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

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WHO ARE WE?

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

MSC Software
- 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
Simulating manufacturing - the manufacturing division of MSC 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

- ≈ 25 years
- > 80 experts
- > 1000 customers
**e-Xstream**, The material modeling company
66+ PhDs & MS Engineering 100% focused on advanced material modeling
+ 15 TBH in 2018

**Digimat**, 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

Foldable commuter bicycle with additively manufactured components

Upper Fork

Bike Saddle
Metrology for Reverse Engineering

RS5 laser scanner

H6, B60
Part / Geometry

CAE Specific Direct Modeling & Simulation Environment

- Finalize geometry
- Stress analysis
- Topology Optimization
Topology Optimization

- Topology Optimization
- Strength evaluation
- Finalize geometry
Topology Optimization

- Stress-oriented Optimization
- Optimized for Additive Manufacturing
- Significant Time Reduction
- Intelligent Smoothing
- Automated Retransition to CAD
- Up to 80% Reduction

- MSC Apex® Generative Design

- ✔️ Topology Optimization
- ✔️ Strength evaluation during optimization
- ✔️ Finalize geometry
- ✔️ Ready-to-print geometry (STL or CAD)
Machine & Material Selection

Plastics & Composites

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

Metals

- Manufacturing process chain simulation
- Check material influence
- Check machine parameter influence
Process Optimization & Part Performance

Plastics & Composites

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

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

Distortion prediction & compensation | Identify manufacturing problems | Avoid failures | Part properties | Optimize Process
First-time-right Production

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)
- Plan & simulate machining and deposition paths
Metrology for Quality Assurance
Metrology for Quality Assurance
Data Management of the entire Process
Thank you very much! Vielen Dank! Mille grazie! Merci beaucoup!