

PRODUCTIVITY AND QUALITY AS DRIVERS FOR IMPROVEMENTS IN THE FIELD OF METAL AM

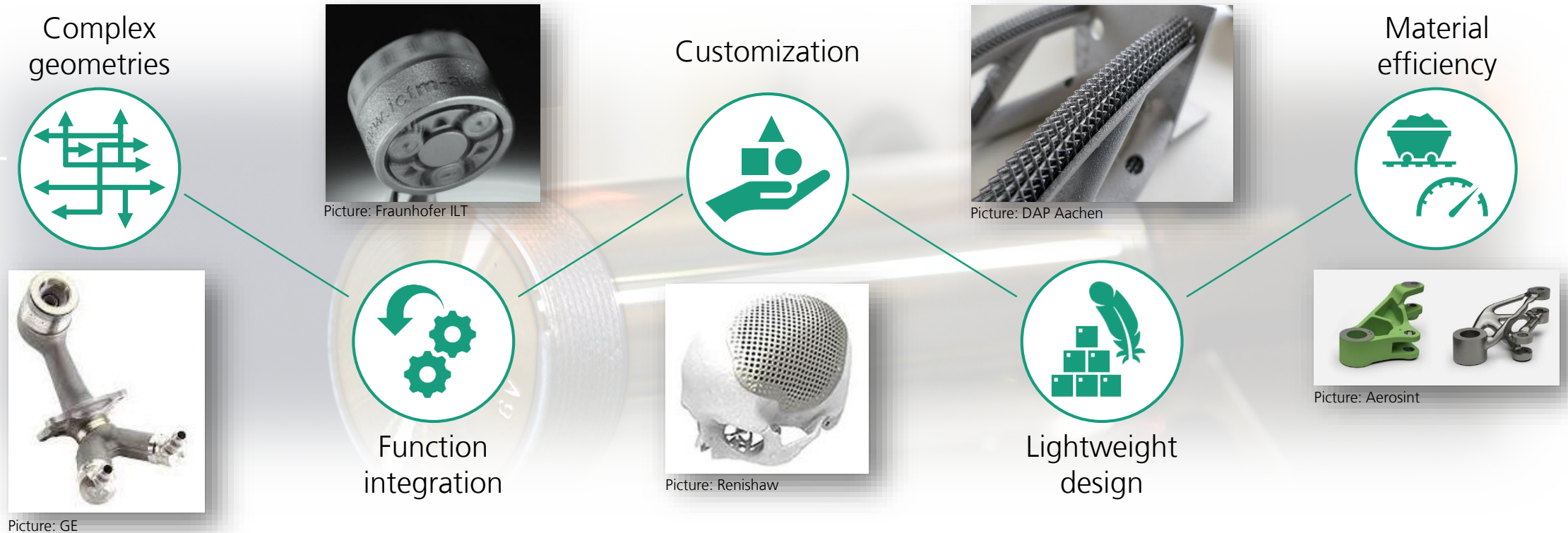


Dipl.-Ing. Kai Winands
Tokyo, 6th October 2020



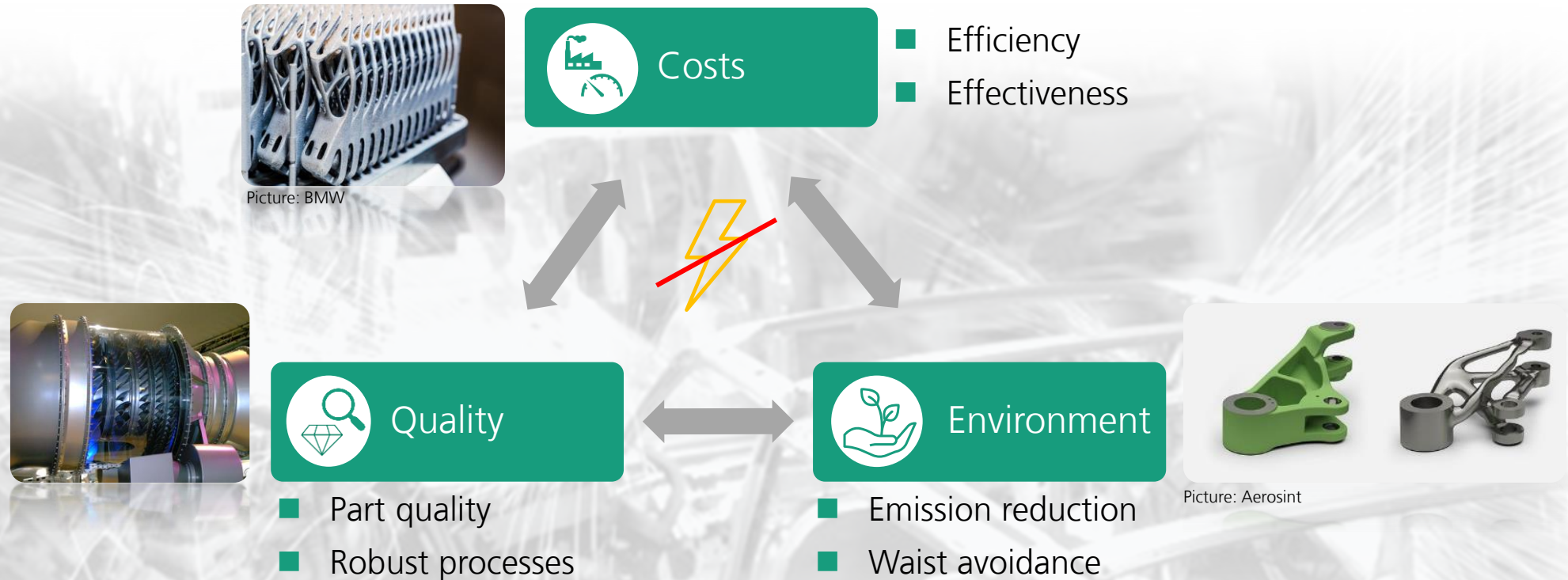
