

Industry 4.0 Meets Additive Manufacturing

Steve Griffiths | Director Software Sales, North America




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CONNECTIVITY

Embrace a disruptive technology

#ConnectAM

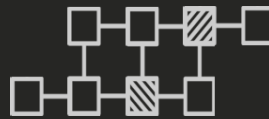
Don't be afraid of change in Innovation



Business Models



Product Life Cycle



Supply Chain



Intellectual Property



Compliance



Skill Set

Industry 4.0 Challenges



AM is part of **Industry 4.0.**



81%

of manufacturers
**already use
3D printing**

Jabil 3D Printing
Trends Survey 2019

38%

expect to use
AM for end-parts
by **2021**

EY Global
Printing Report 2016

\$100_{bn}

**overall impact
on the economy
by 2025**

McKinsey 2017

26%

**annual growth rate
with strong intra-industrial
investment in AM R&D**

Wohlers Report 2018

Winners challenge the status quo

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CERTIFIED AEROSPACE

“Now we take spare parts from a virtual shelf.”



VOLKER LIEDLOFF

Compliance Verification Engineer
328 Support Services GmbH

MASS CUSTOMIZATION

“AM allows us to react better to changing market demands.”



FÉLIX ESPAÑA

Global New Media Manager
HOYA Vision Care

COMPLEX GEOMETRIES

“A great design is strong. Even when 18 kg lighter.”



DR. ATSUSHI KAWAMOTO

Sr. Program Manager
Toyota Central R&D Labs

Toyota Central R&D

Pushing the Limits of Lightweight Design

- 72% lighter car seat, from 25kg to 7kg
- Improved heat distribution, better comfort
- 250GB file size transformed to 36MB





Philips Lighting

3D Printing Becomes Essential Production Thinking

- Production tools 3D-printed in metal
- Clever design that follows function
- Saves €89K/year in operational benefits



Airbus

Bionic Design, On-Demand
Production

- Drastically faster time-to-market than conventional manufacturing
- 15% lighter



RapidFit

The Next Generation of Automotive Tooling

- Up to 90% lighter
- Saving time and cost at each stage of production
- Replacing entire toolkits with a modular approach

What can AM do for your business?

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One-off Production



Mass Customization



Serial Manufacturing



Why do people turn to 3D printing?

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Time



Design



Cost

shorten time-to-market

create faster design iterations

become more market-responsive

reduce the cost of complex design

enable lighter, bionic designs

put function before form

eliminate tool production

enable mass customization

realize affordable small series

Production with AM is a reality

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Increased
availability
of materials

Continuously
improving
performance

Better understanding
of
suitable applications

Quality
control
software

Materialise Competencies

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- 30 years of experience in AM
- +2000 employees in 26 offices worldwide
- Team of AM-experts for training & consultancy

KNOWLEDGE

PRODUCTIVITY

Best-in-class software & services for high-end AM with award-winning modules to simulate, automate & guarantee steadfast quality

CONNECTIVITY

Our AM-ecosystem is open & customizable by nature...

...it connects your manufacturing in a network of 150+ solution partners

Partners

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Global Reach, Local Presence

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26 offices in 20 countries

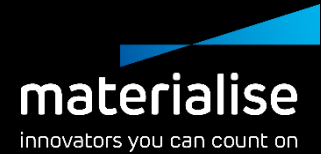


- Office
- Production
- Competence Center

+2000 employees

Materialise Software

is used in **+65 countries** around the world by

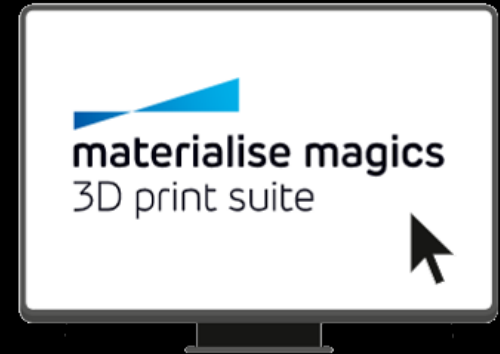


92% of the largest metal AM system manufacturers

85% of all automotive companies of the Fortune Global 500

68% of the largest industrial AM system manufacturers

40% of the top 20 companies of the Fortune Global 500



Creating innovation and competitive advantage across industries



**Materialise
Software**



**Materialise
Manufacturing**

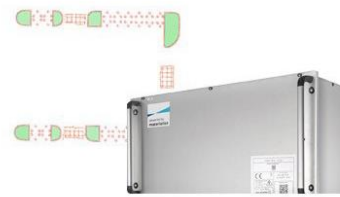
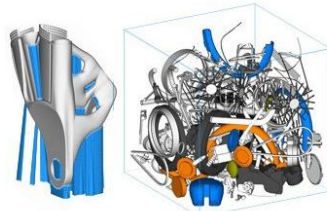
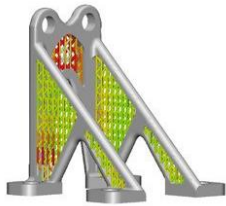


**Materialise
Medical**

Enabling Industry 4.0

From CAD File to Printed Part

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CAD File

Design Optimization

File Preparation

Machine Comm.

