

Additive Manufacturing from end to end – hard- & software solutions along the process chain

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Dr. Patrick Mehmert

Product Manager Additive Manufacturing, simufact engineering GmbH



WHO ARE WE?



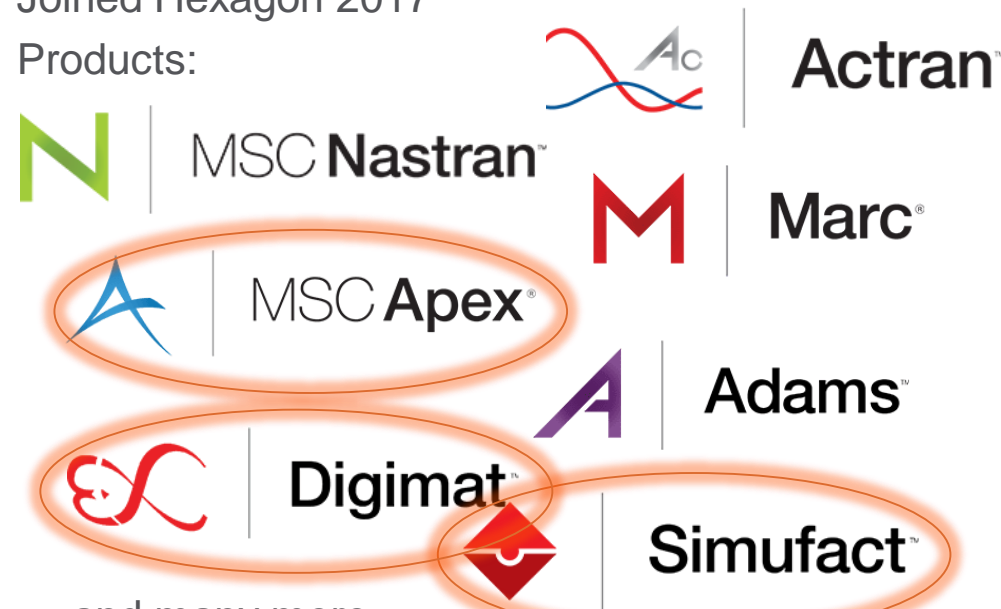
- founded 1975, Sweden based
- Metrology
- Geo Analytics
- Software
- 18 000 employees
- Group members:



...and many more



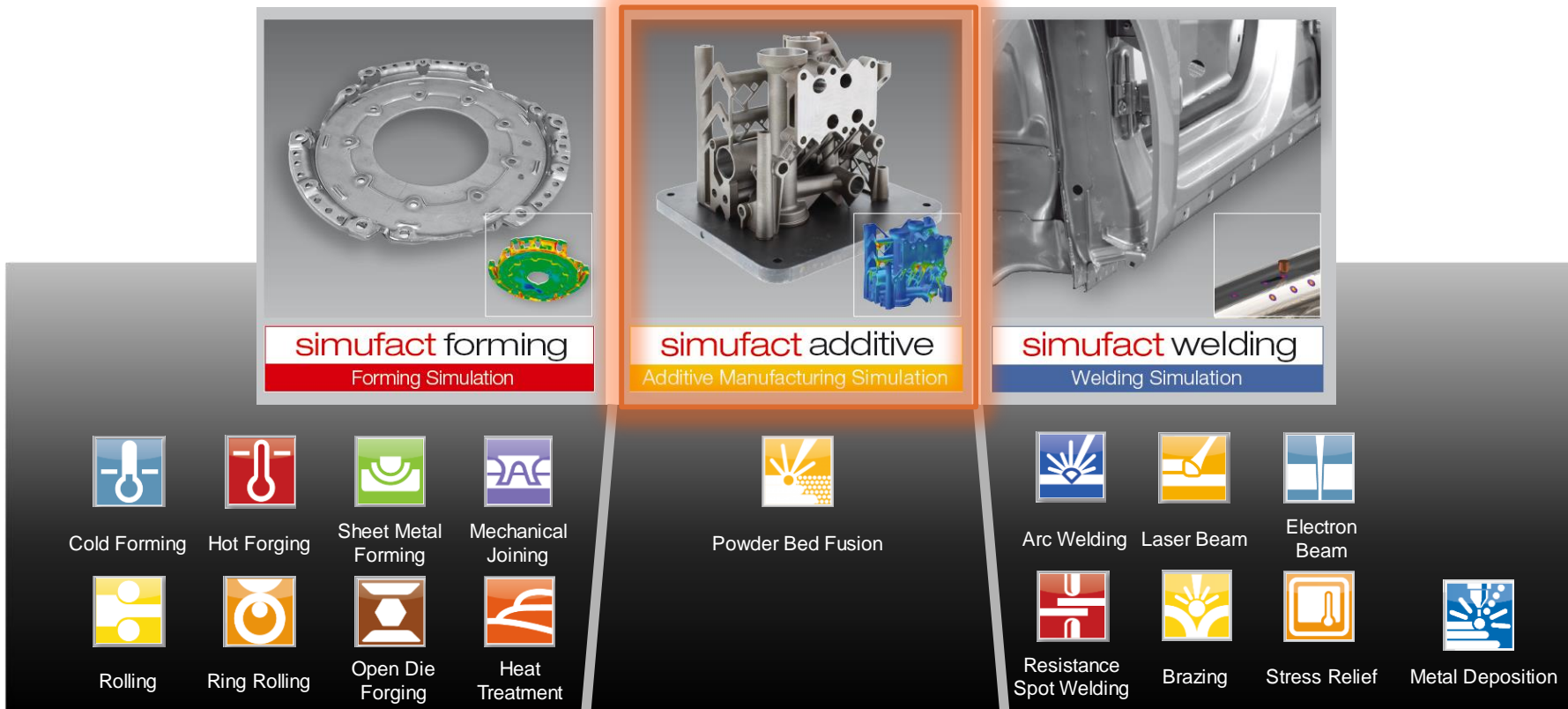
- founded 1963, US based
- MacNeal & Schwendler Corporation
- Pioneer in the field of finite element simulation software
- 1 200 employees
- Joined Hexagon 2017
- Products:



...and many more

simufact at a Glance

Simulating manufact**uring** - the manufacturing division of **MSC X Software**



- ◆ Supporting the optimization of **metal-based manufacturing** processes
- ◆ Manufacturing oriented **process simulation**
- ◆ Technology based on specially adapted **MSC MARC** non-linear finite element solver – SF-MARC

Xstream - at a Glance

ENGINEERING



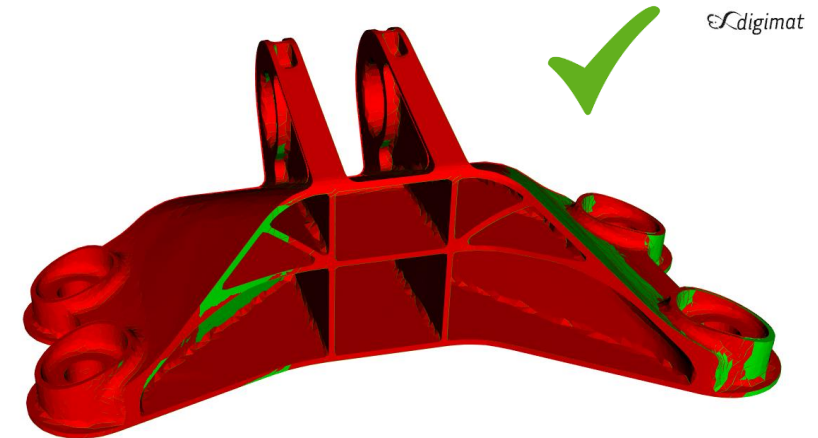
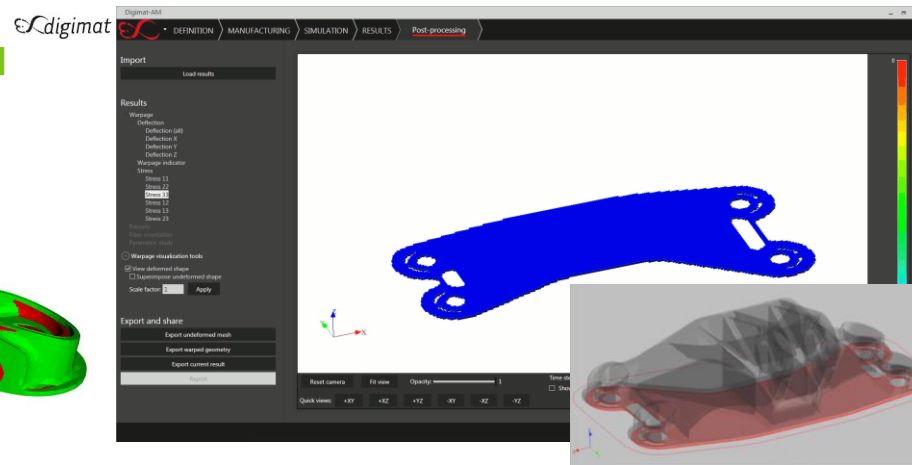
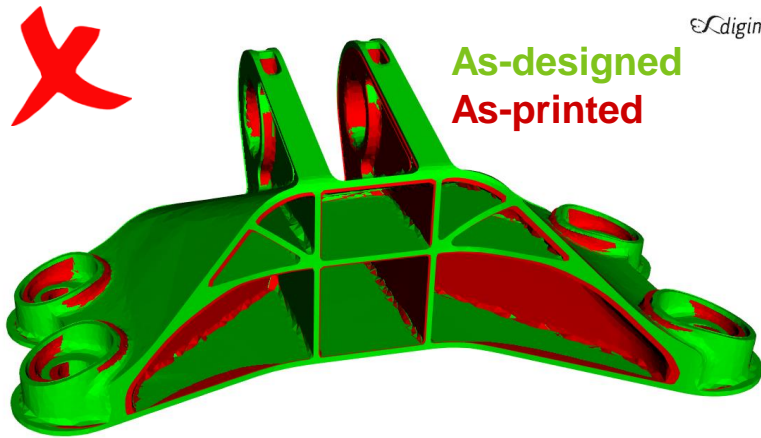
e-Xstream, The material modeling company
66+ PhDs & MS Engineering 100% focused on advanced material modeling
+ 15 TBH in 2018