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Metal AM as enabler



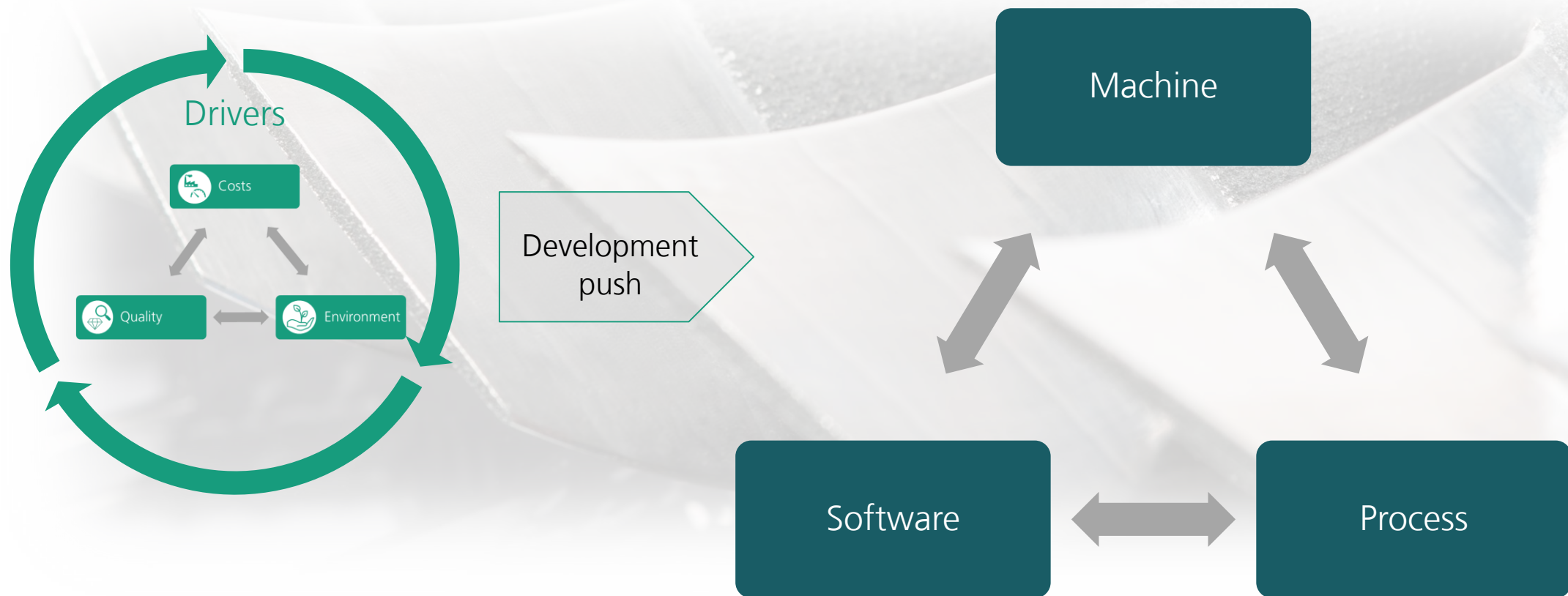
Many different reasons for using metal additive manufacturing (AM) as innovative production technology