Result: Quality Part

Materialise 3-matic
Available in APA

Materialise Magics
Materialise e-Stage

Materialise Build Processor
Materialise Control Platform

Materialise Inspector

Streamics Control and Automation

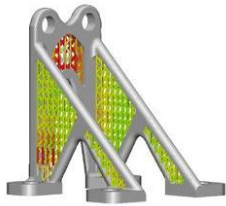
Enabling Industry 4.0

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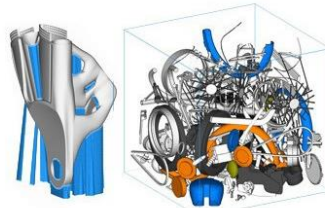


CAD File



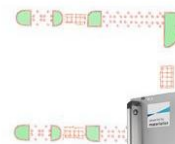
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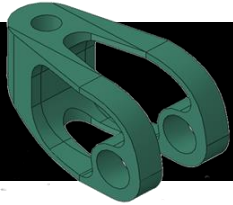


Materialise 3-matic

Available in the APA

materialise magics
3D print suite

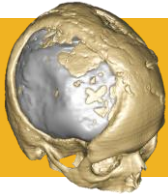
Materialise 3-matic



**Parametric
Design (CAD)**

- ▶ Quick creation of 3D textures
- ▶ Design lattices to reduce weight
- ▶ Import .fem lattices

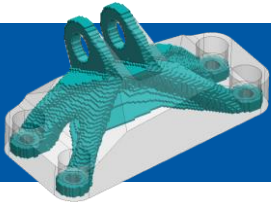
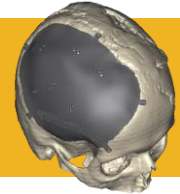
**Lattices and
textured
design**



**Scanned and
Image Data**

- ▶ Rough, incomplete mesh
- ▶ Make design on top of mesh
- ▶ Highly personalized designs

**STL design
directly on fixed
scan mesh**



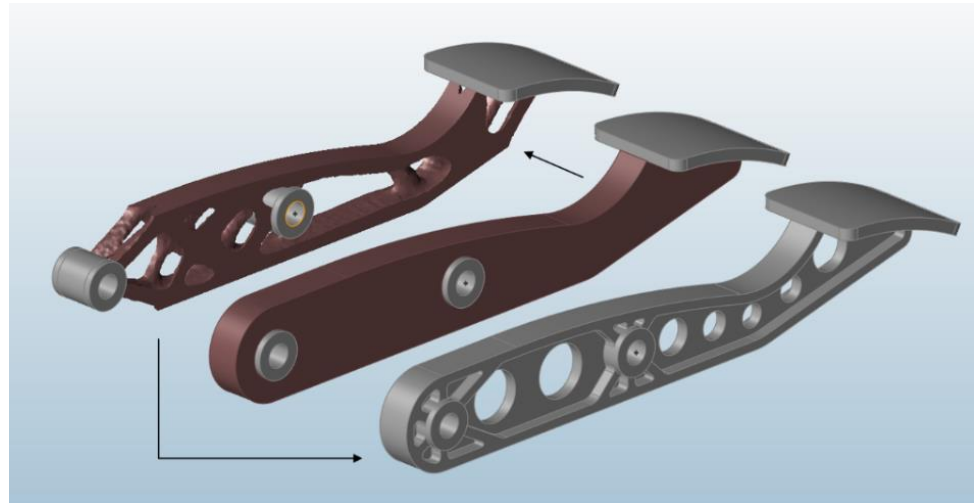
**Topology
Optimization**

- ▶ Optimal shape approximation
- ▶ Redesign on mesh-level
- ▶ Parts for optimal performance

