

Additive Fertigung optimieren und industrialisieren Businessvorteile für die Automobil-Industrie

Jürgen Stierle & Helmut Zeyn

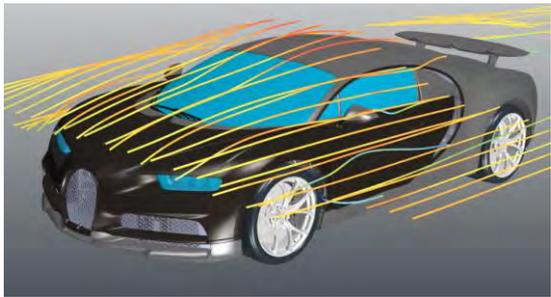
It's time to rethink

EVERYTHING

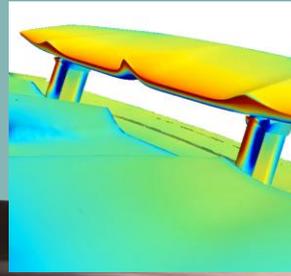
Industrializing Additive Manufacturing

Produce useful parts at scale

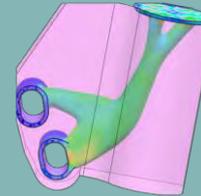
Requirements /
Original design



Load definition



Design optimization

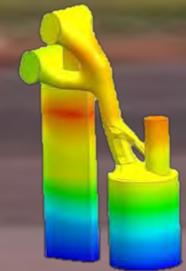


Refine design
Convergent Modeling™



Associative & Iterative

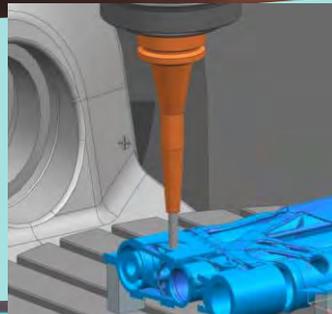
Validate
Product and process
simulation



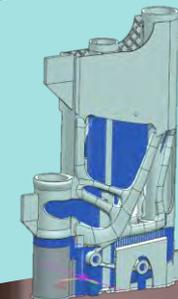
Final system

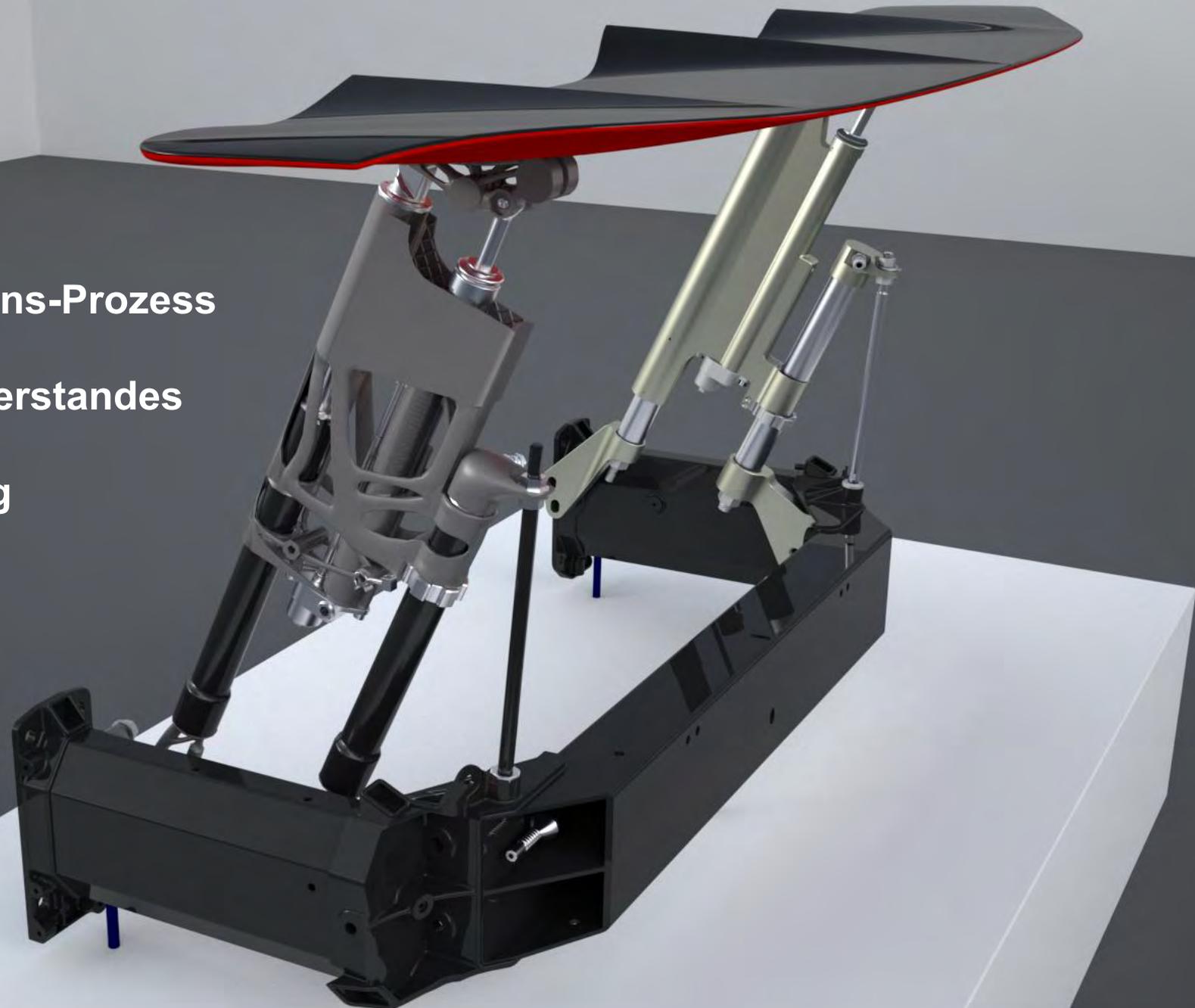


Post processing
(heat treatment, machining
and inspection)



Prepare for 3D printing*





10 x schnellerer Innovations-Prozess

Verringerung des Luftwiderstandes

53% Gewichts-Einsparung



Hackrod and Siemens Partner to Enable Unprecedented Automotive Design and Production

Hackrod Siemens PLM Software partnership will accelerate engineering design and manufacturing within the automotive space

NEWS PROVIDED BY

Hackrod, Inc.

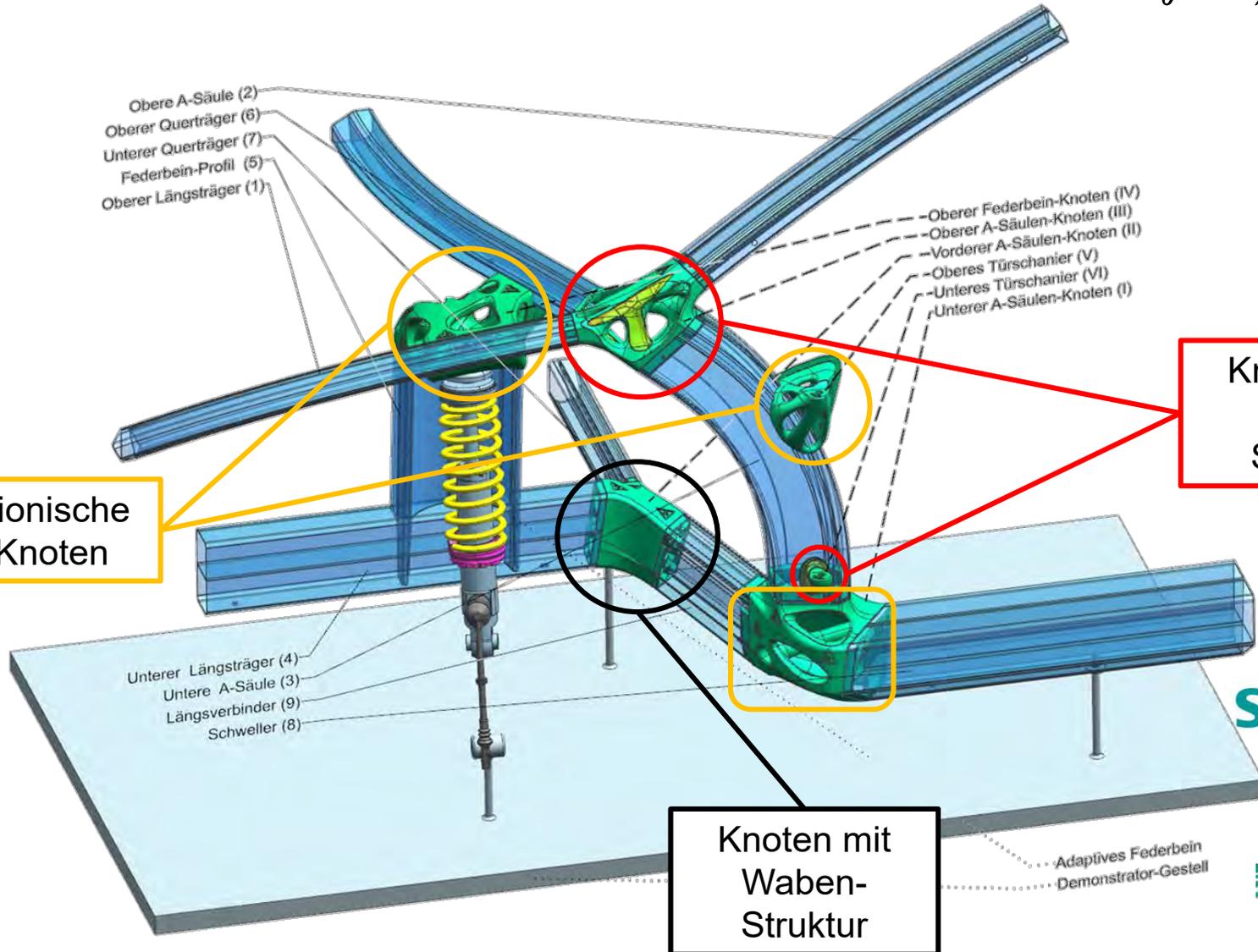
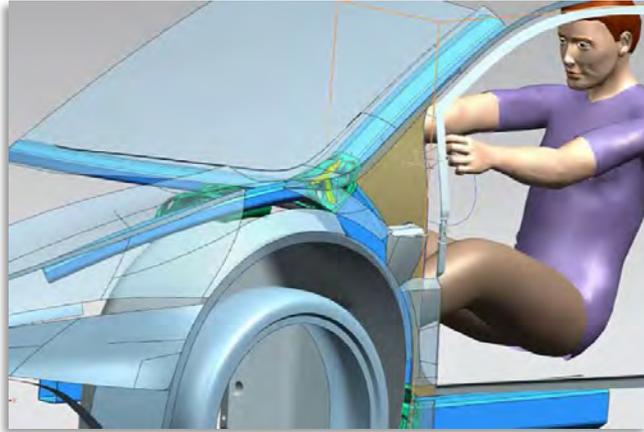
Mar 21, 2018, 15:35 ET



NX – Eine integrierte Lösung für Additive Fertigung

“NextGen Spaceframe 2.0”