Digmat, The material modeling platform
Tools, Solutions & Expertise for modeling Plastics & Composites
Wide & Deep Material & Process coverage



Global Market leader in Multi-Scale Modeling (CAGR = +34%)
Market Leader in Automotive (Top OEM & Tier 1), Material Suppliers, E&E
Fast Growing in Aerospace & Defense (OEM & Suppliers)

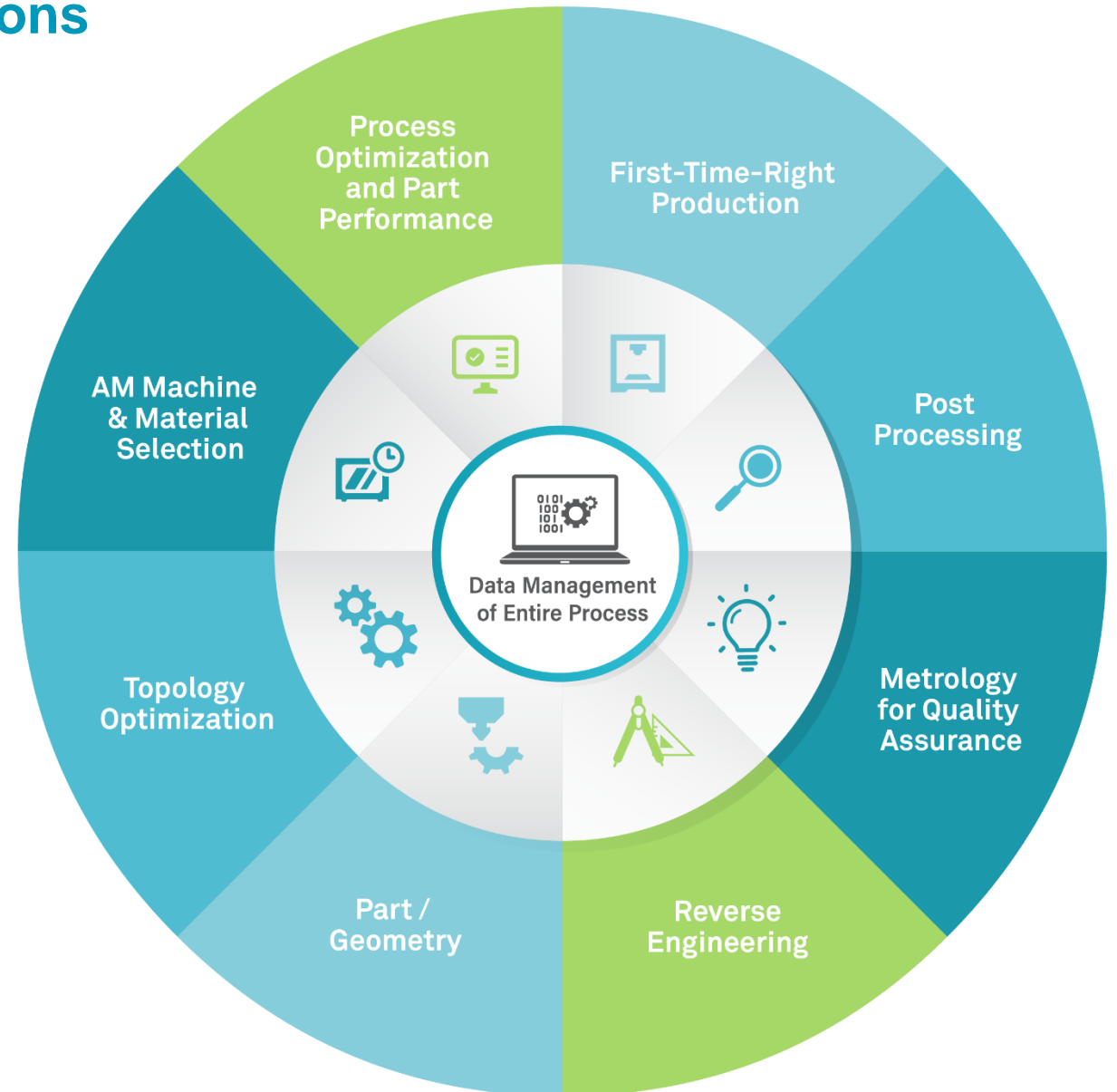


„End-to-end solution case study“

Hexagon Additive Manufacturing Solutions

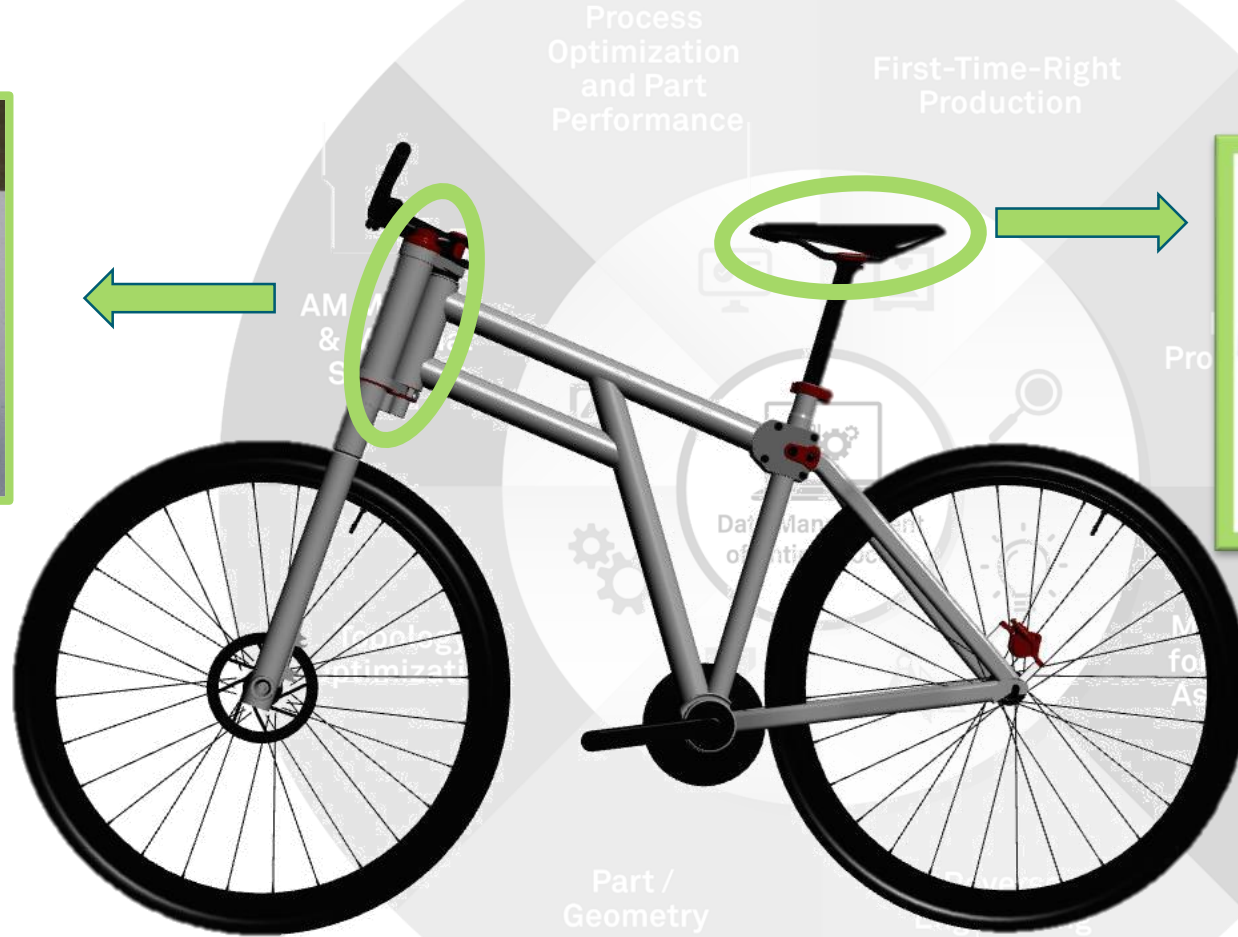
- *plan*
- *optimize*
- *validate and*
- *replicate*

