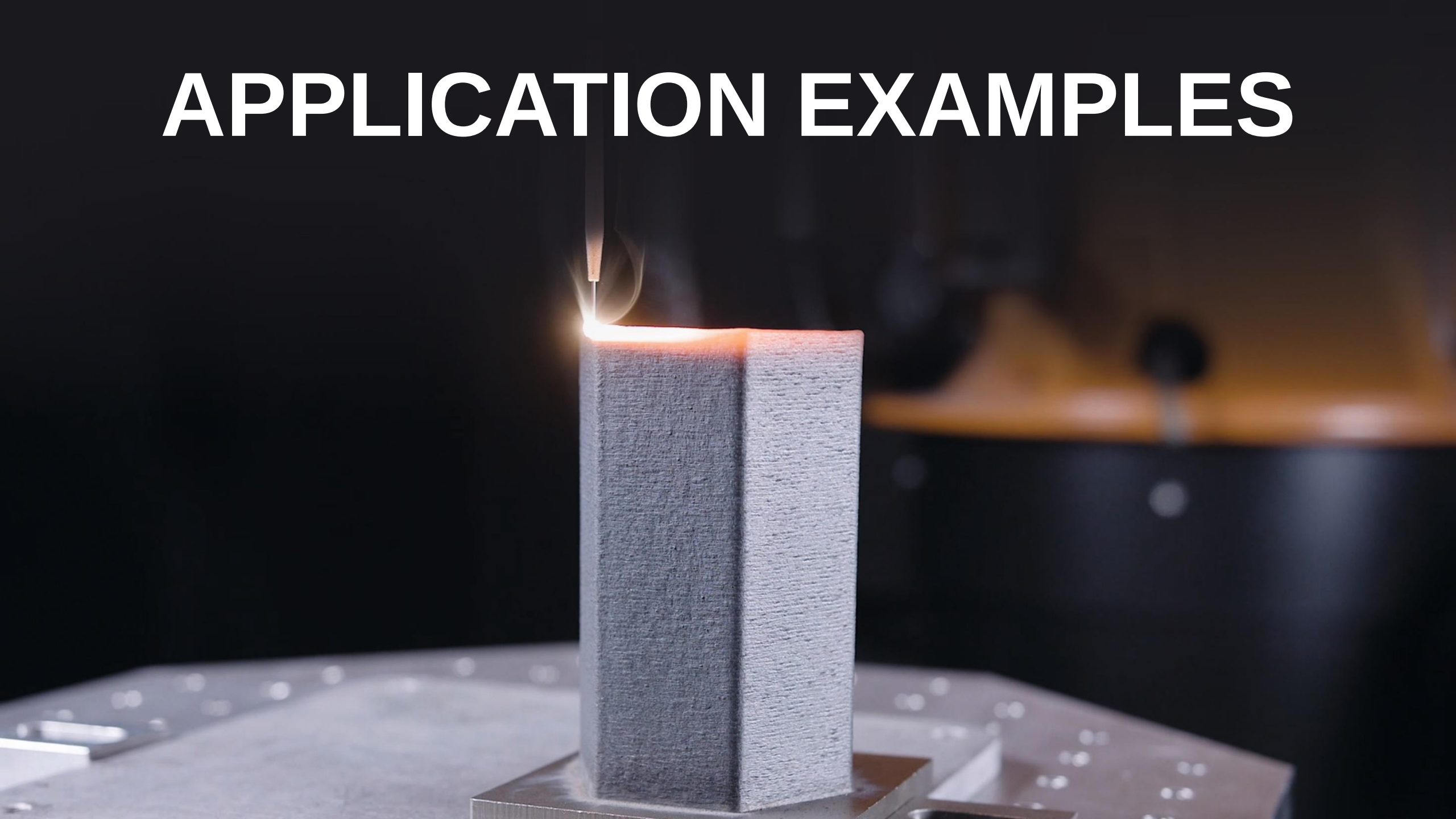
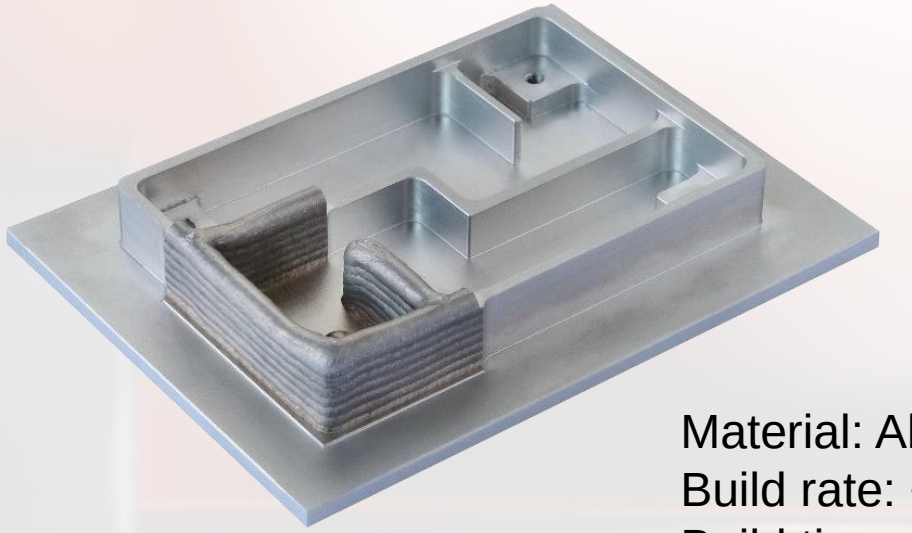
APPLICATION EXAMPLES