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Knoten mit Gitter-Struktur

Bionische Knoten

Knoten mit Waben-Struktur



EDAG

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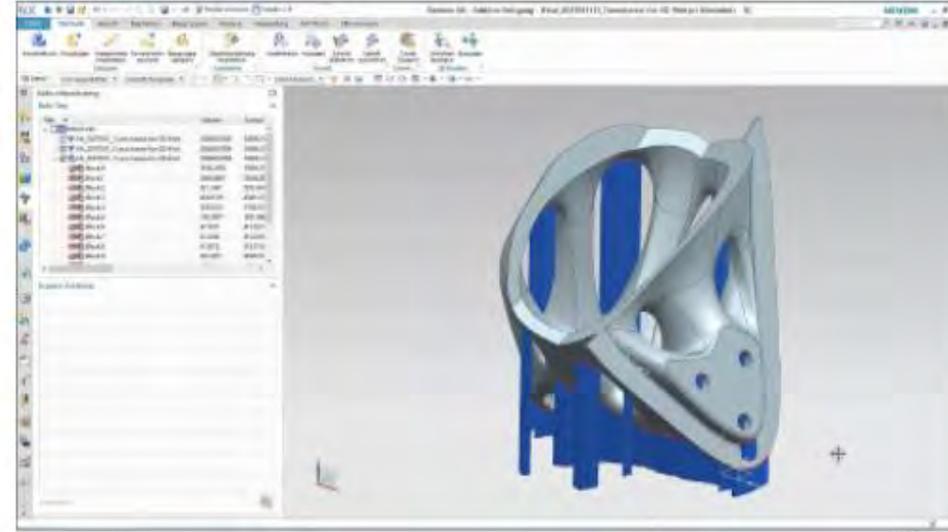
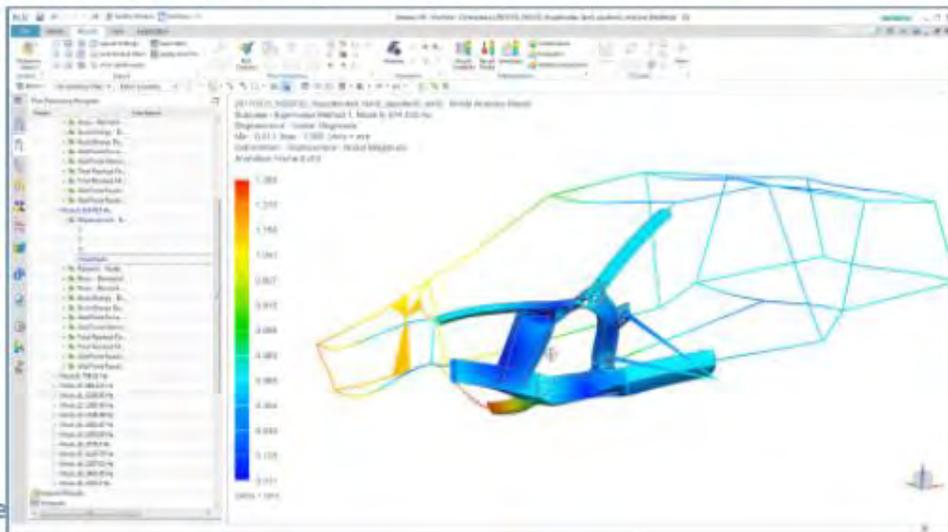
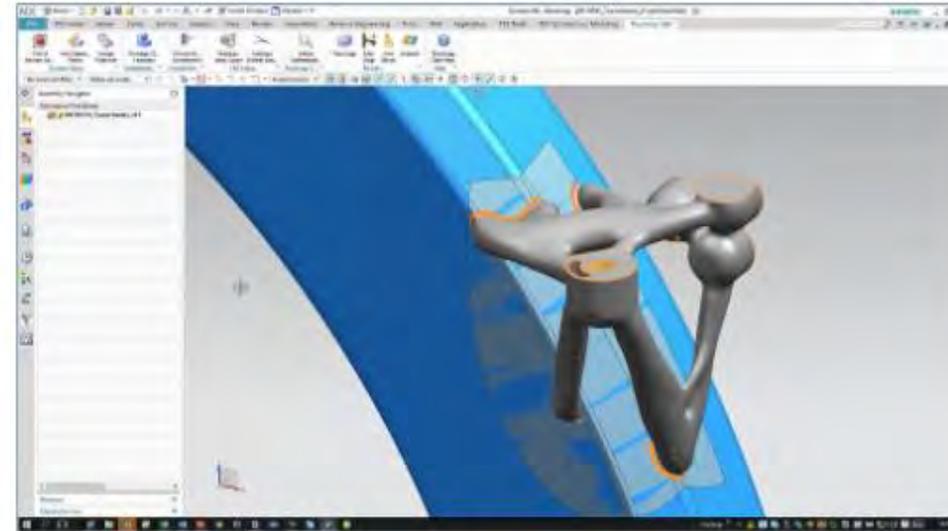
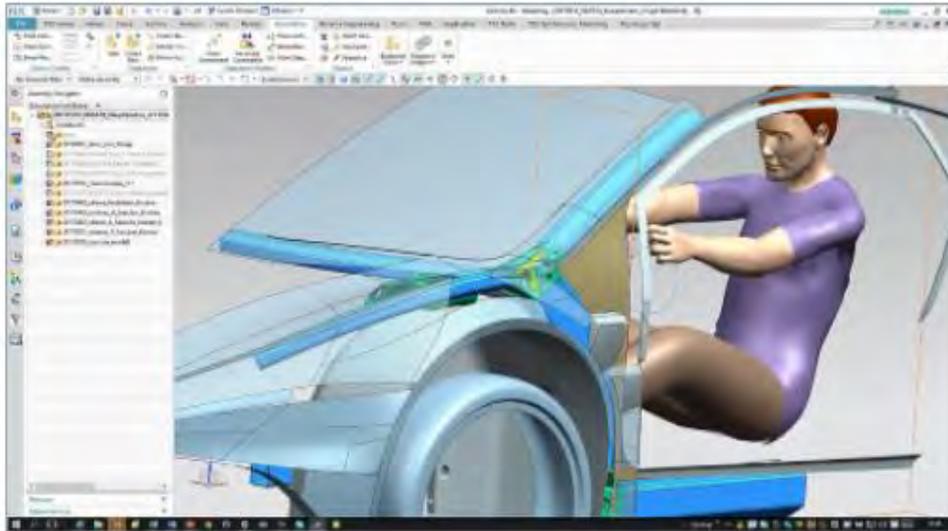
EDAG

Fraunhofer IAPT

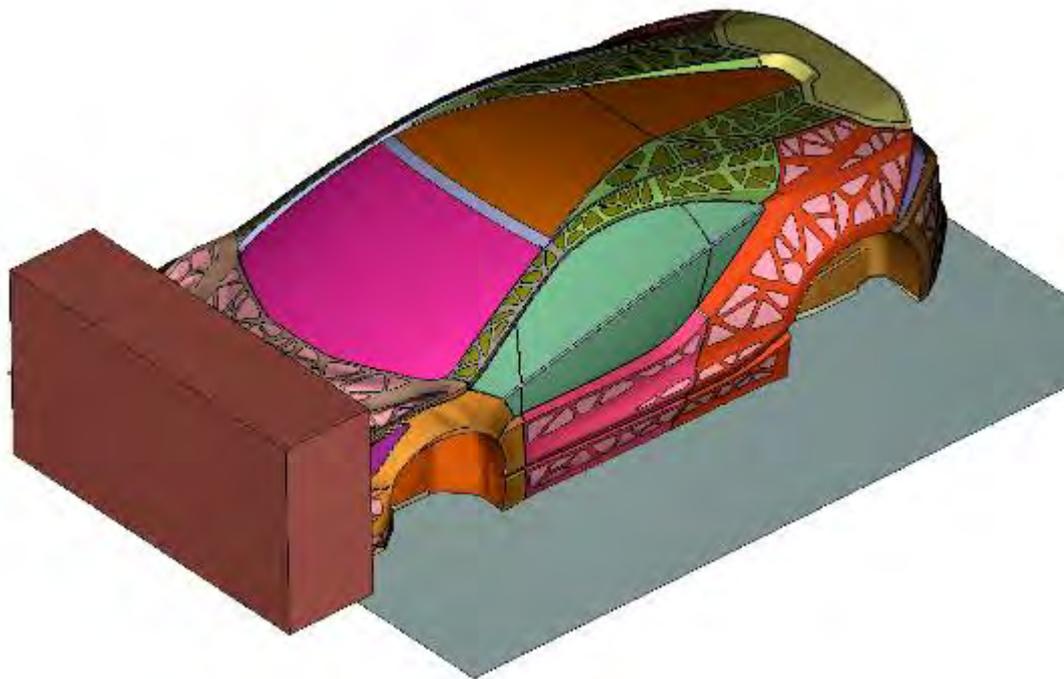
NX – Eine integrierte Lösung für Additive Fertigung

Anforderungs-getriebenes, Generatives Design bis hin zum 3D Druck

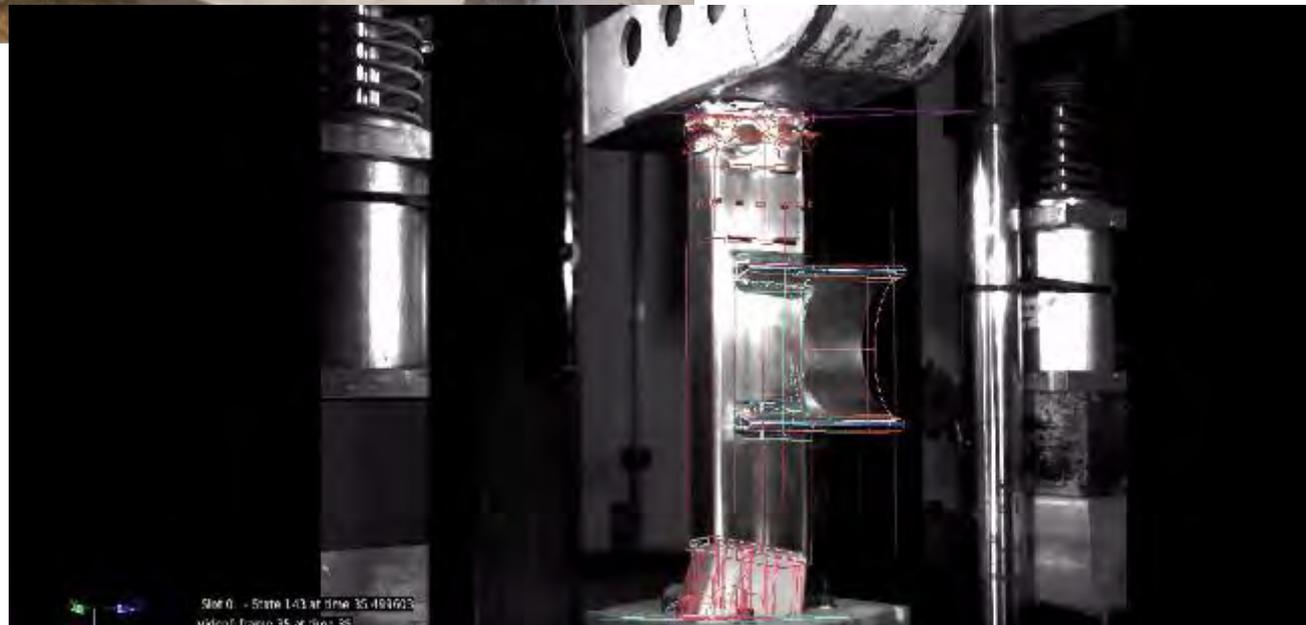
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Tests



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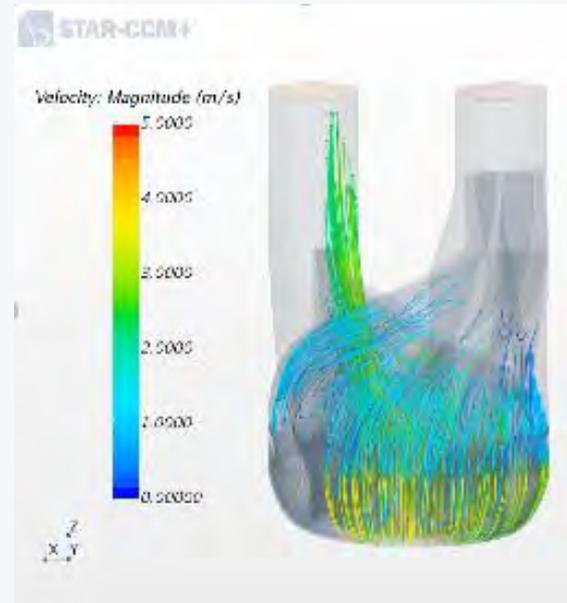
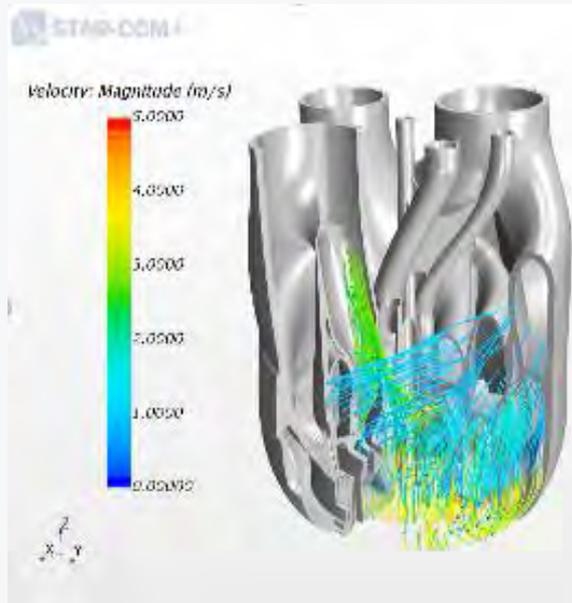
Innovationen – Inkrementeller Fortschritt bringt keinen Wettbewerbsvorteil