Industrial demands as drivers for improvements in the field of metal AM



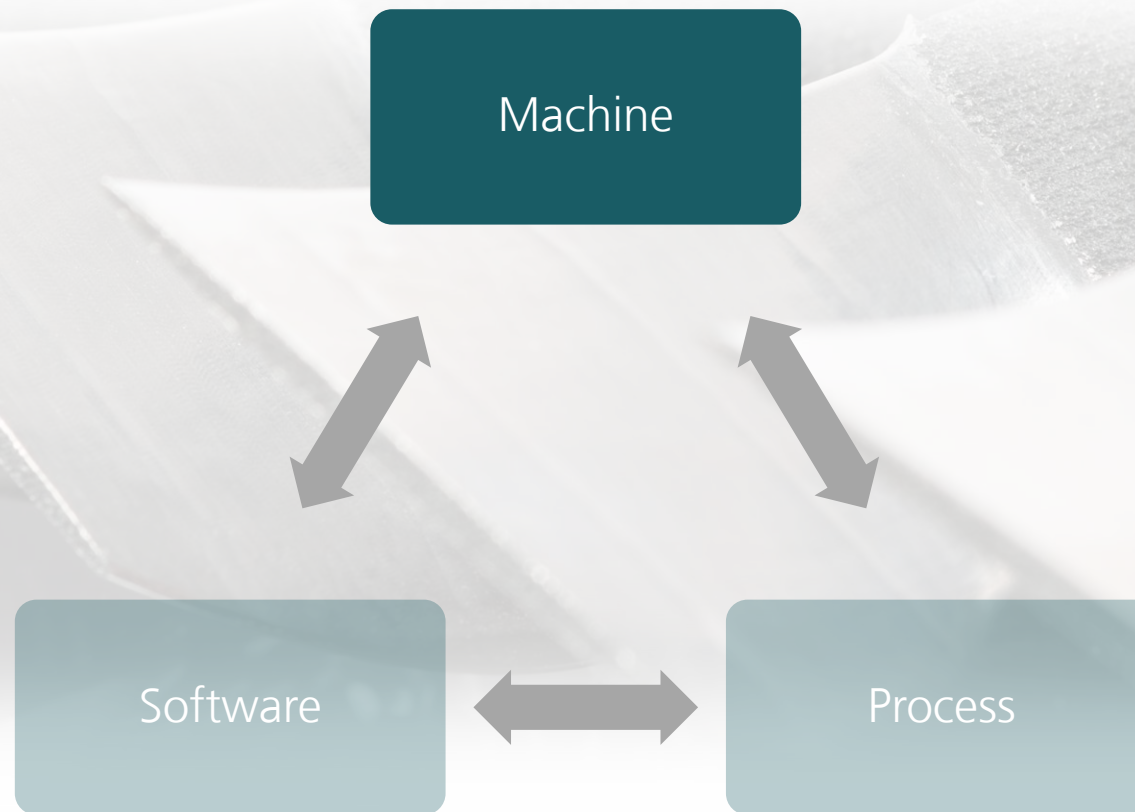
Productivity, quality and environmental requirements are not pure contradictory demands.
Together they are constructive drivers for improvements.