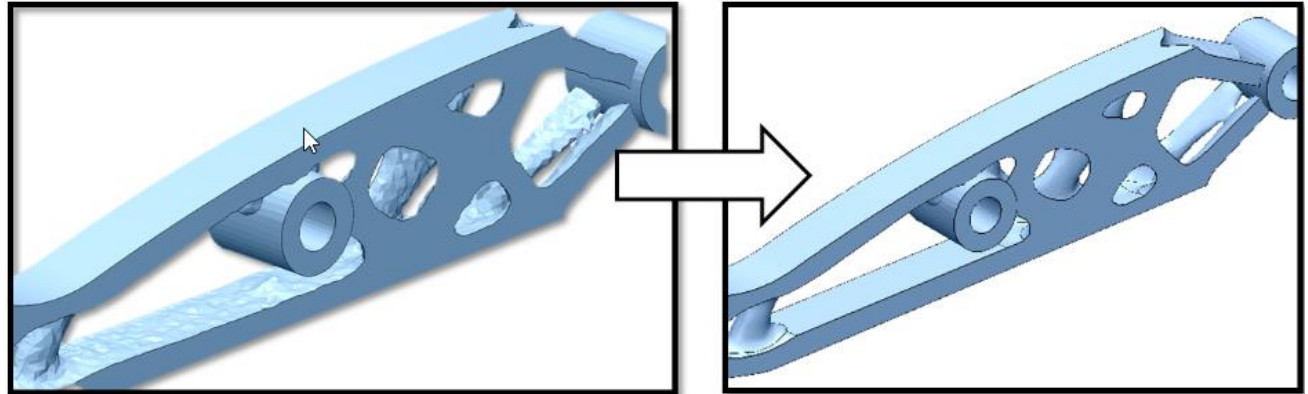
**Cleaned up and
re-designed
geometries**



- Altair topology optimization to minimize break pedal volume



- Altair topology optimization to minimize break pedal volume
- Materialise 3-matic
 - To make a printable part



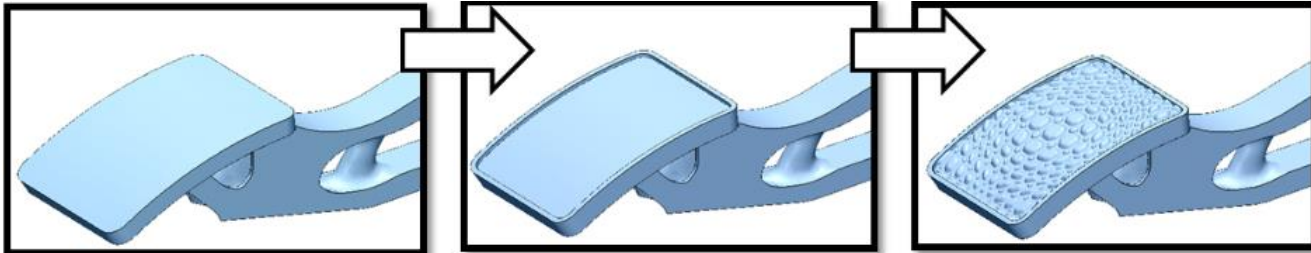


Materialise 3-matic

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3D print suite

- Altair topology optimization to minimize break pedal volume
- Materialise 3-matic
 - To make a printable part
 - Add texture to pedal surface



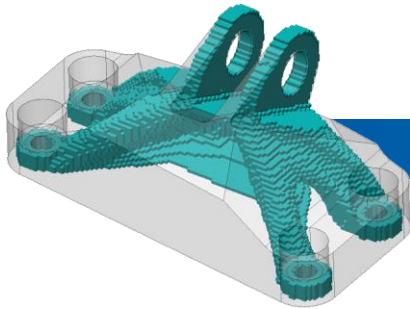


Materialise 3-matic

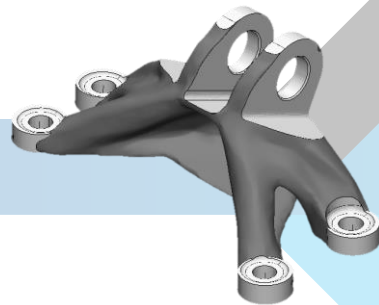
Available in the APA

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3D print suite

Materialise 3-matic



Topology optimization
output or file scanning



- Saves time
- Close to optimized shape
- High quality mesh – FEA
- Reverse engineering – CAD
- Completely fixed for printing
- Lattices possible



To CAD
(parametric)



To Magics
(printing)



To FEA
(good mesh)



The time to **#ConnectAM** is *now*.

CONNECTIVITY



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“Our mission is to innovate product development that results in a **better and healthier world**, through our software and hardware infrastructure, and an in-depth knowledge of Additive Manufacturing.”

Fried Vancraen, CEO

Empowering meaningful 3D printing applications since 1990

“If you want to be a Factory of the Future, you don’t work in a vacuum. We’ve always been supporting **co-creation and open solutions**. Enabling interconnectivity is a strategic focus for us, and one of the biggest trends in 3D printing in 2019.”

Bart Van der Schueren, CTO

Empowering meaningful 3D printing applications through co-creation

Thank you.