*high quality
additively manufactured parts*



Solution Demo Parts

Upper Fork



Bike Saddle

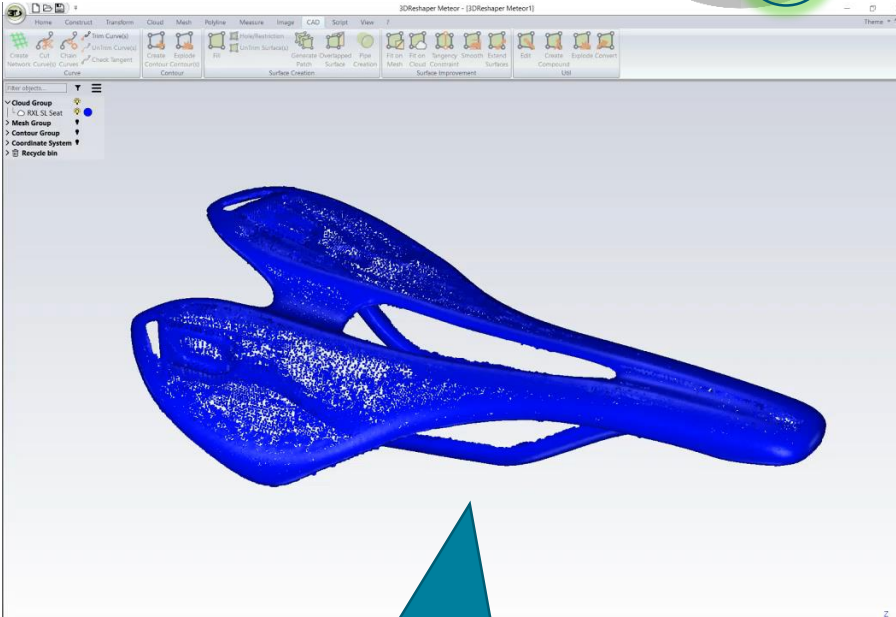


Foldable commuter bicycle with additively manufactured components

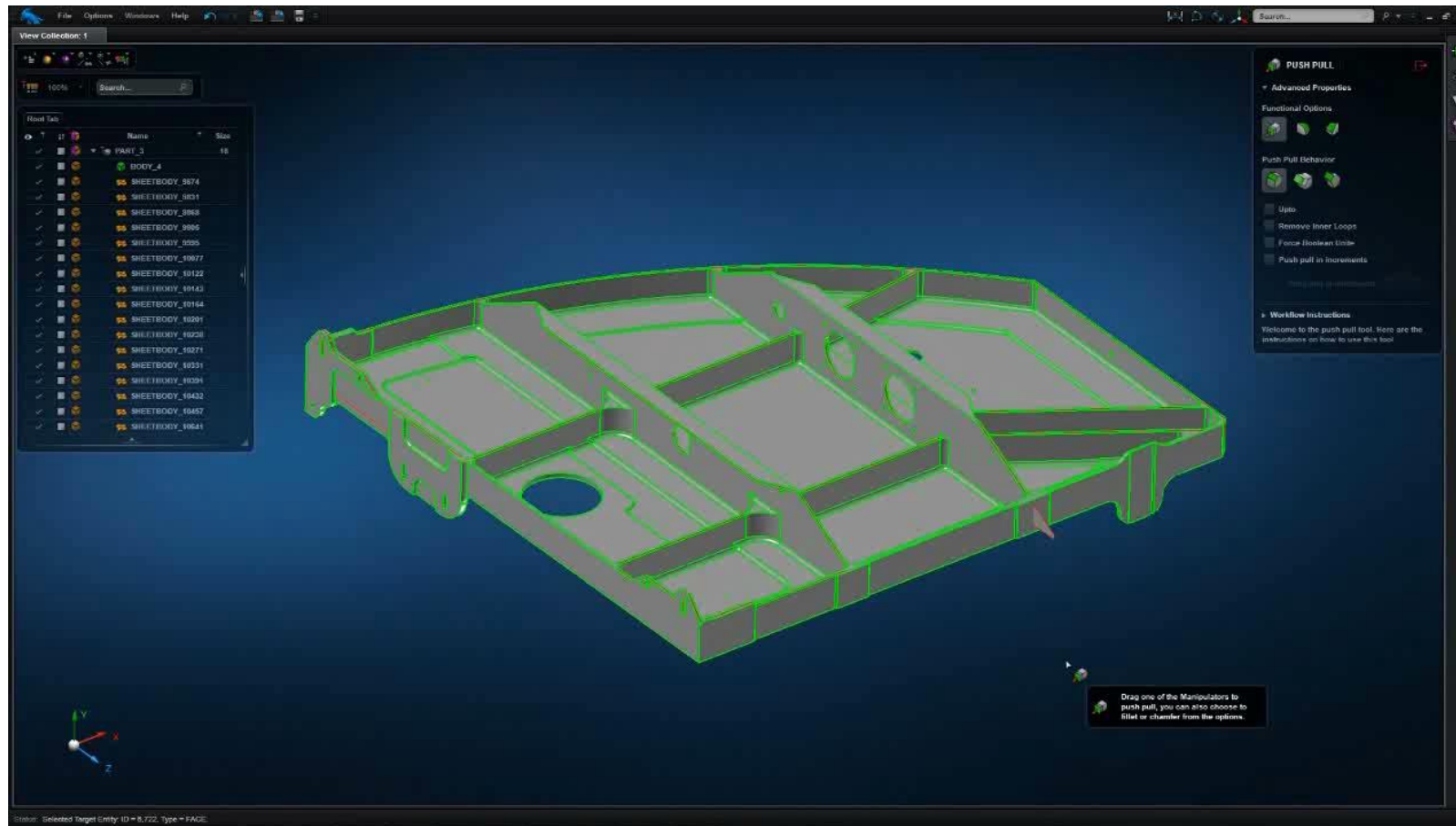
Metrology for Reverse Engineering



RS5 laser scanner



Part / Geometry



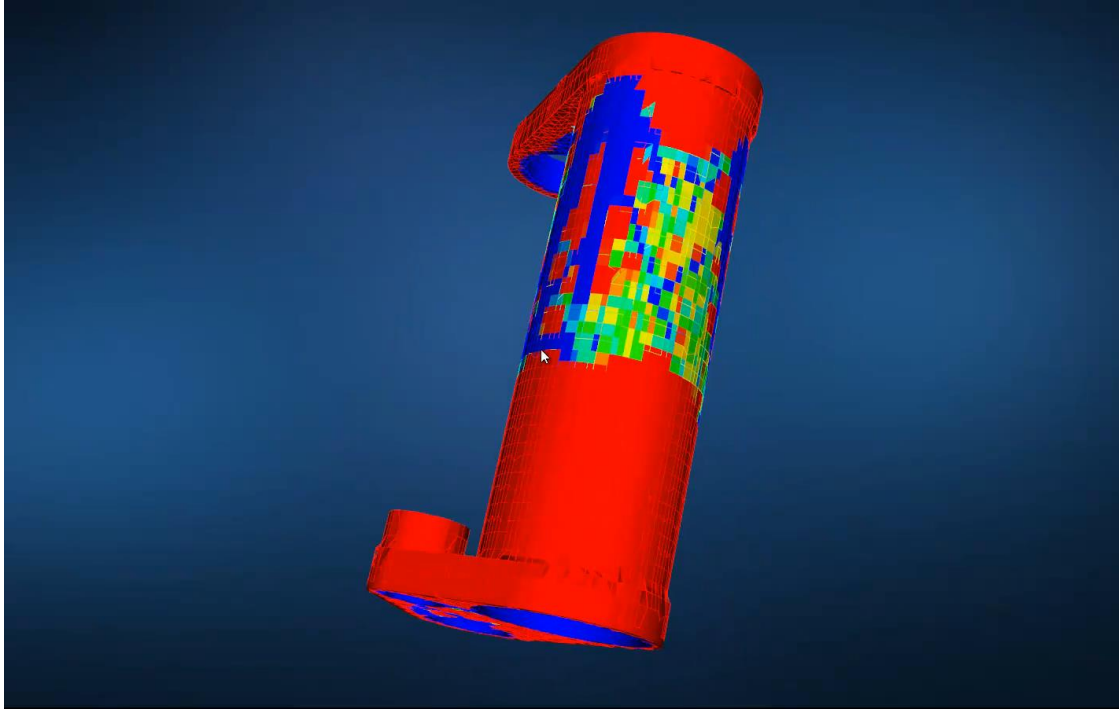
- Finalize geometry
- Stress analysis
- Topology Optimization