Industrial demands as drivers for improvements in the field of metal AM



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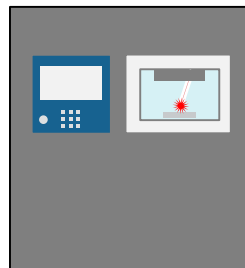
Improvements in the field of metal AM – machine related example



Machine developments in the field of LPBF

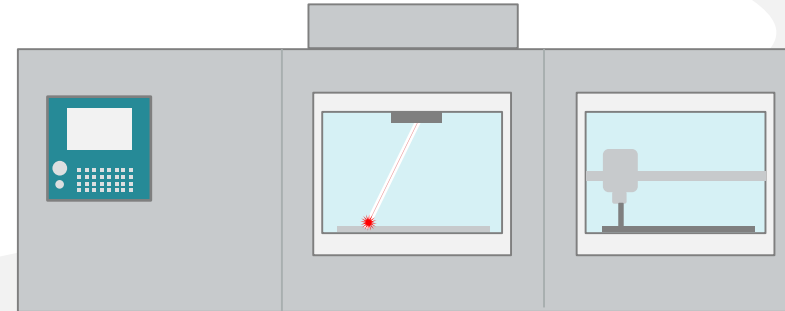
Multi-spot optics
Multi-material concepts
Process control

"Low-cost"
LPBF machine



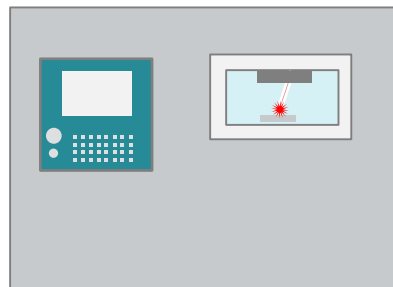
- 1-laser system
- Build volume limited
- Build quality limited
- Simple machine design

Modular multi-process machines



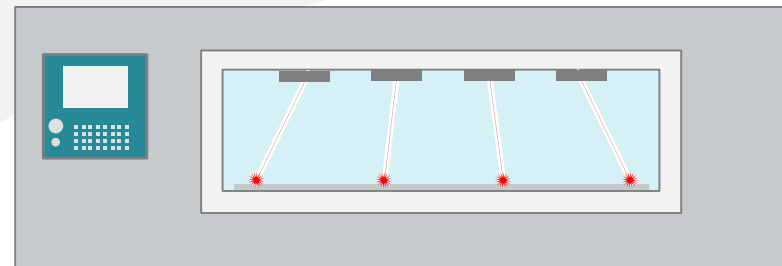
- Multi-laser system
- Build volume medium
- Build quality limited
- Complex machine design

"Standard"
LPBF machine



- 1-laser system
- Limited build volume
- Melt pool monitoring

Large multi-laser LPBF machines



- Up to 4 lasers simultaneously
- Build volume large
- Build quality limited
- Complex machine design

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Improvements in the field of metal AM machines



Large machines / Hybrid machines

- Larger parts printable
- Simultaneous multi-part manufacturing
- High automation level possible
- Low costs per part possible to achieve



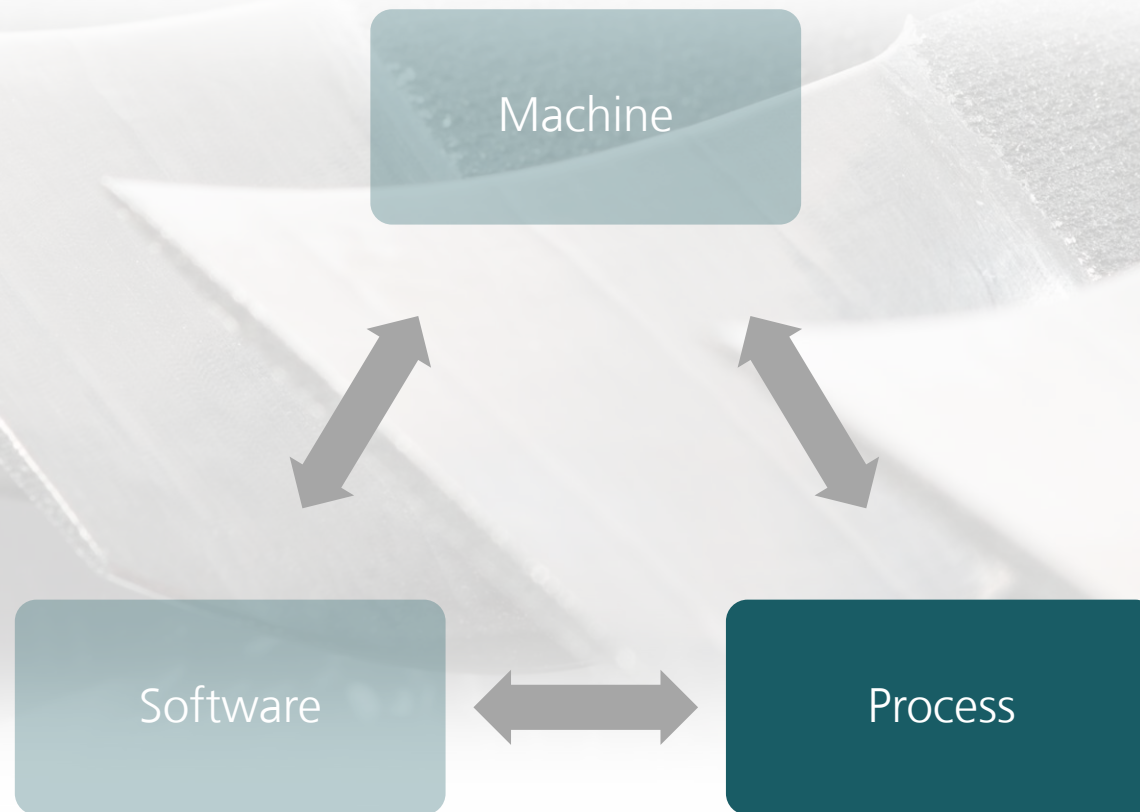
- High invest and operating costs
- Larger footprint
- Accuracy and quality limited
- Process chain in some cases incomplete
- Risk of unwanted interactions and downtimes