Siemens Brennerdüse

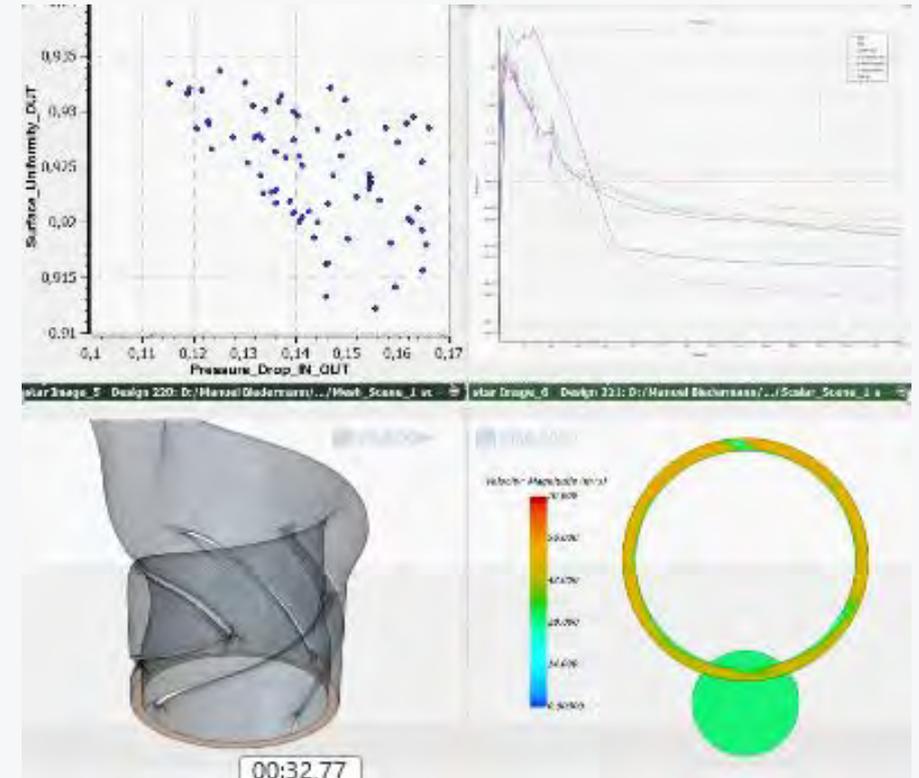
Simulations-getriebenes Design

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Simulation Kühl-Flüssigkeit (STAR-CCM+)

Design-Auslegung (HEEDS)

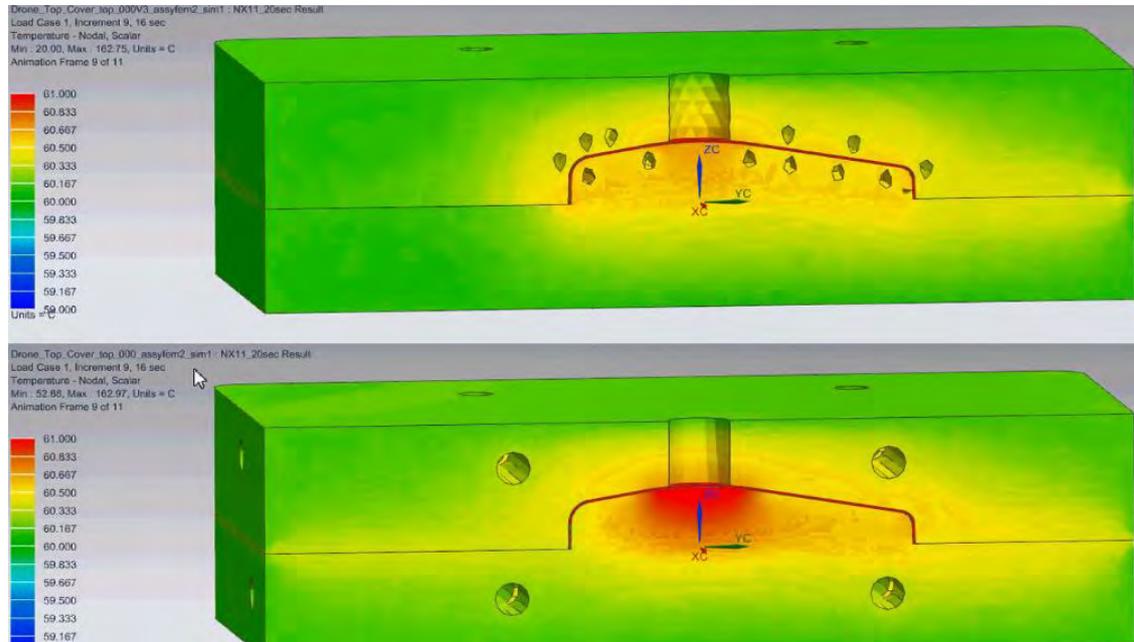


Effektive Werkzeuge Konturnahe Kühlung

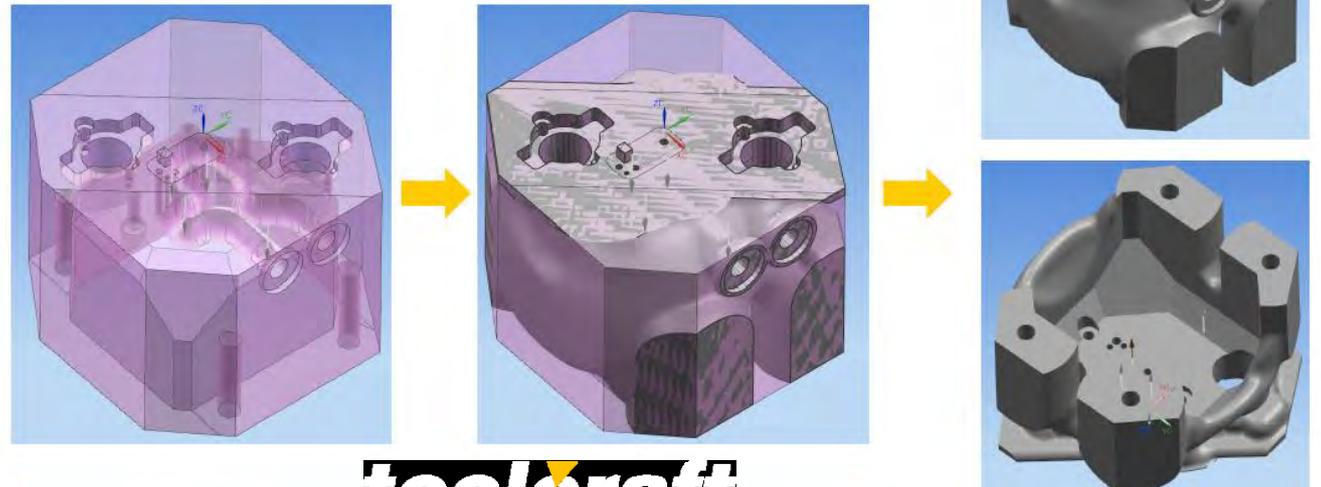
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Halle 3.0 – E50



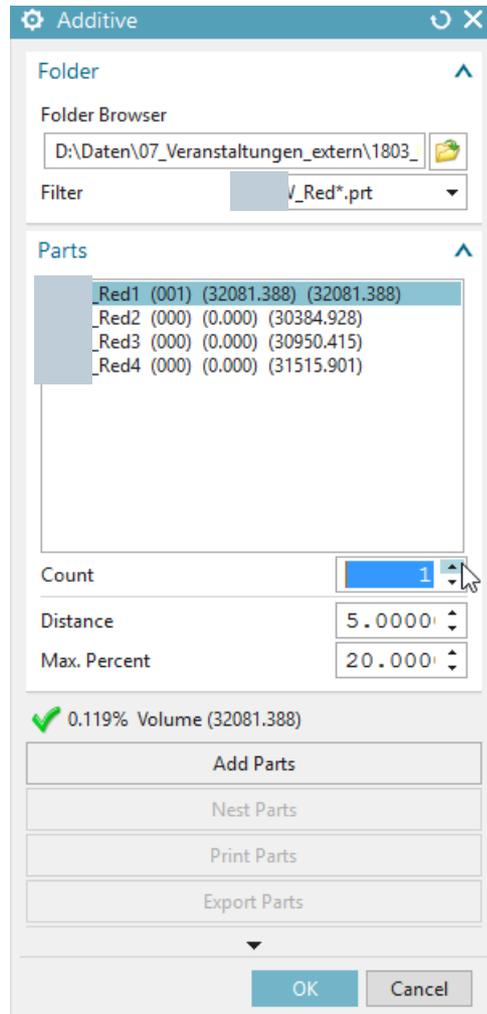
Deutlich kleinere und leichter
Weniger Bauteile
Besseres Kühlverhalten



toolcraft

Mass-Customization

Automatisierung individueller Produktion



- Automatischer MES gesteuerter Workflow
- Kann in NX durch API beliebig angepasst werden

Name	X	Y	Z	Xx	Xy	Xz	Yx	Yy	Yz	Zx	Zy	Zz
Red1	100.934	72.616	270.001	0.000	-1.000	0.000	1.000	0.000	0.000	0.000	0.000	1.000
Red1	100.934	85.884	264.999	0.000	1.000	0.000	1.000	0.000	0.000	0.000	0.000	-1.000
Red1	118.384	125.501	172.066	1.000	0.000	0.000	0.000	0.000	-1.000	0.000	1.000	0.000
Red2	100.934	-127.001	244.616	0.000	0.000	-1.000	1.000	0.000	0.000	0.000	-1.000	0.000
Red2	-102.434	-119.884	252.499	0.000	-1.000	0.000	-1.000	0.000	0.000	0.000	0.000	-1.000
Red2	-109.066	-121.999	32.884	0.000	0.000	1.000	1.000	0.000	0.000	0.000	1.000	0.000
Red2	-11.999	118.384	27.934	0.000	1.000	0.000	0.000	0.000	1.000	1.000	0.000	0.000
Red2	110.116	10.066	252.501	-1.000	0.000	0.000	0.000	-1.000	0.000	0.000	0.000	1.000
Red2	-114.116	45.501	74.566	1.000	0.000	0.000	0.000	0.000	-1.000	0.000	1.000	0.000
Red2	-116.616	120.066	212.499	1.000	0.000	0.000	0.000	-1.000	0.000	0.000	0.000	-1.000