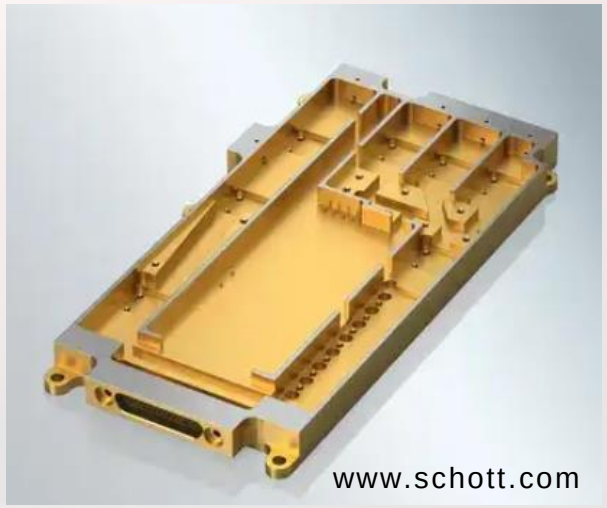
MICRO APPLICATIONS

- Creation of 3D structures on existing parts (hybrid manufacturing)
- Minimum wall thickness due to wire diameter
- Reduced milling operations
- Improved CO2 footprint due to less waste material
- Expierence in aluminium, titanium and stainless steel

HOUSINGS FOR ELECTRONIC COMPONENTS



Material: Aluminium 5k / 6k / 7k
Build rate: ~ 1 kg / h
Build time: ~ 3min



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AEROSPACE - TITANIUM

AEROSPACE FLANGE

LESS MACHINING
due to new design possibilities

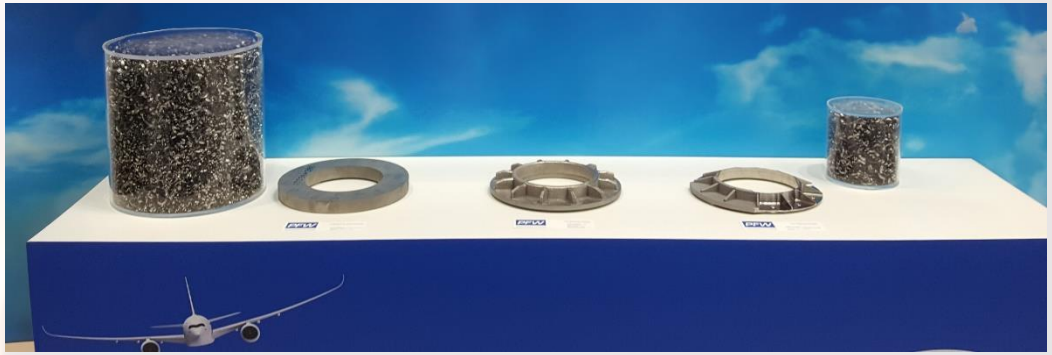
OPTIMIZED CO2 FOOTPRINT
based on reduction of wasted material, e.g. during milling process