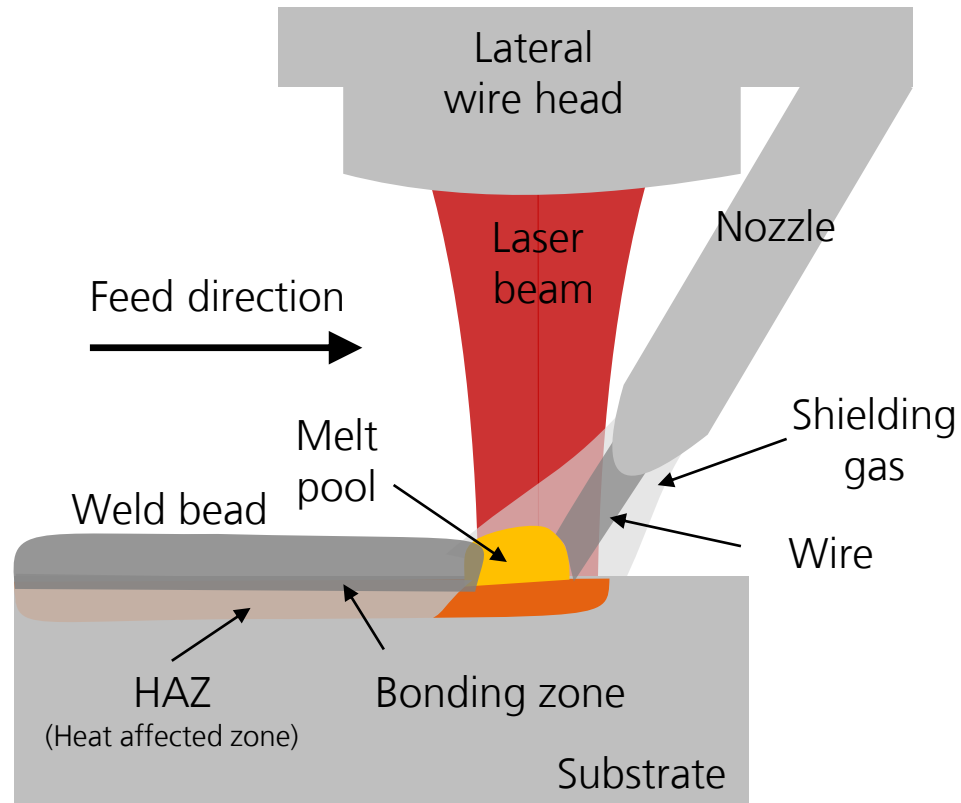
Business cases must consider
return of invest (ROI) scenarios

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Improvements in the field of metal AM – process related example