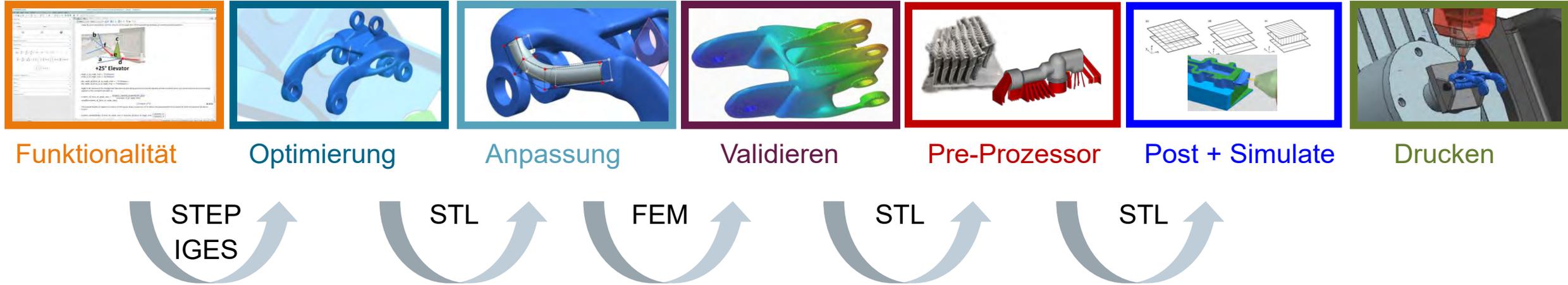
Siemens Strategie Additive Manufacturing

Traditioneller Prozess

Viele Prozessbrüche

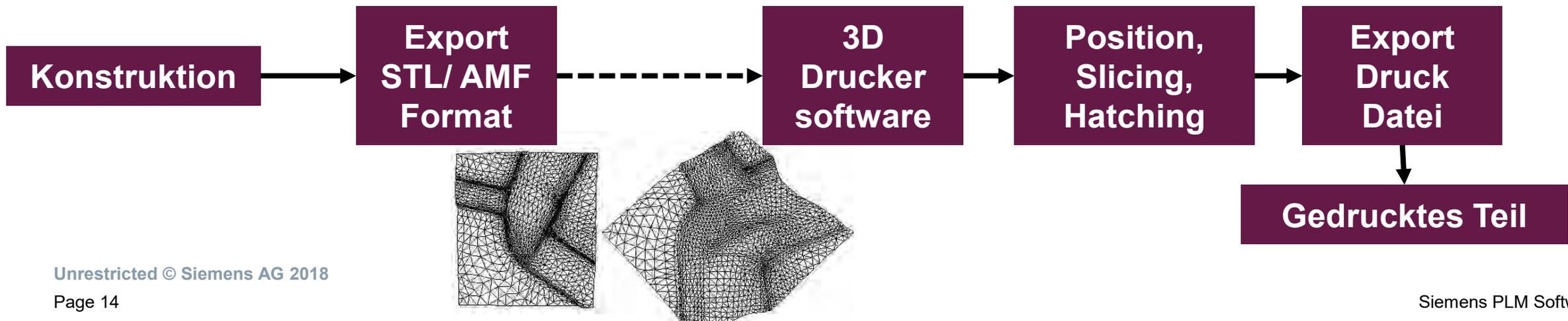
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PLM Managed

Unmanaged – Uncontrolled



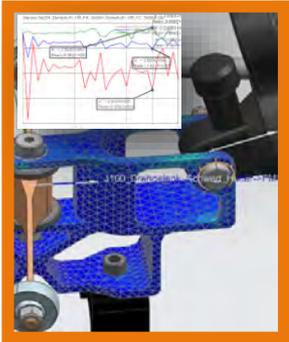
NX – Eine integrierte Lösung für Additive Fertigung

Von Anforderungs-getriebenen Design zum fertigen Produkt

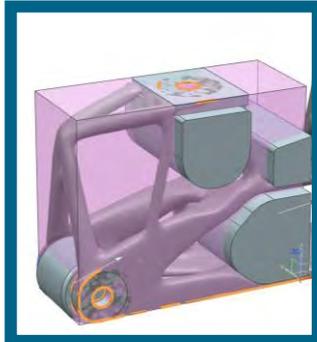
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1 – Produkt Design

2 - Produktion Planung



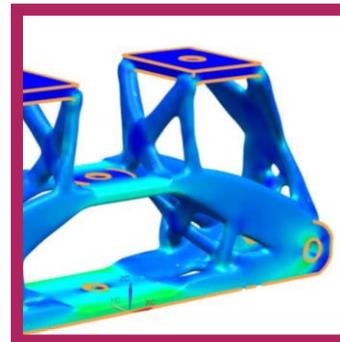
Anforderungen



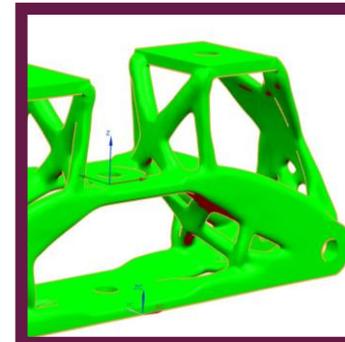
Generatives Design



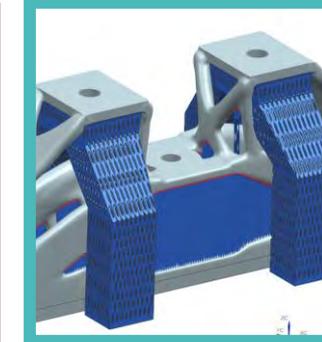
Adaption



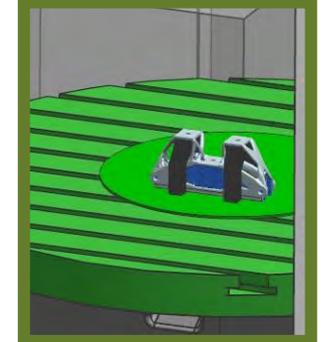
Performance Validierung



Prozess Simulation



Pre-Processing & 3D Druck

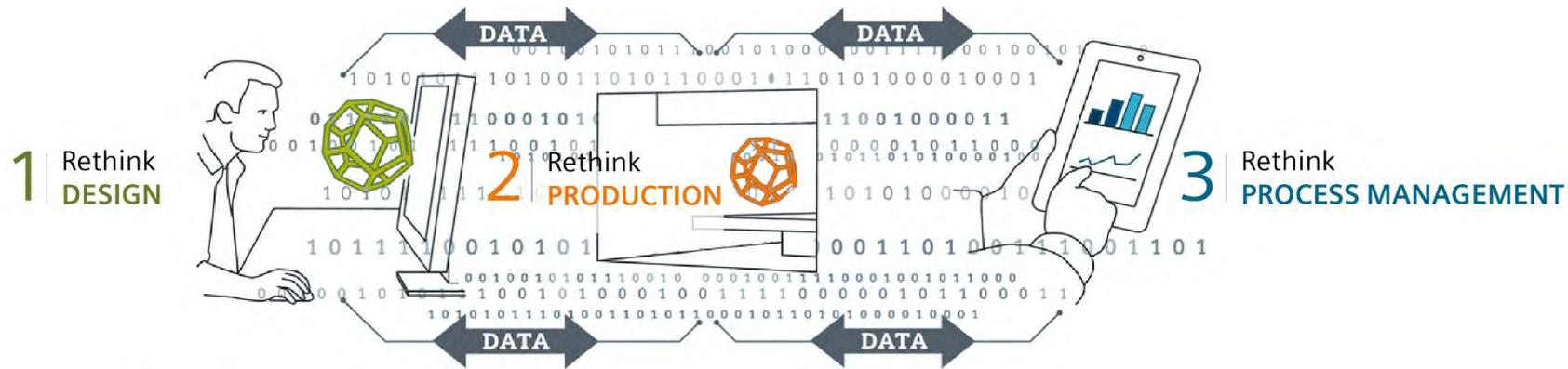


Nachbearbeitung & QMS

Daten und Prozess Management

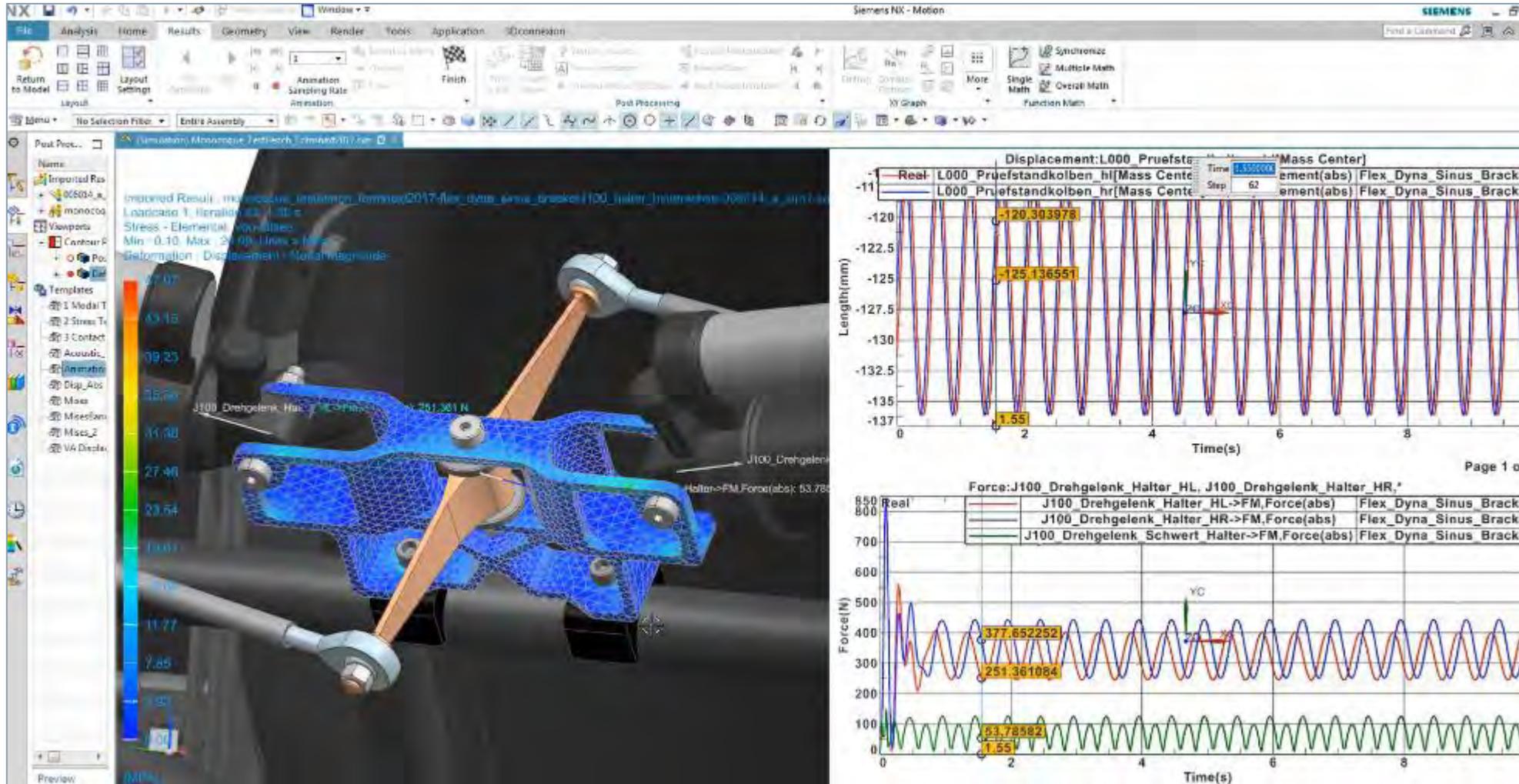
Siemens liefert Bausteine für die komplette Prozesskette in der Additive Fertigung