70% SCRAP REDUCTION
- DED, heat treatment and partially machining
- Reduce scrap volume by over 70% through near net shape printing

DED printed

PFW

Heat treated and partially machined



Scrap volume traditional machining vs. DED with partial machining

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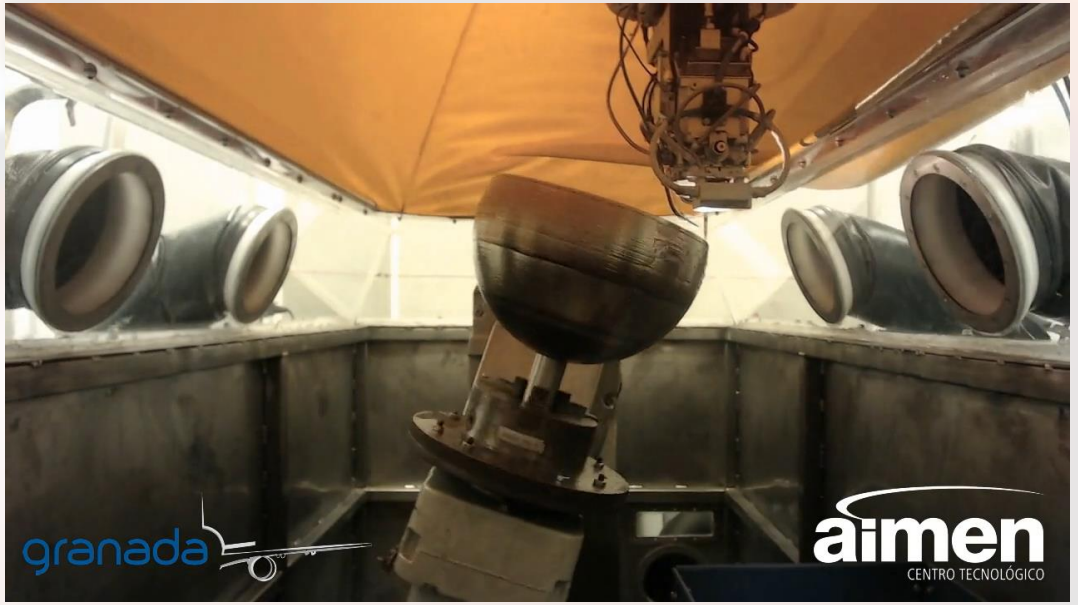
AEROSPACE - TITANIUM

TITANIUM TANK FOR SPACE LAUNCHERS

Korea Space Launch Vehicle-Ⅱ



- Material Ti6Al4V
- Total layers: 500
- Build length: 430m
- Total weight: 3.6 kg

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AEROSPACE - TITANIUM

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INSTITUT MAUPERTUIS
APPLICATIONS LASER, FSW ET ROBOTIQUE

Wire material: TA6V

Wire diameter: 1mm

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FORGING HAMMER - NI BASED ALLOY

ELIMINATION OF TOOLING COSTS

- build exactly the geometry you need without additional tool

HIGH DIMENSIONAL ACCURACY

- high resolution due to small laser spot
- reduced heat input
- minimum distortion of the parts

100% MATERIAL EFFICIENCY

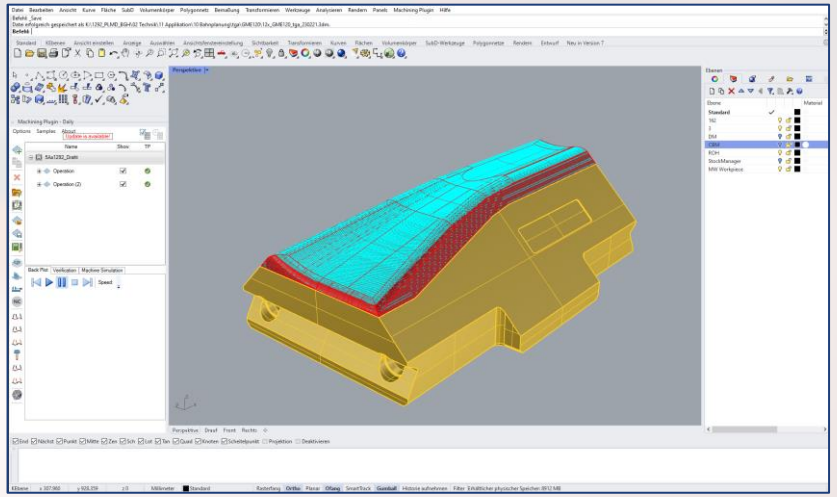
- filler material wire
- high deposition rate