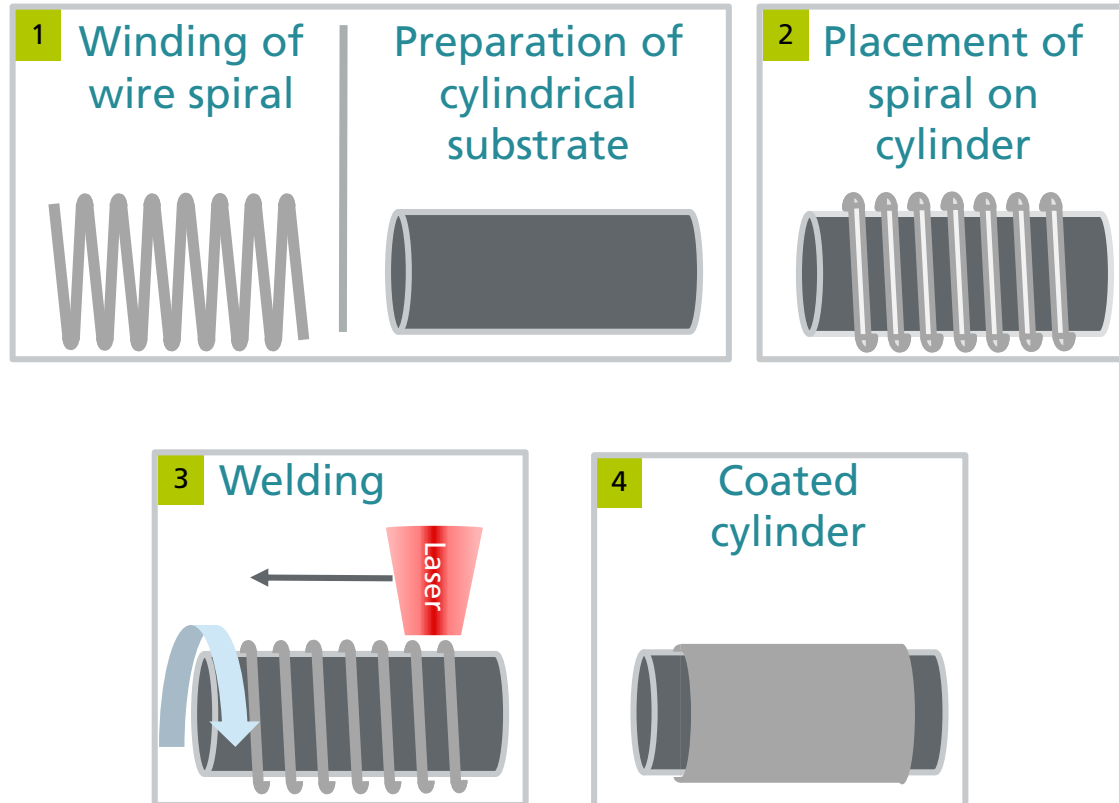


Process principle of wire-based laser metal deposition LMD-w



Standard LMD-w process is limited regarding speed, stability and needs a complex machine setup

New LMD-w process to face challenges for rotation-symmetrical components



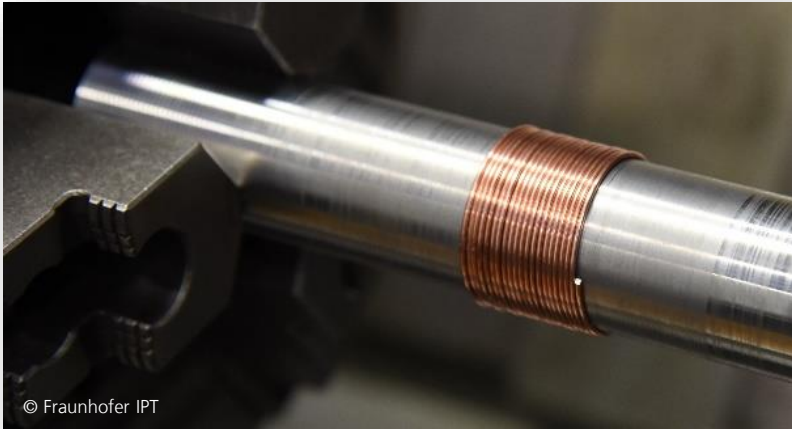
Express Wire Coil Cladding (EW2C) - Approach

- Wire pre-positioning concept for cylindrical components
- Wire oscillation as critical process factor during welding process does not occur anymore
- Feed rate is independent from wire feeding
- Laser spot geometry optimized for area exposure (rectangular shape with adapted energy profile)