Siemens forciert die Industrialisierung der Additiven Fertigung

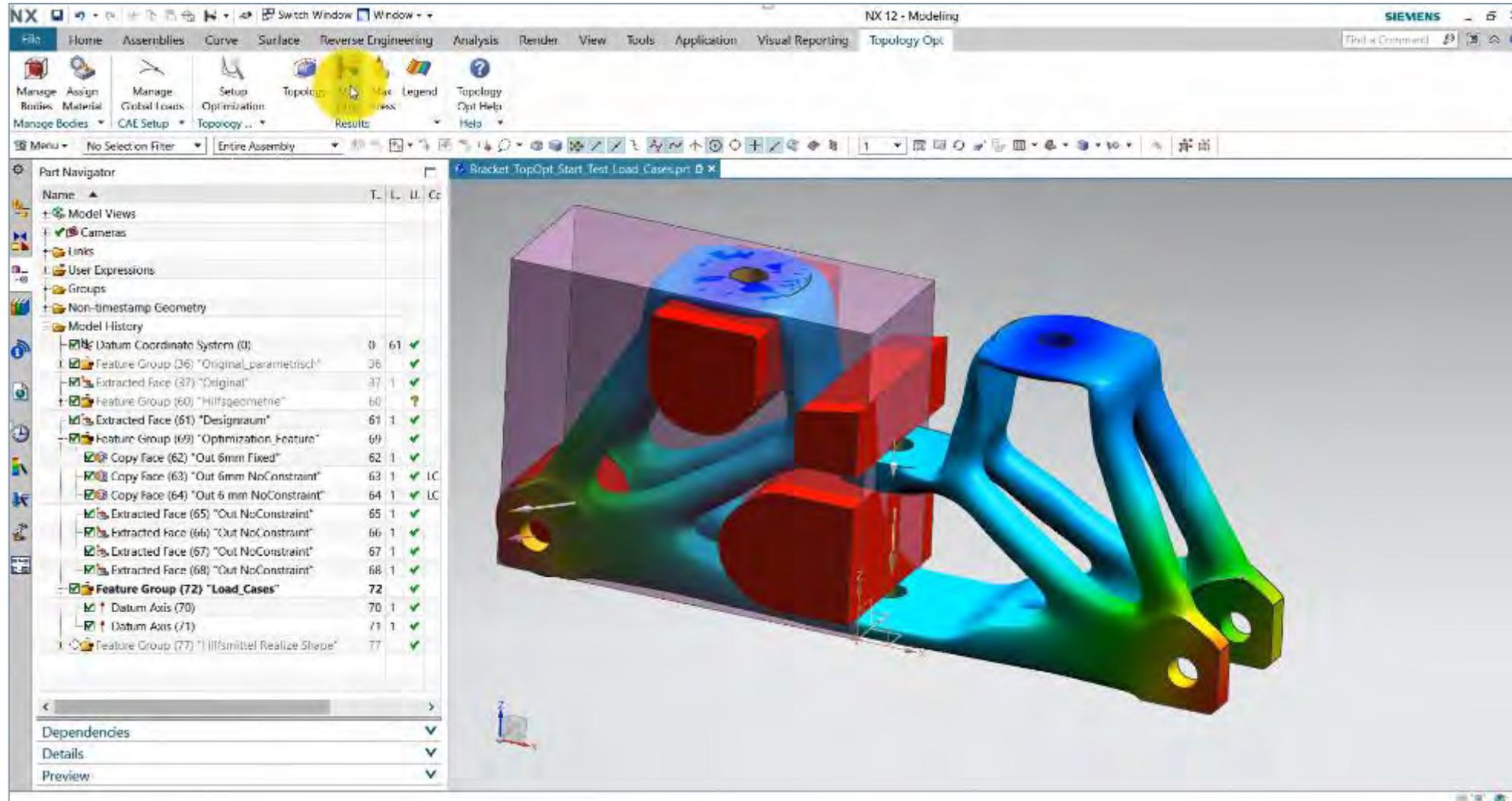


SIEMENS PLM Software	SIEMENS AUTOMATION	SIEMENS MOM
<p>NX TEAMCENTER</p> <p>Design Optimize Adapt Validate</p> <p>Prepare Generate print path Make</p>	<p>SINUMERIK SINAMICS SIMOTICS</p> <p>SIMATIC Controller / HMI / IPC / IOs SIMOTION</p>	<p>SIMATIC IT Unified Architecture</p> <p>Complex Genealogy and Traceability</p> <p>Raw Material Preparation and Tracking</p> <p>Print Job File and Serial Number Management</p> <p>Substrate Management</p>
End-to-end AM solution	Totally Integrated Automation	Manufacturing Operations Mgmt.

Live Präsentation Jürgen Stierle

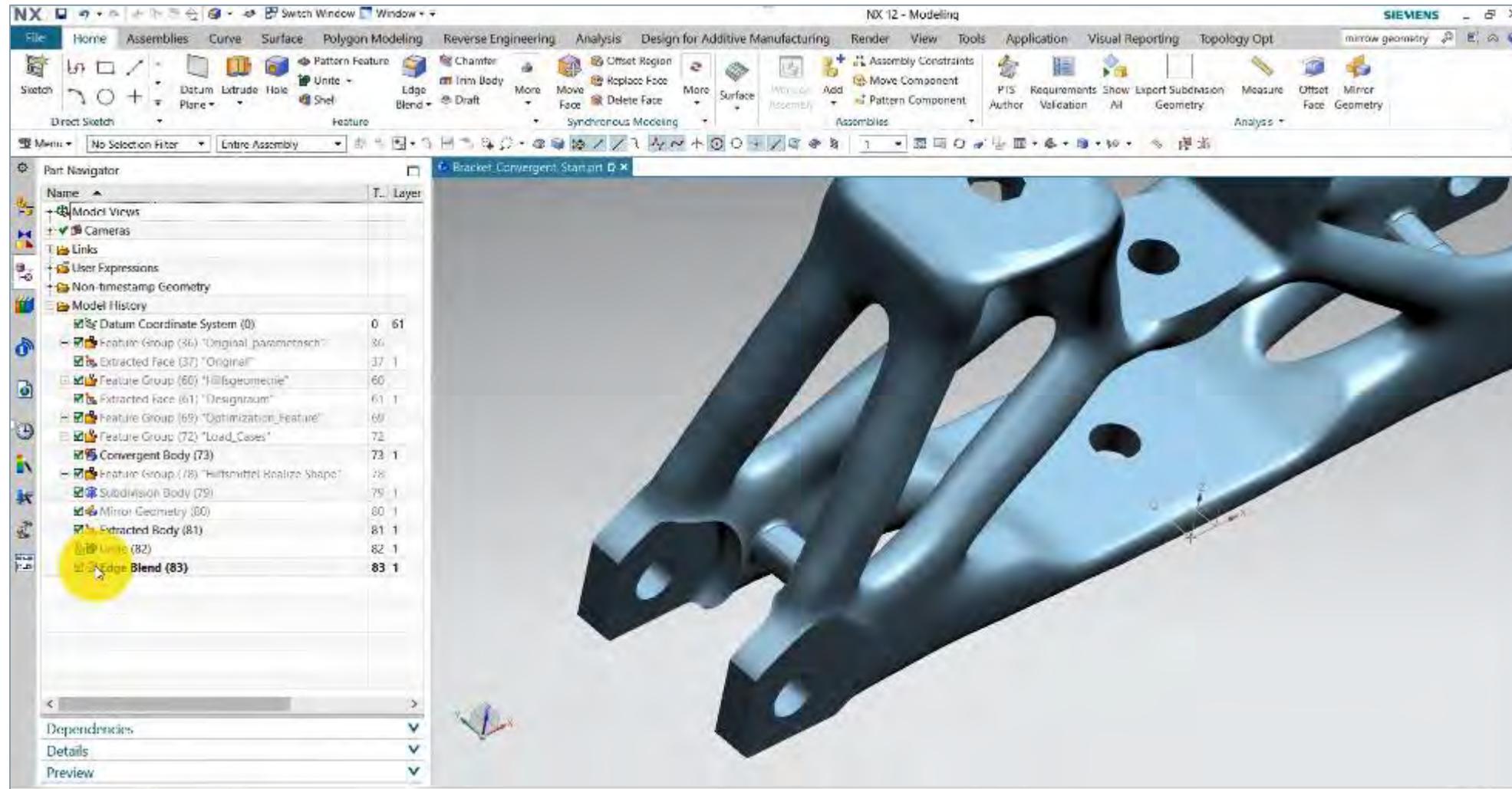


Topologie-Optimierung für Konstrukteure



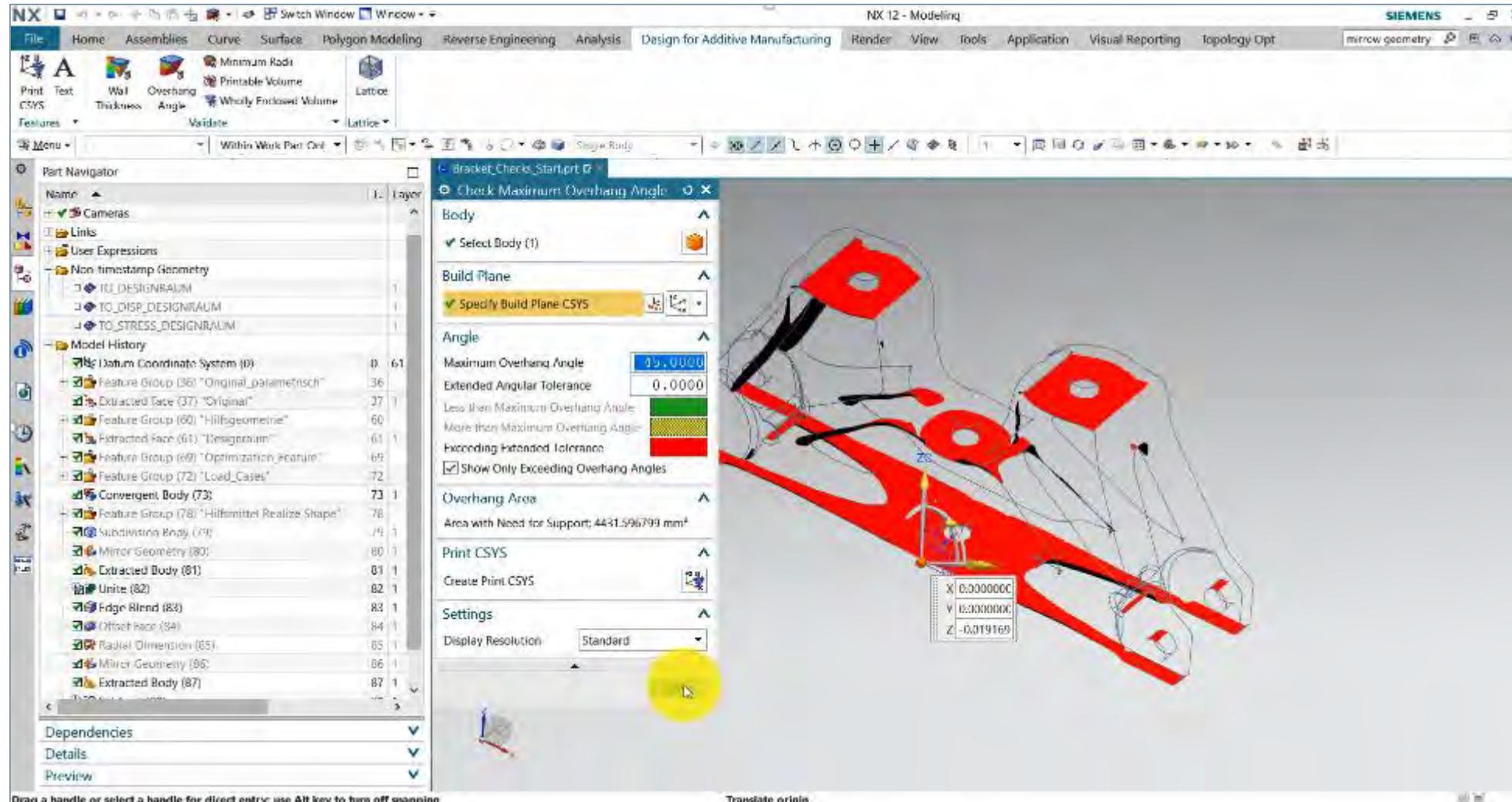
Convergent Modeling/Realize Shape/Polygon Cleanup