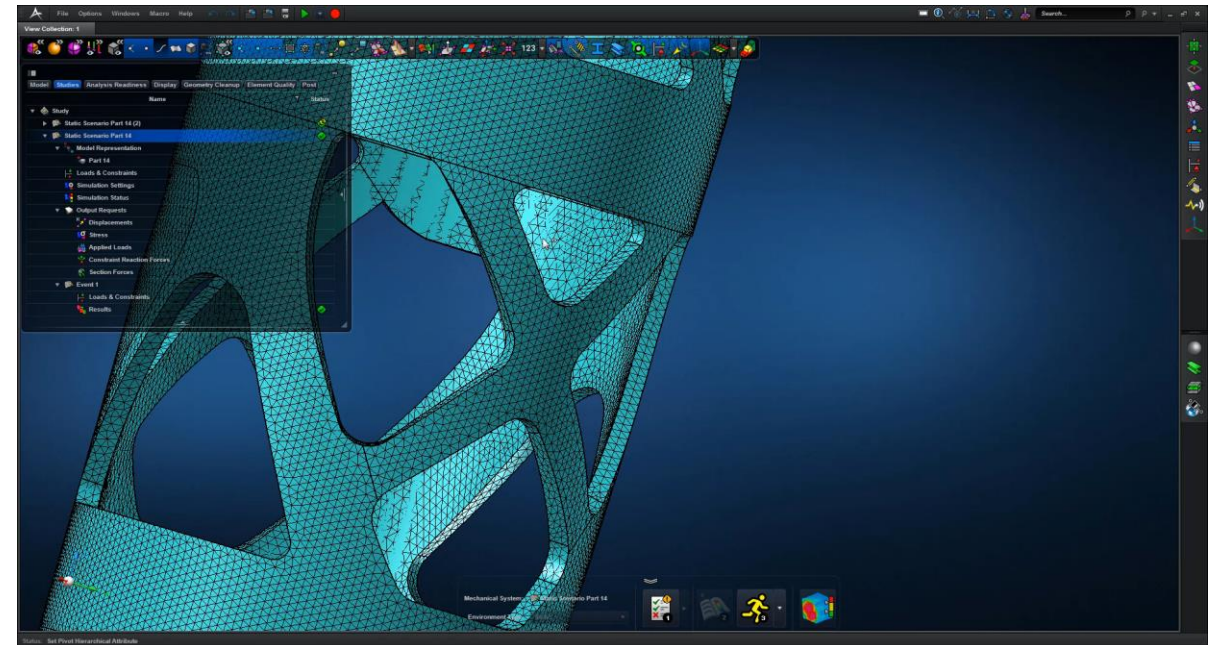
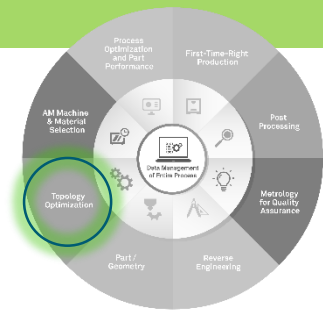
MSC **Apex**[®]

CAE Specific Direct Modeling & Simulation Environment

Topology Optimization



- ✓ Topology Optimization
- ✓ Strength evaluation
- ✓ Finalize geometry

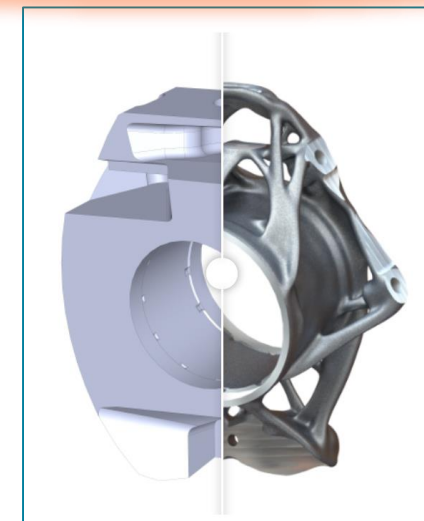
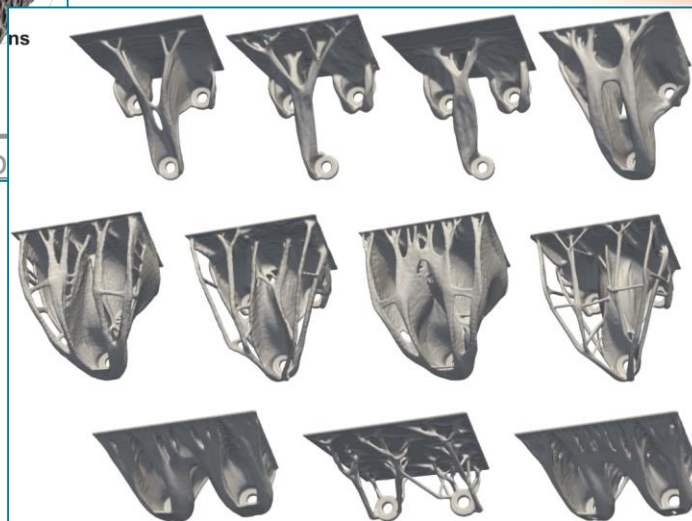
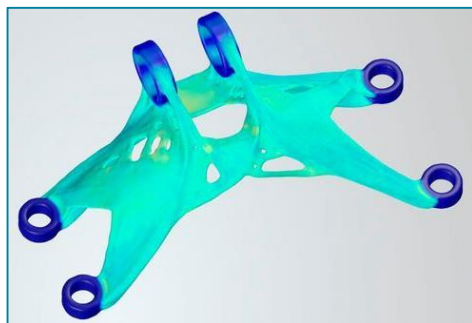
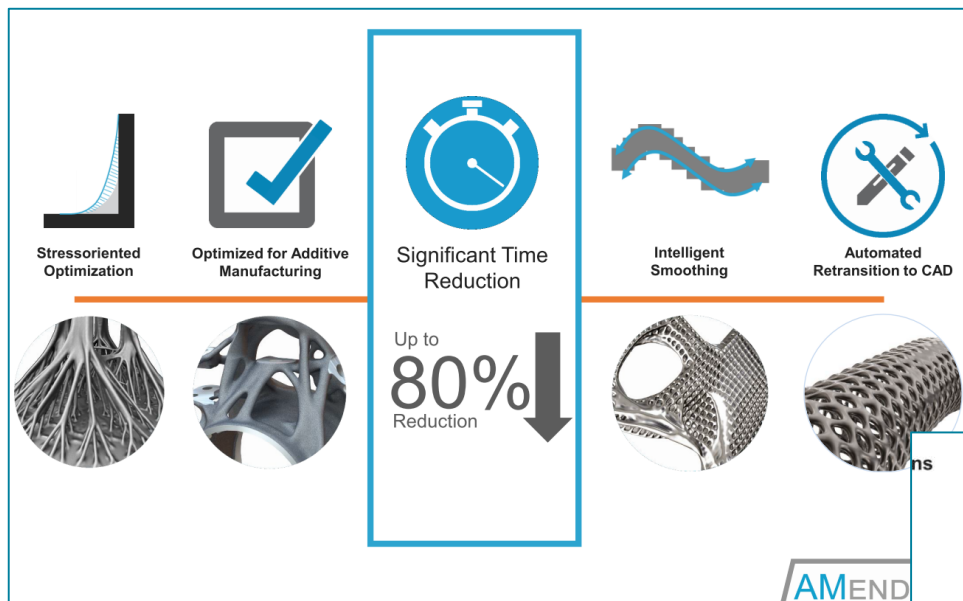


MSC **Apex**®

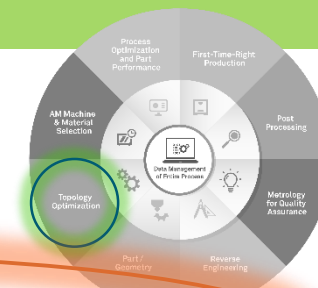


MSC **Nastran**™

Topology Optimization



- ✓ Topology Optimization
- ✓ Strength evaluation during optimization
- ✓ ~~Finalize geometry~~
- ✓ Ready-to-print geometry (STL or CAD)