Patent pending
by Fraunhofer IPT

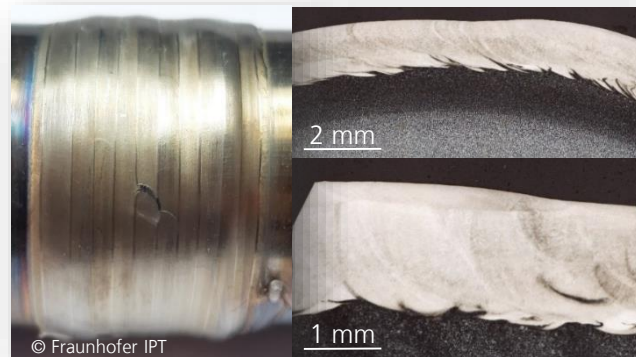
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New process to face challenges for rotation-symmetrical components



Advantages

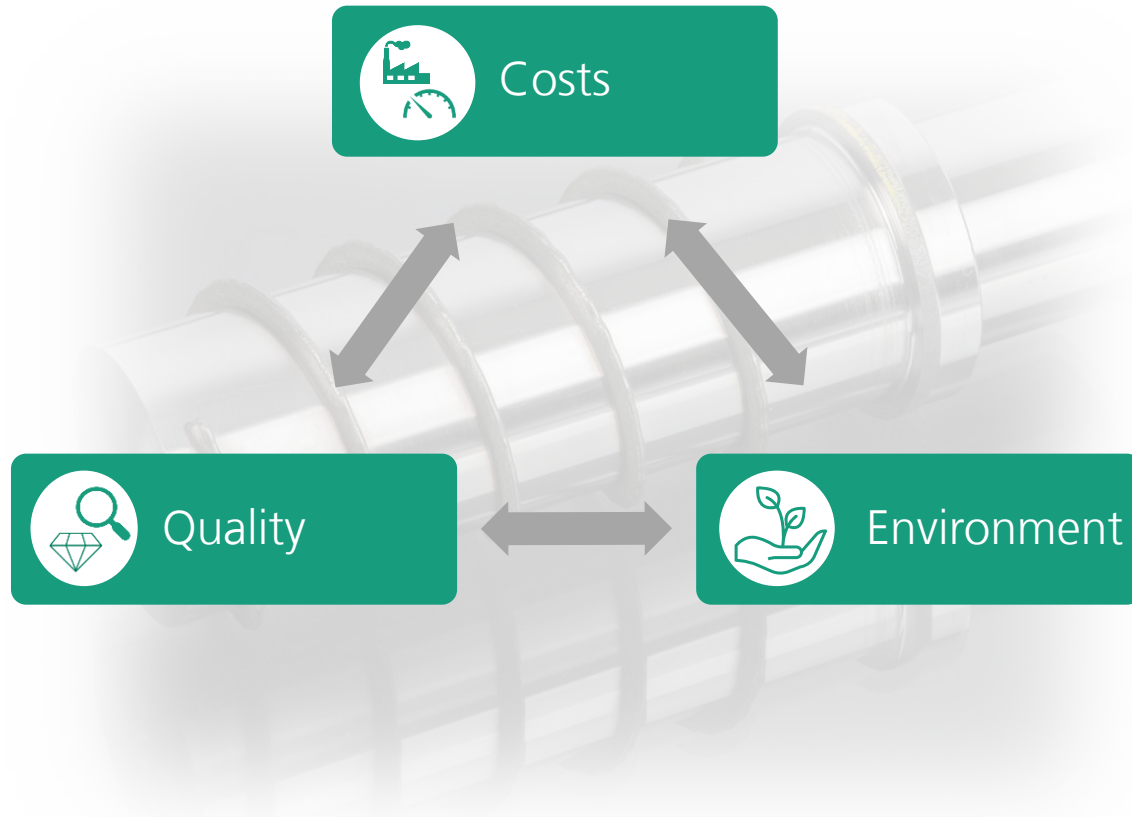
- Faster deposition process especially for thick layers
- Higher process stability due to pre-positioned wire
- High automation potential



Patent pending
by Fraunhofer IPT

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Summary and Outlook



- Productivity, quality and environmental requirements can be drivers for improvements
- Think out of the box and not like usual, e.g.
 - ~~Increase of laser power~~
 - ~~Larger machines~~
 - ~~Higher deposition rates~~
- Think unconventional and new like
 - “EW2C”

Thank you for your attention!



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