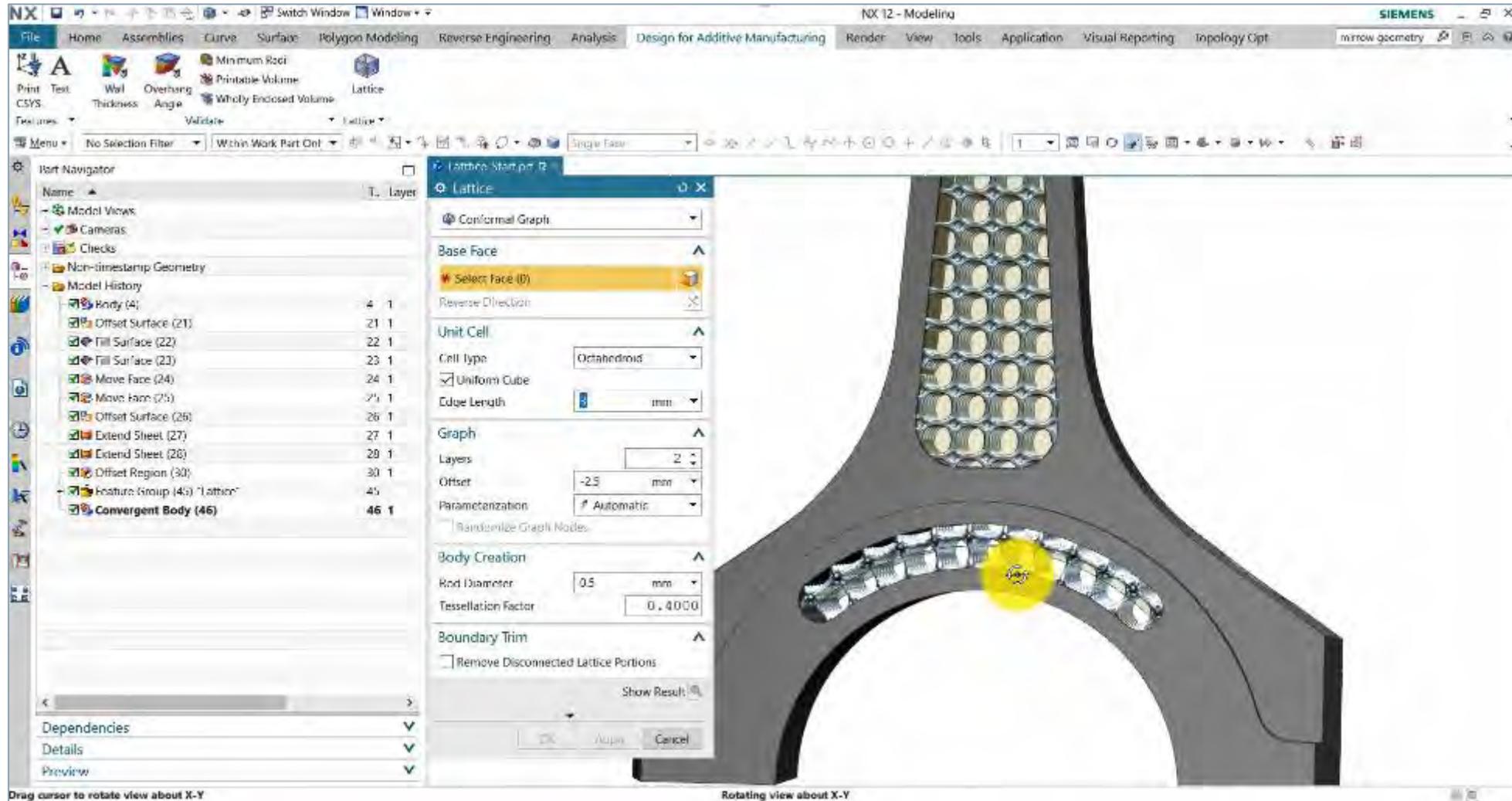
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Additive Manufacturing Checks für Konstrukteure

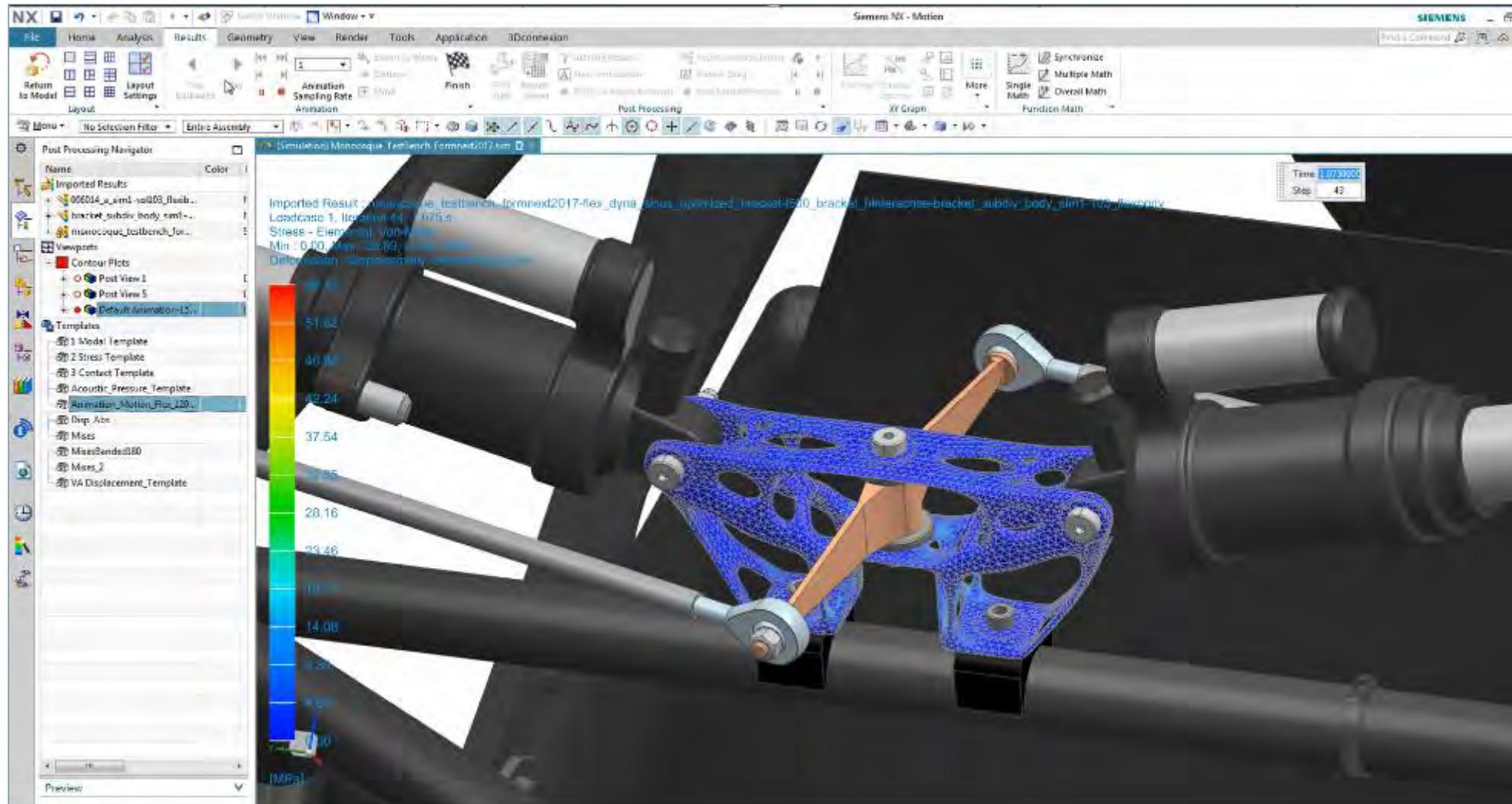
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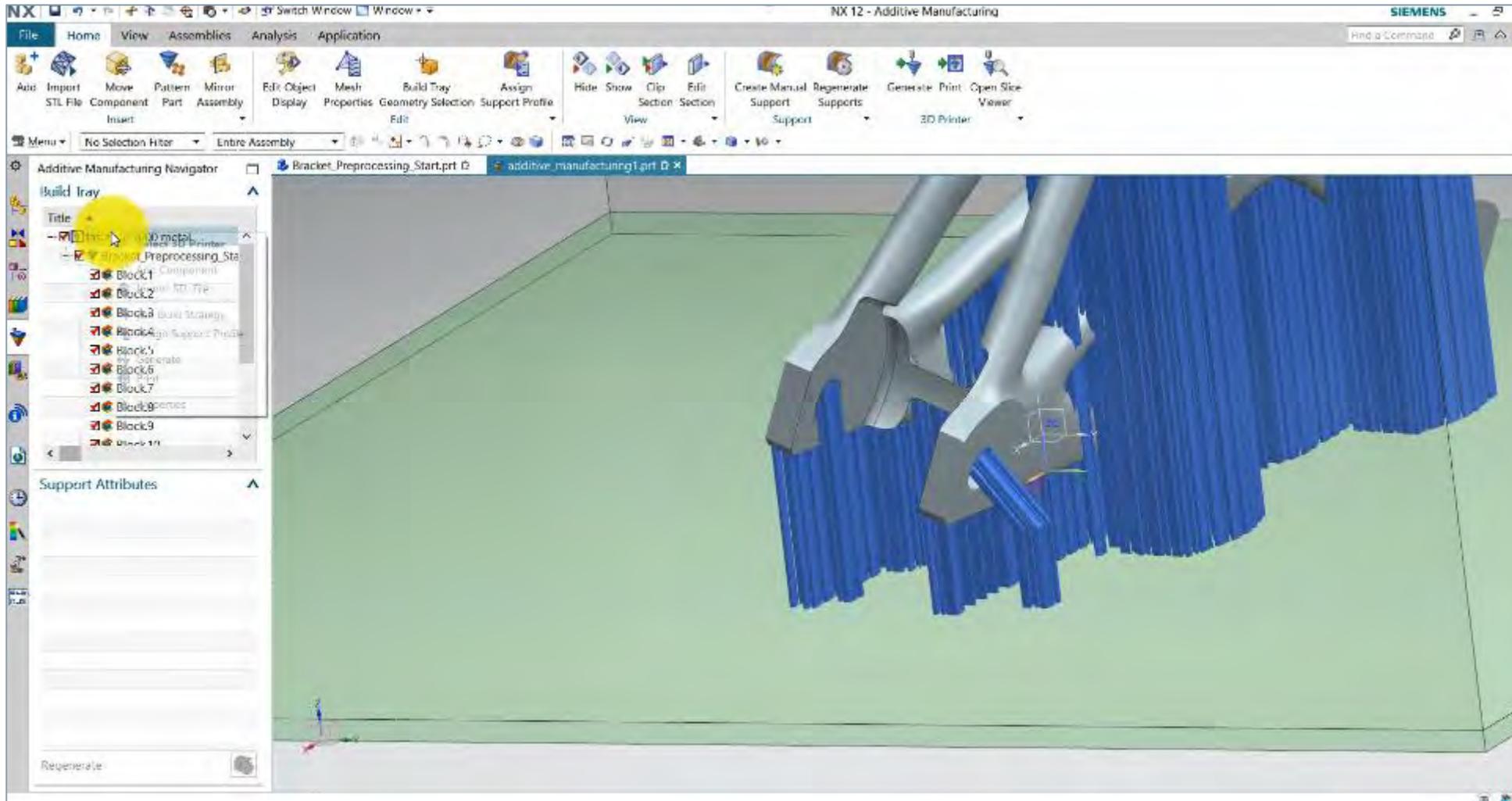


Produkt-Validation

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Druck-Vorbereitung Generierung Druckjob, Slicing/Hatching



Weitere Prozess-Schritte

NX – Eine integrierte Lösung für Additive Fertigung Prozess Simulation (Jan 2019)

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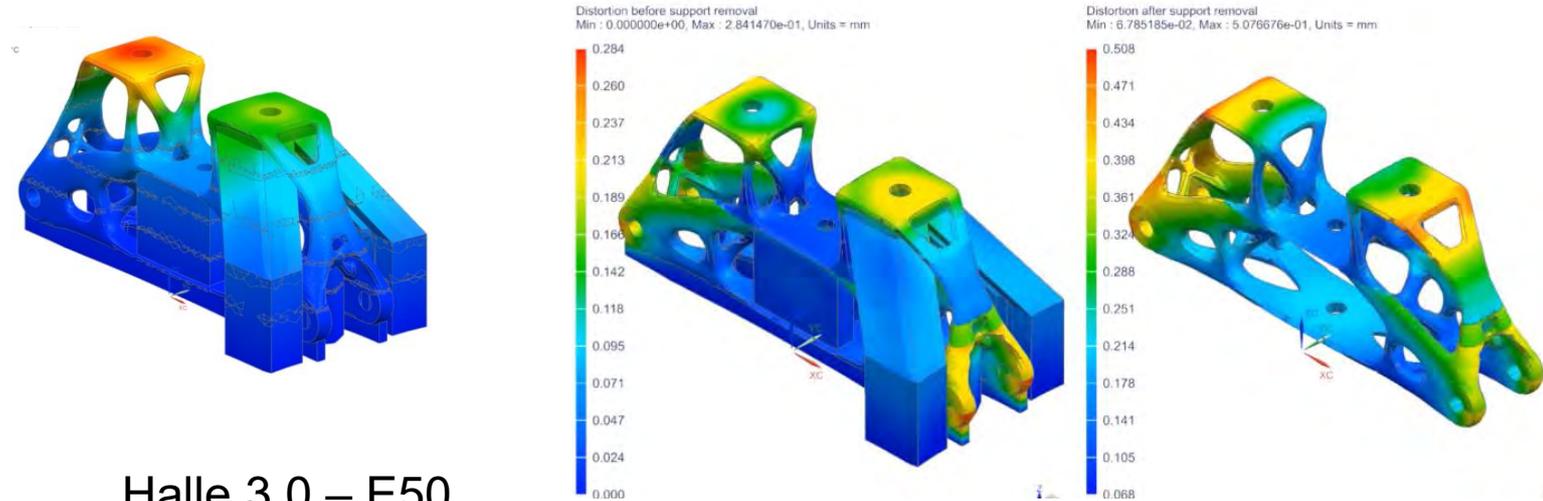
First time right!