MSC **Apex**® Generative Design

AMENDATE
INNOVATIVE AM OPTIMIZATION

Machine & Material Selection

Plastics & Composites

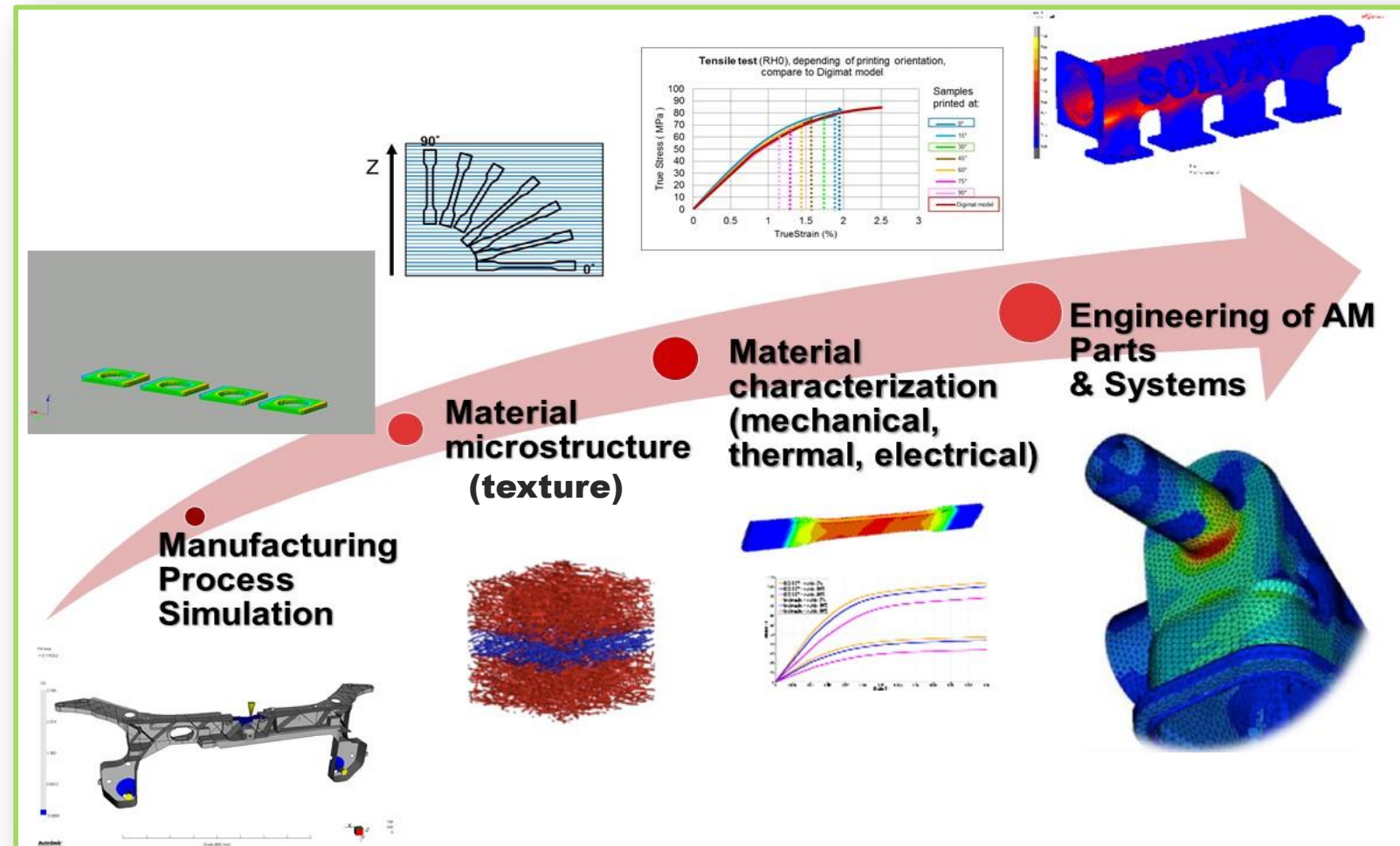
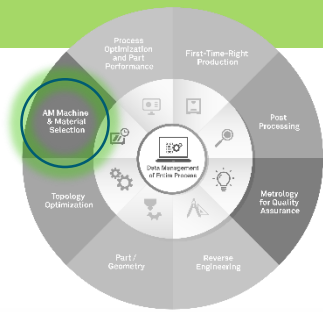
Stream Digimat

- Virtual material characterization
 - Composites, incl. FDM/FFF
 - Lattices
- Process simulation

Metals

simufact additive

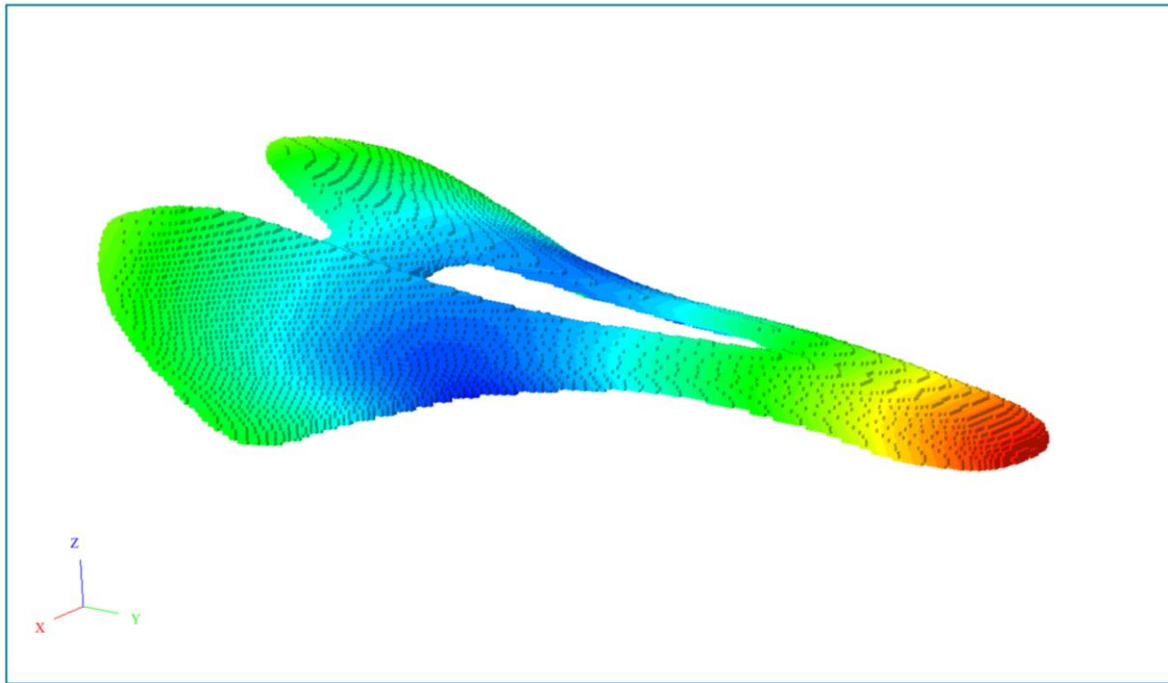
- Manufacturing process chain simulation
- Check material influence
- Check machine parameter influence



Process Optimization & Part Performance

Plastics & Composites

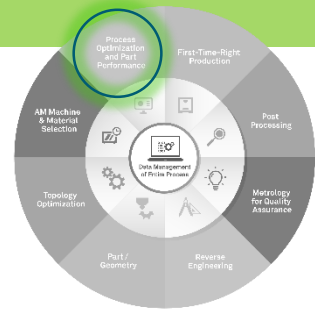
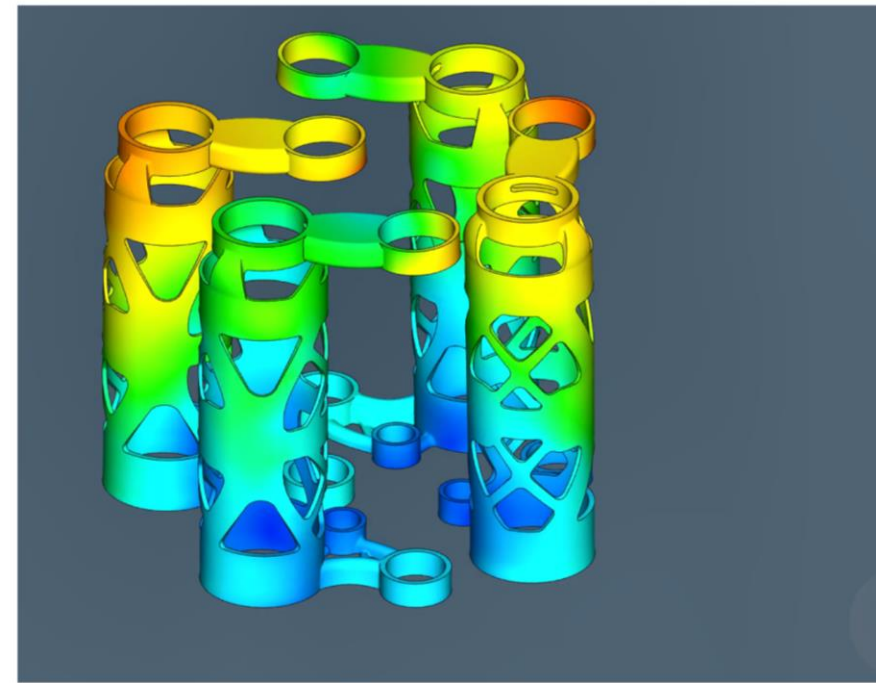
Stream **Digimat**