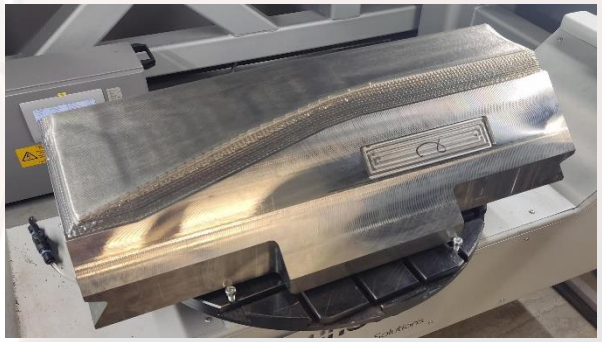
USE CASE FORGING HAMMER

- hammer manufacturing and repair with laser wire DED
- 20 kg of Ni-based alloy deposited at 3 kg / h
- reproducibility ~ 0,3 mm
- no further machining required

BGH Leistung in Edelstahl

LUNOVU Integrated Laser Solutions





BEARINGS - BRONZE

- Wire material: CuAl8
- Wire diameter: 1,6 mm

IREPA LASER
INSTITUT CARNOT MICA

CHEMICAL PLANTS - STAINLESS STEEL 316L

INSTITUT MAUPERTUIS

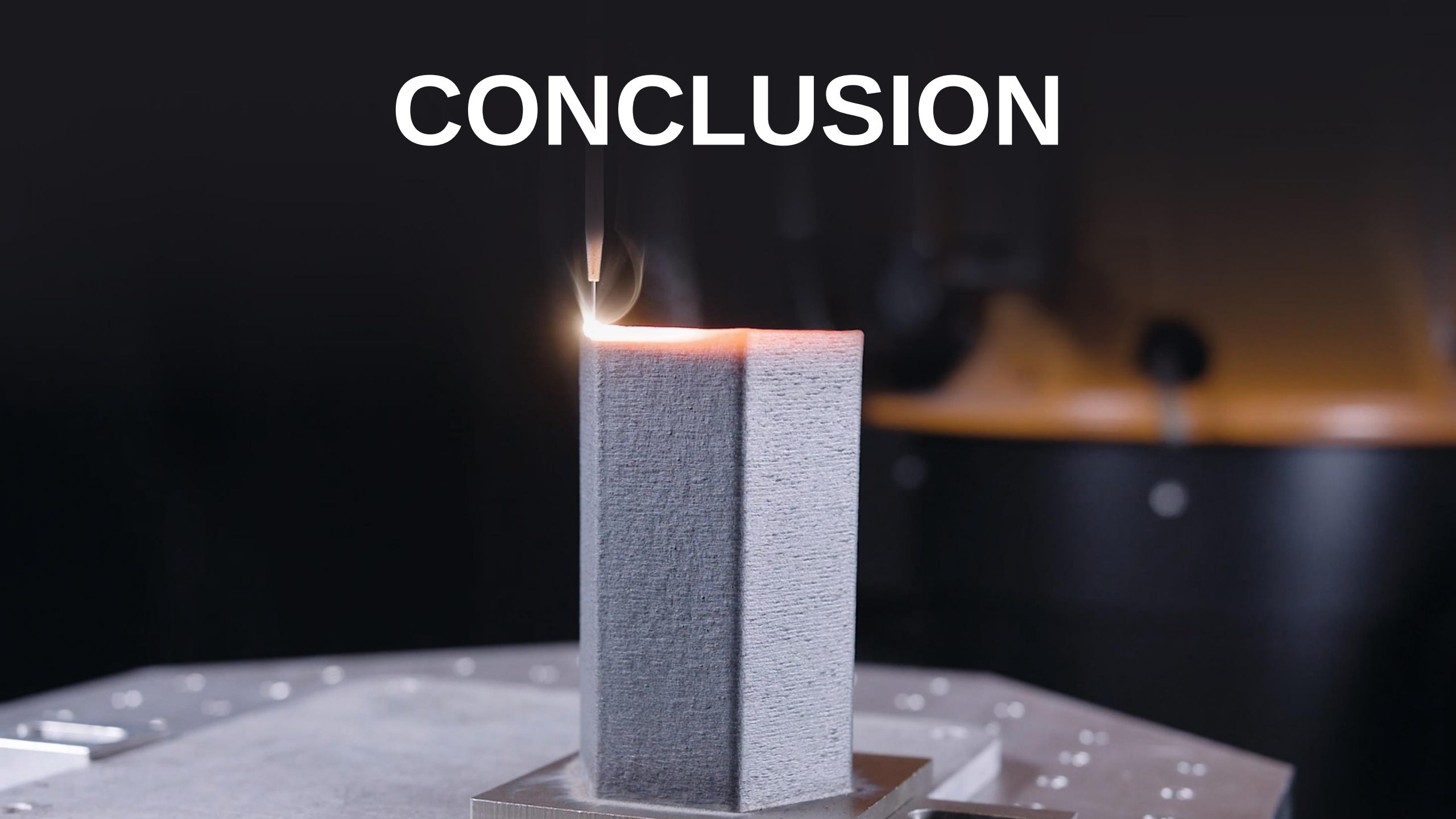
- Wire diameter : 1mm
- Wire feed rate : 2 m/min
- Deposition rate : 0.75 kg/h
- Processing time : 3 hours 30 min
- Printing time : 2 hours 50 min