Übersicht:

- Bauteil-Aufbereitung
- Thermale Historie
- Lokale Überhitzung
- Verzug
- Recoater Kollision
- Verzugs-Kompensation

Vorteile:

- Einfach zu bedienen
- Volle Integration
– Kein Daten Im- und Export

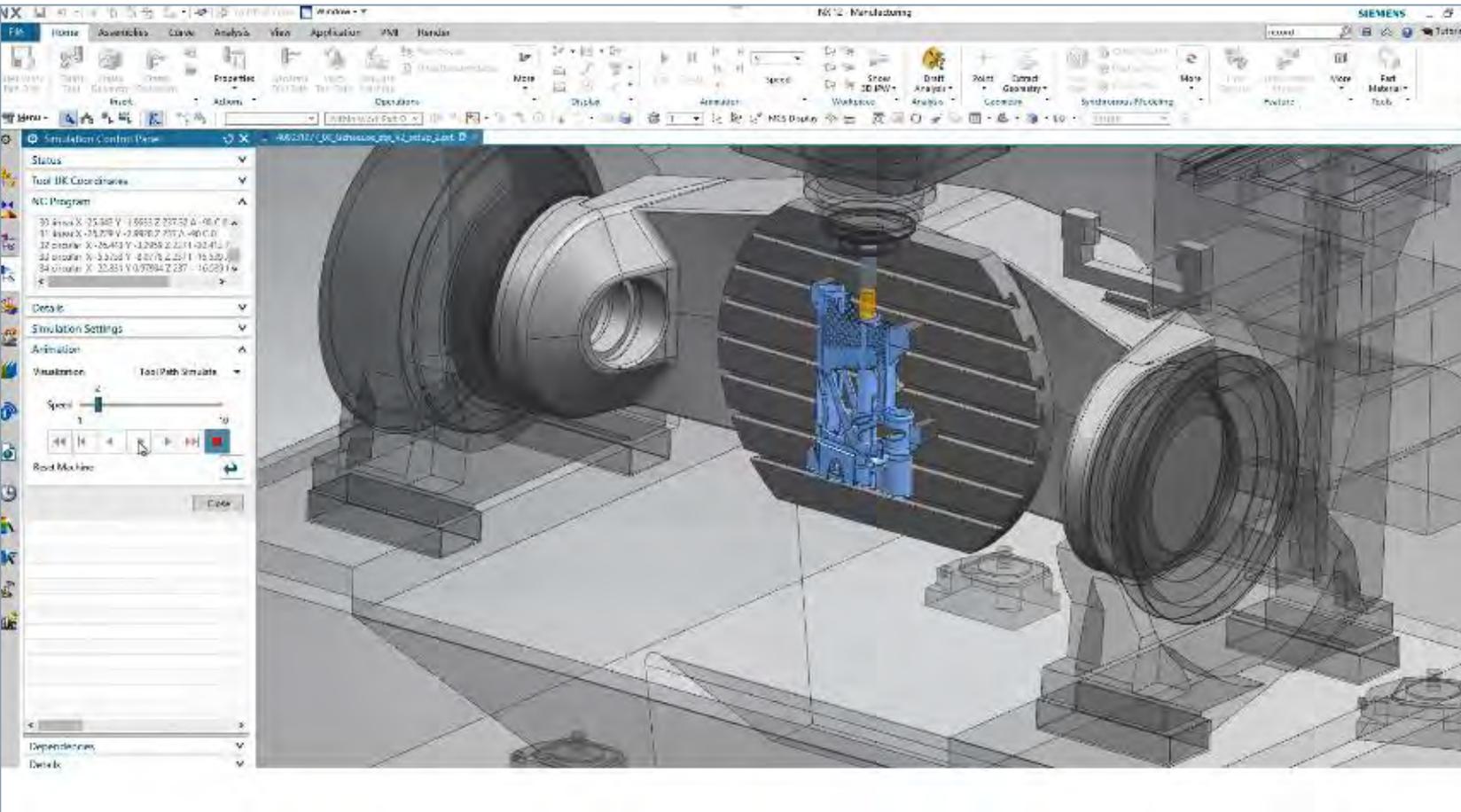


Halle 3.0 – E50
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NX – Eine integrierte Lösung für Additive Fertigung Nachbearbeitung und Qualitäts-Kontrolle

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Übersicht:

- Nachbearbeitung der gedruckten Bauteile
 - Entfernen der Stütz-Strukturen
 - Passungen, Toleranzen
 - Oberflächen-Qualität
- Alle NX CAM Operationen nutzbar (2,5 – 5 Achsen Werkzeugmaschinen, Roboter, ...)
- Assoziativ

Vorteile:

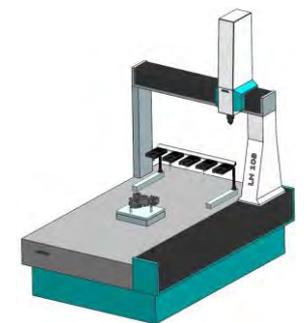
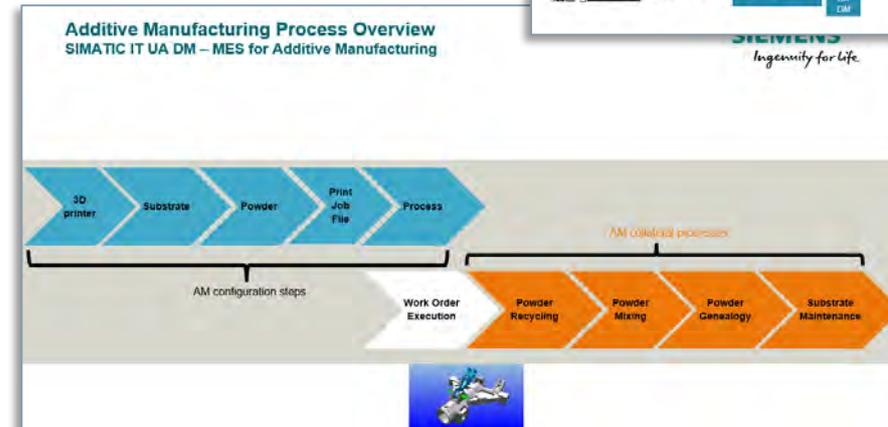
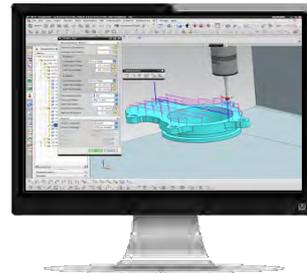
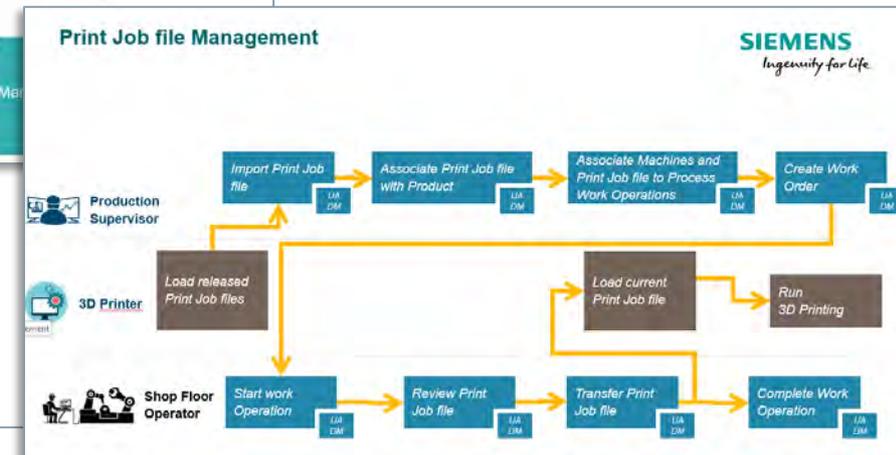
- Volle Integration
 - Kein Daten Im- und Export
- High end CAM System mit Automatisierungs-Optionen

MES/QMS für Additive Fertigung

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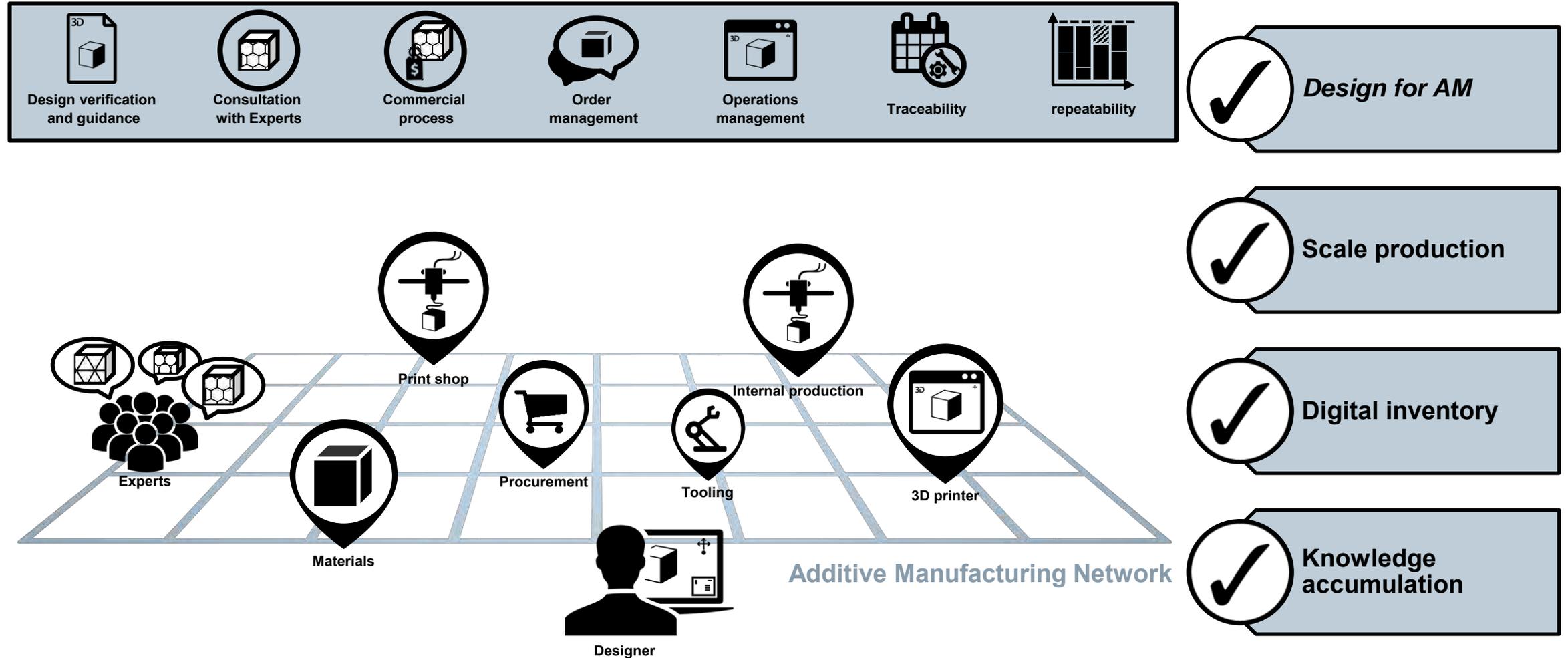
Übersicht:

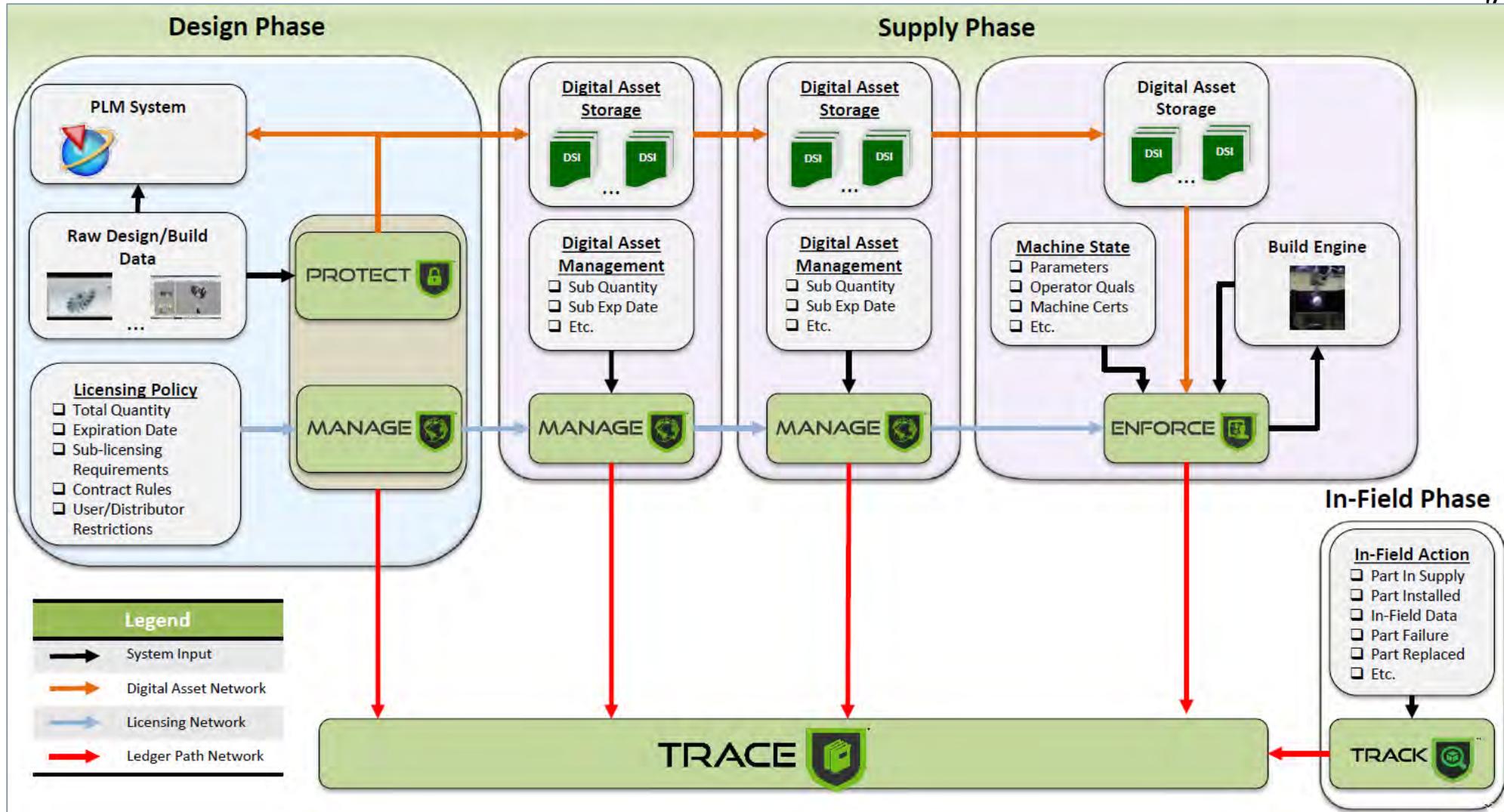
- 3D-Drucker im Anlagenlayout
- Definition Substrat und Pulver
- Druck-Datei verwalten
- Prozess-Design
- Arbeits-Unterlagen
- Pulverrecycling etc.
- Substratwartung



Siemens Additive Manufacturing Network

Globale Zusammenarbeit

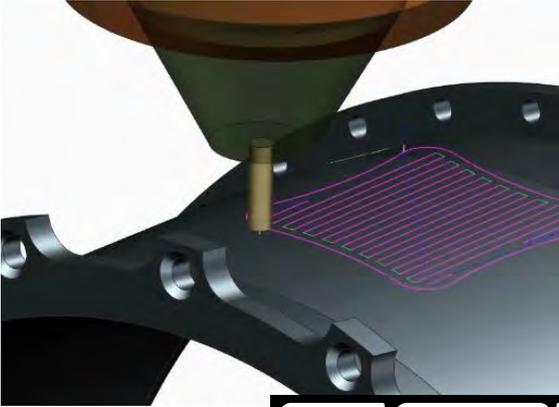




Industrialisierung der Additiven Fertigung

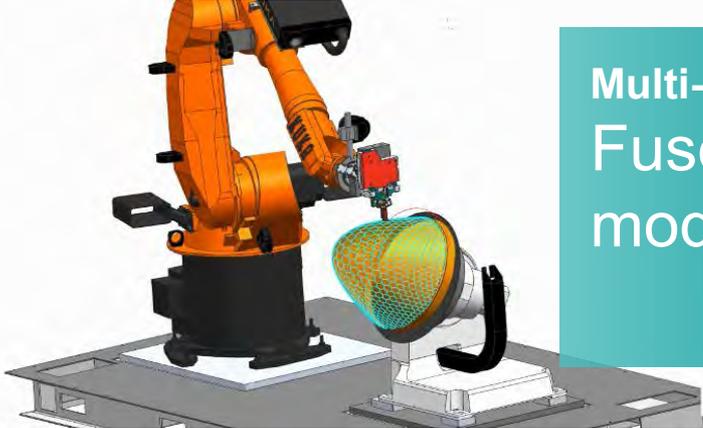
Unterstützte Druck-Technologien

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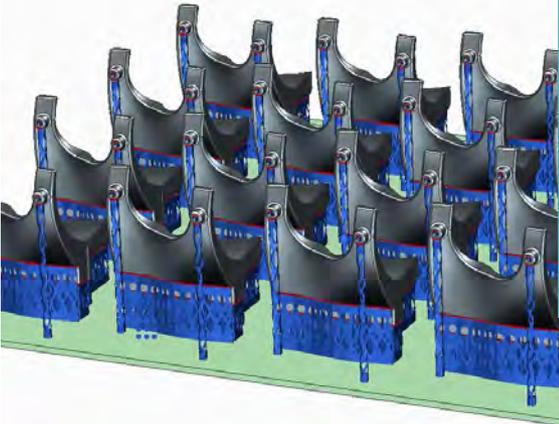
Hybrid additive
Directed energy
deposition

GEFERJET **DMG MORI**



Multi-axis
Fused deposition
modeling

stratasys



Powder bed fusion
Laser material
fusion

SLM SOLUTIONS **TRUMPF** **eps**
Manufacturing Solutions

Productivity Simulation
HP Multi Jet Fusion

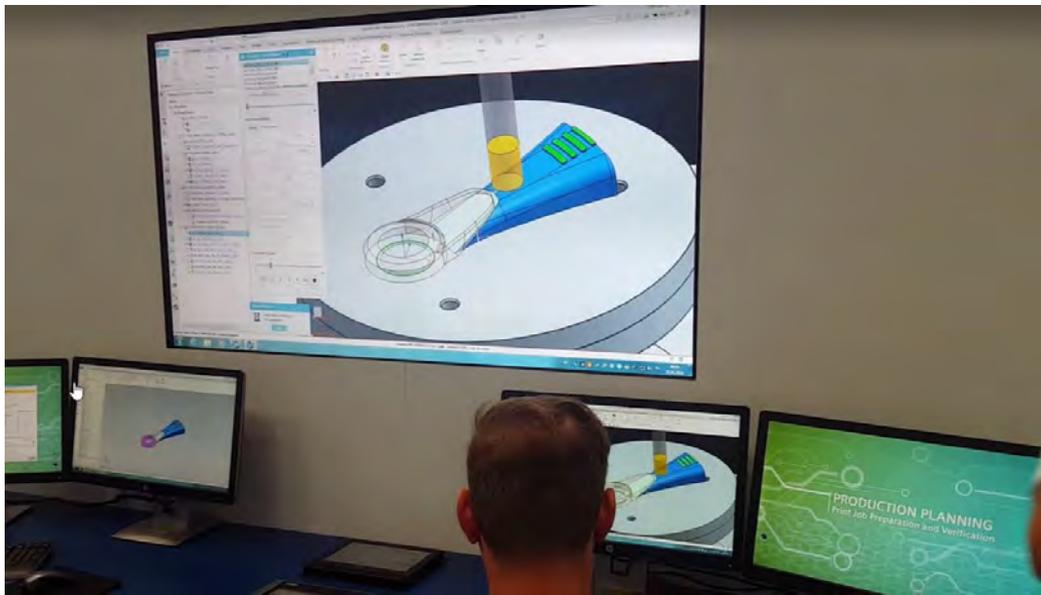


Multi jet fusion
Agent jetting/
inkjet technology

hp

Additive Manufacturing zum anfassen Experience Center (Erlangen)

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MBFZ toolcraft erweitert sein Business durch Industrialisierung der Additiven Fertigung

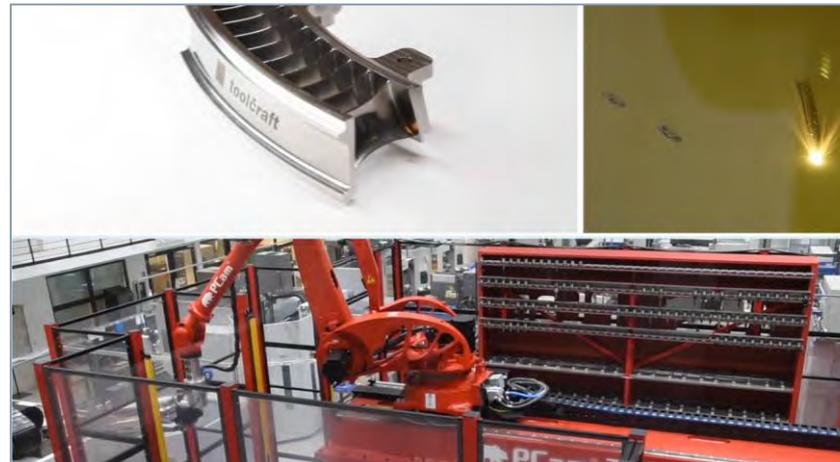
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„Siemens bietet uns die komplette und assoziative End-to-End-Prozesskette - vom Design bis zum 3D-Druck von Teilen, einschließlich Nachbearbeitung und Qualitätssicherung, die es uns ermöglicht, Additive Fertigung in eine industrielle Produktionstechnologie zu wandeln.“

Christoph Hauck, Managing Director of MBFZ toolcraft GmbH

toolcraft



**Video in YouTube
>225.000 mal
angesehen!**

Vielen Dank

Jürgen Stierle
Helmut Zeyn

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