Distortion prediction & compensation | Identify manufacturing problems | Avoid failures | Part properties | Optimize Process

Metals

simufact additive



Process Optimization & Part Performance

Plastics & Composites

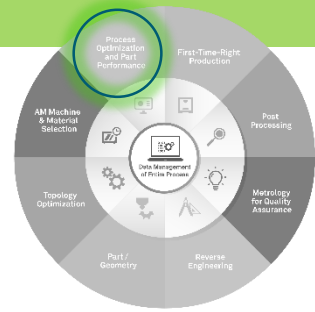
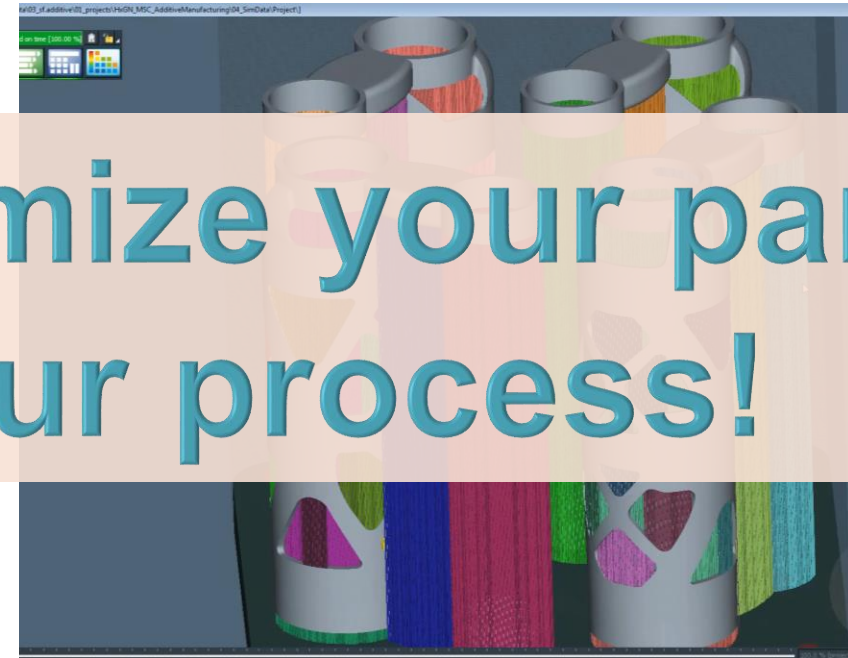
Stream **Digimat**



Don't just optimize your part,
optimize your process!

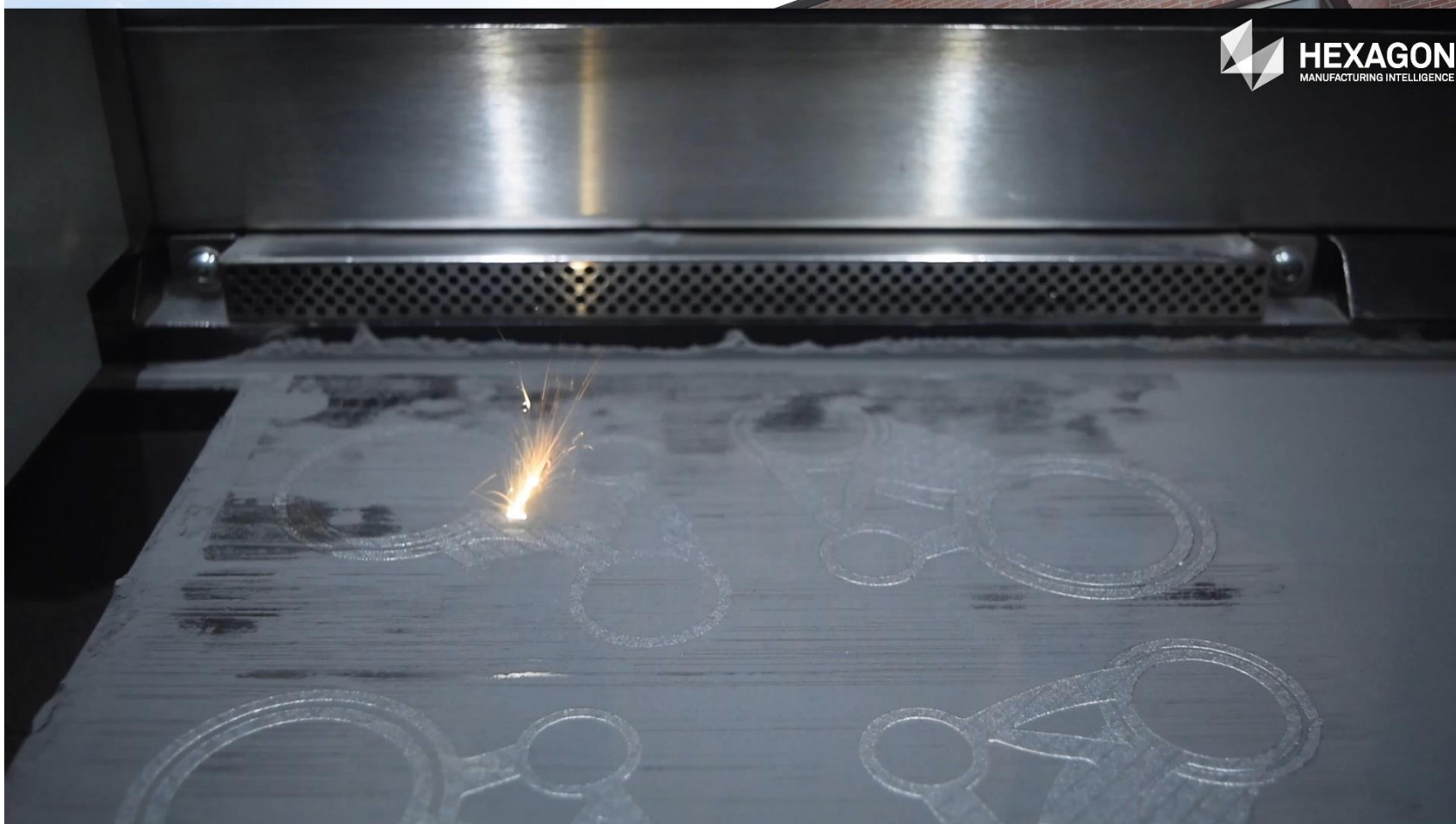
Metals

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Distortion prediction & compensation | Identify manufacturing problems | Avoid failures | Part properties | Optimize Process