CHEMICAL PLANTS - STAINLESS STEEL 316L

ENERGY - STAINLESS STEEL 316L

- Wire diameter: 1mm
- Deposition rate: 470 g/h (60 cm^3/h)
- Processing time: 5h
- Weight of deposition: 2350g

CONCLUSION



CONCLUSION

RELIABLE PARTNER
proven in numerous projects

UNIQUE PRODUCT COAXPRINTER
enables previously impossible applications

THE RIGHT SIZE OF A COMPANY
to scale production and on-site support (OSS) in short notice

R&D CAPACITY
in Germany and China ensure further development and technology leadership

INTERNATIONAL SUPPORT
available in US, China, India and Europe

LARGE INTERNATIONAL NETWORK
with R&D and material scientists and suppliers for additive manufacturing

DECADES OF EXPERIENCE
working with additive manufacturing

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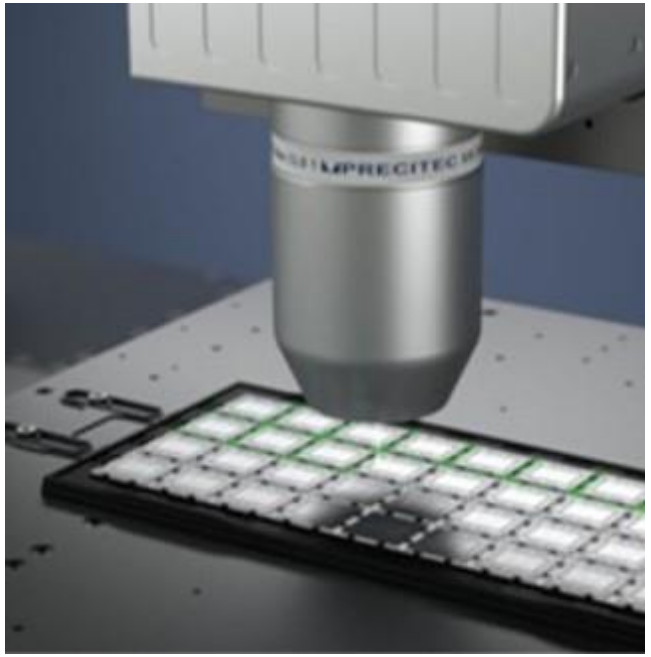

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