First-time-right Production



WICHITA STATE
UNIVERSITY
NATIONAL INSTITUTE
FOR AVIATION RESEARCH

simufact additive

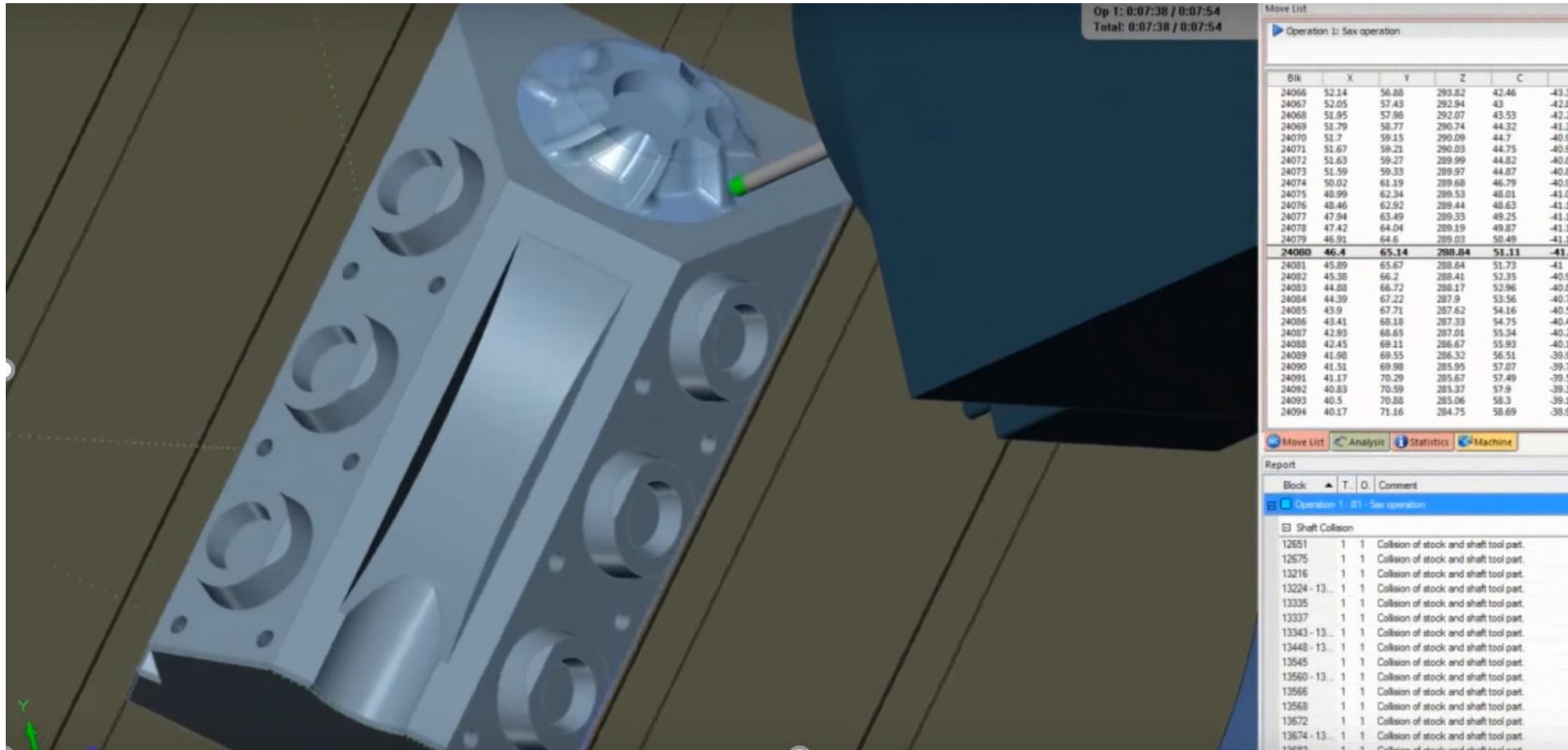
Stream Digimat



HEXAGON
MANUFACTURING INTELLIGENCE

Minimize distortion | Avoid failures | Optimize orientation | Optimize Supports | Predict part properties |
In-line monitoring (under investigation) | Reduce trial & error | Reduce time & cost efforts

Post-processing



- Simulate & optimize manufacturing post processing (HT, Cutting, Support removal, HIP) **simufact additive**
- Plan & simulate machining and deposition pathes

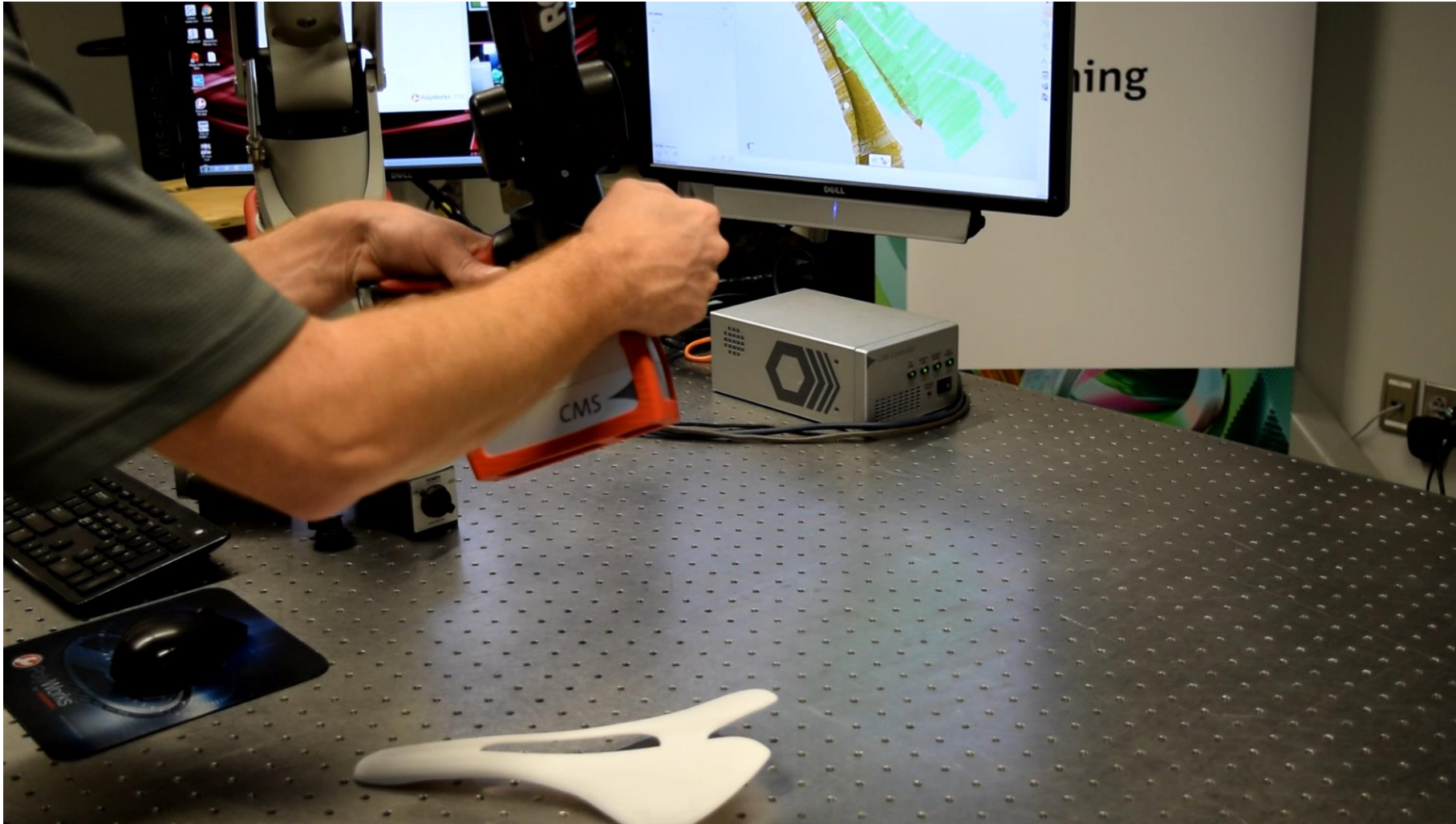


HEXAGON
MANUFACTURING INTELLIGENCE

EDGE CAM

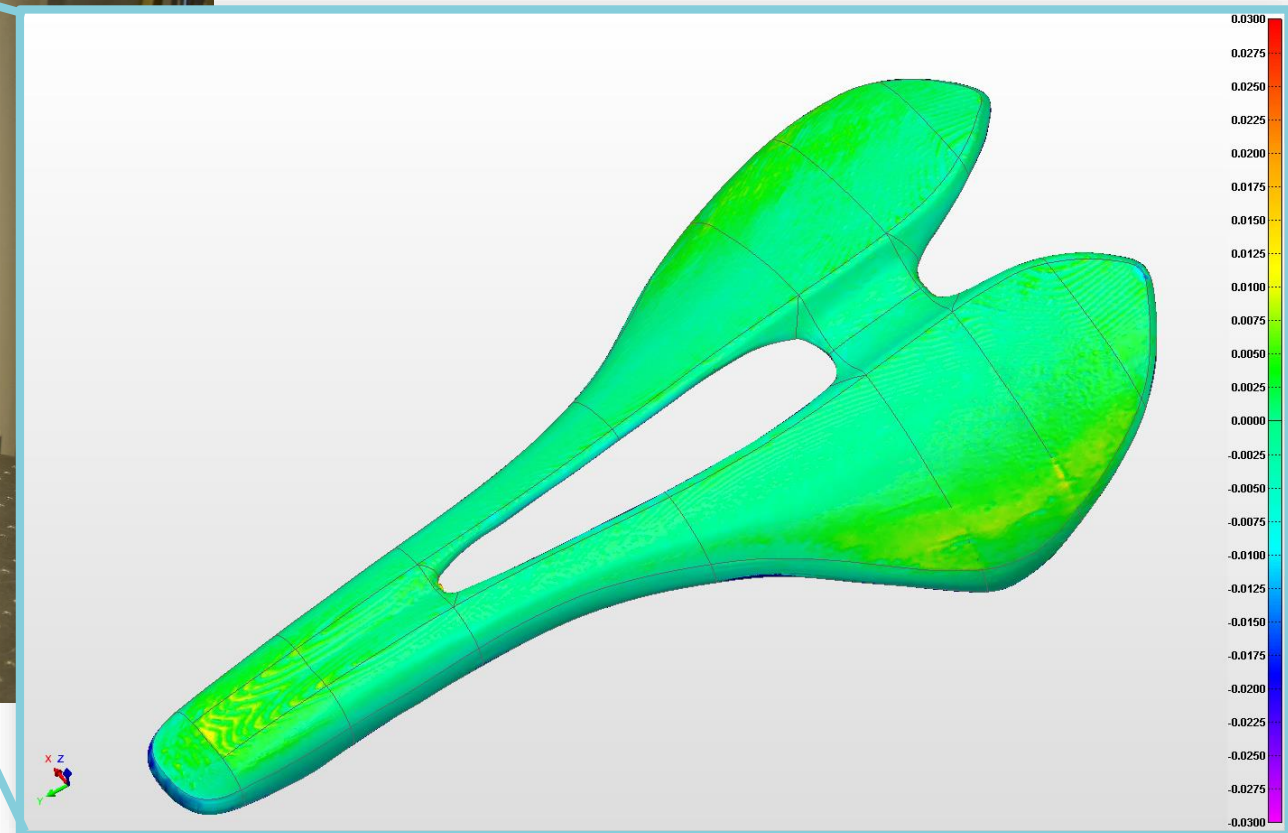
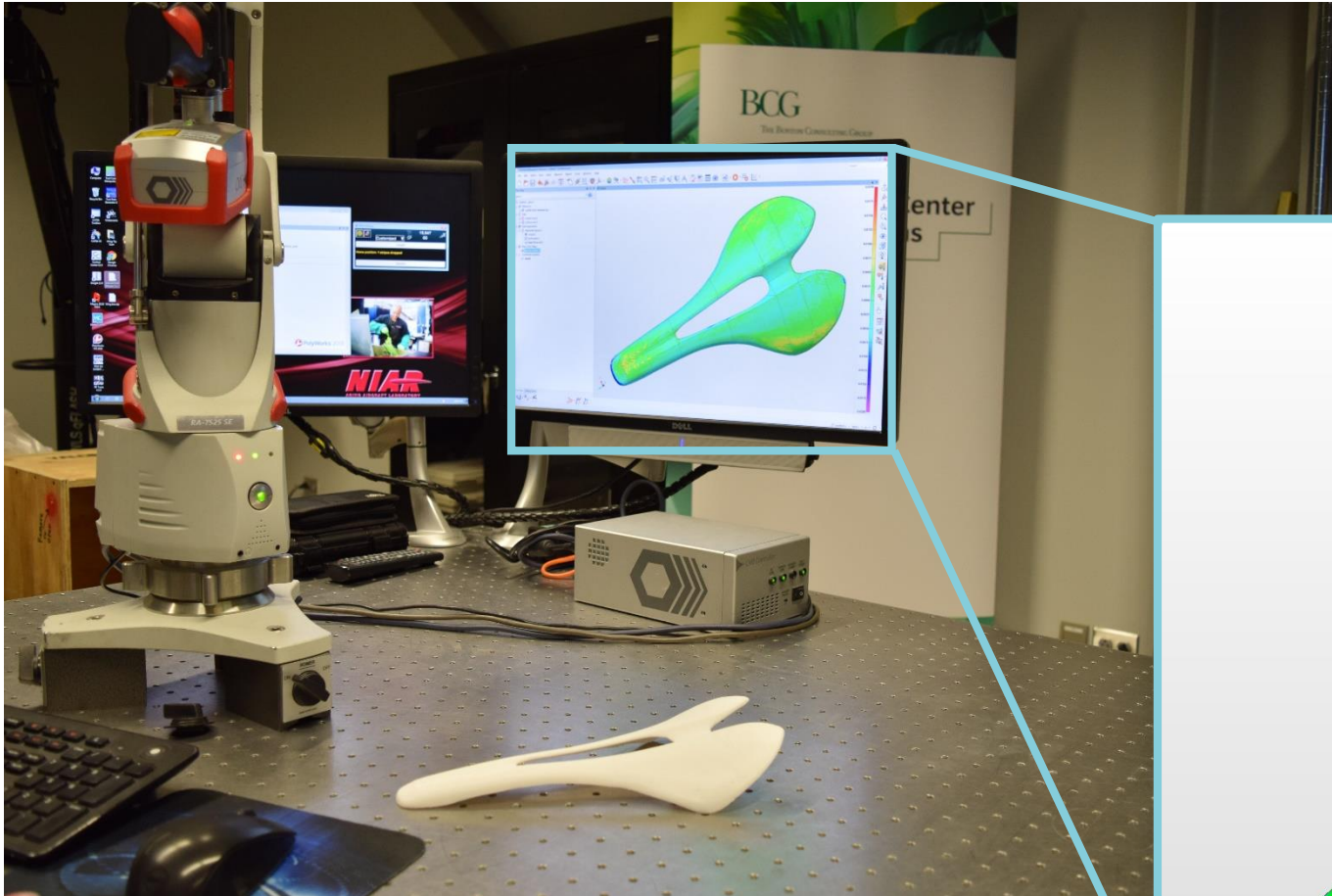
H9, E03

Metrology for Quality Assurance

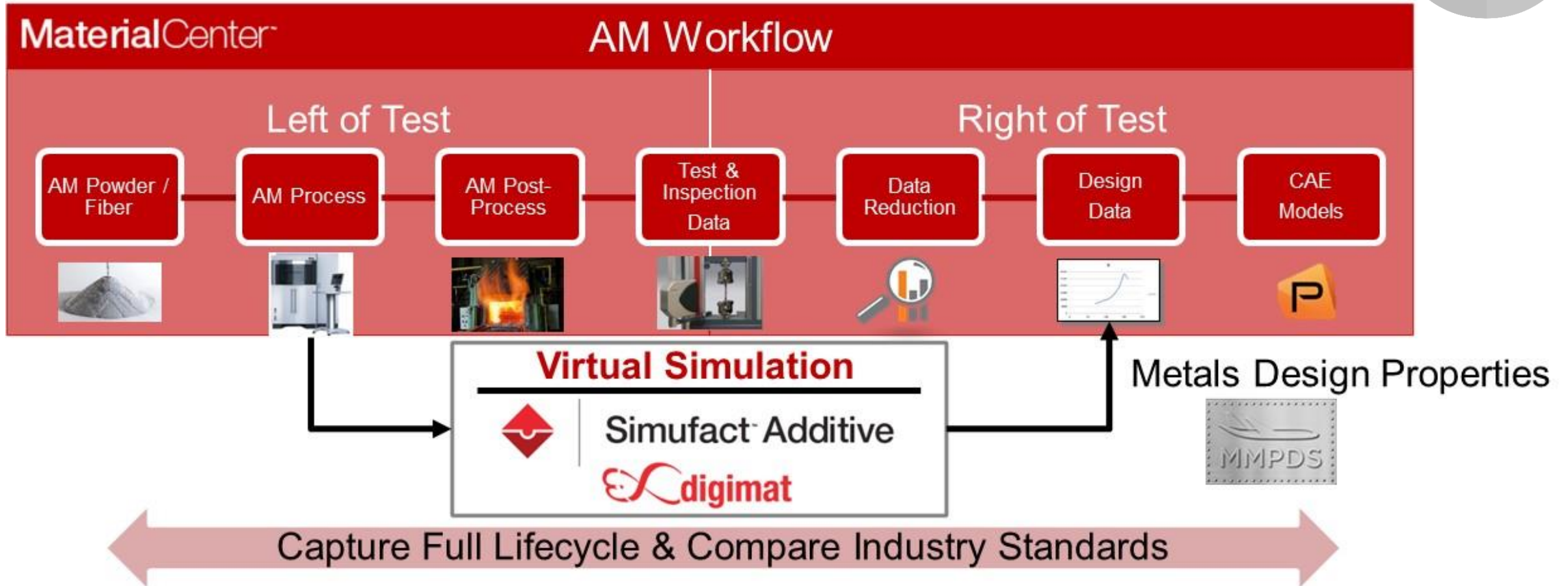


ROMER absolute arm

Metrology for Quality Assurance



Data Management of the entire Process





HEXAGON



Thank you very much! Vielen Dank! Mille grazie! Merci beaucoup!

MSC Software

simufact
Simulating Manufacturing

stream
ENGINEERING