

Additive Manufacturing Reshapes Everything

Reimagine products. Retool manufacturing. Rethink business.

Heinz Signer
Marco Steiger
Janus Engineering



Profil of JANUS Engineering



Numbers - Data - Facts

- 6 international locations
- > 20 years of service and product experience in NX / TC
- Focus on CAD/CAM/PLM implementation, optimization and automation



Employees worldwide

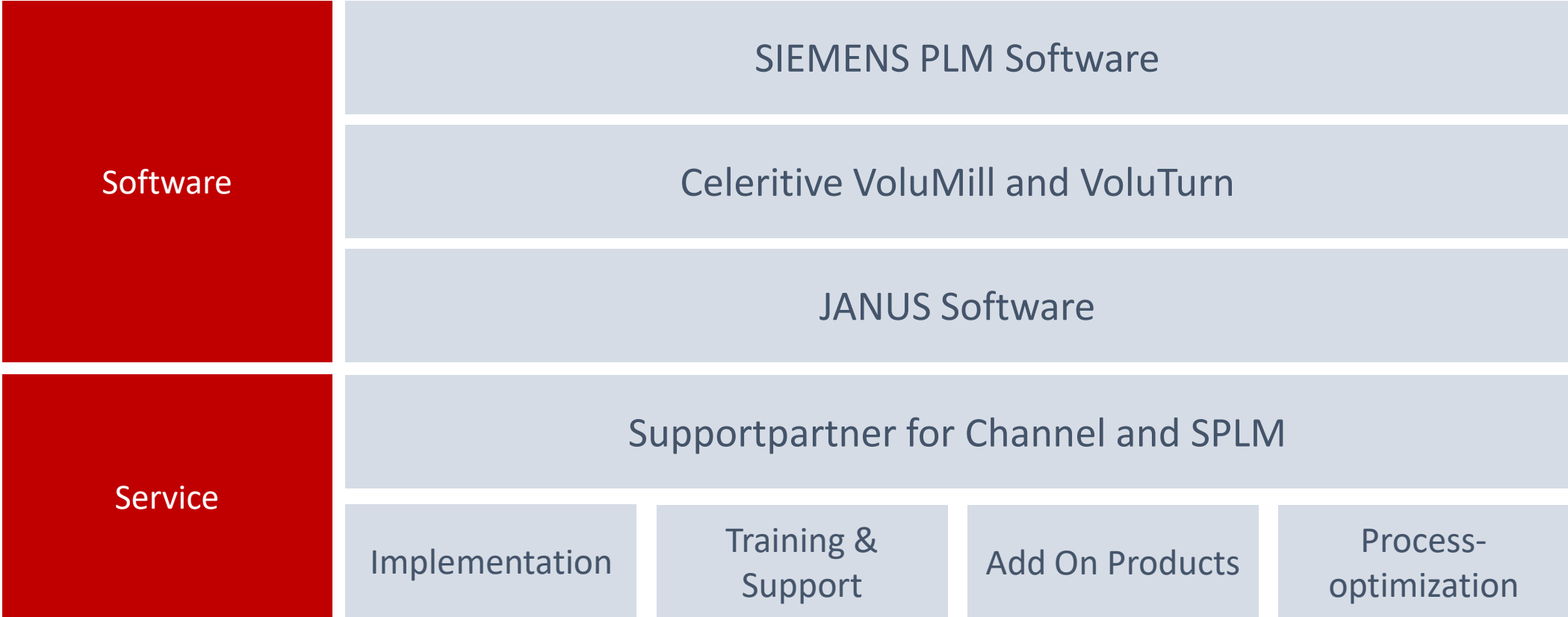
-  Sindelfingen – 29
-  Port (Biel) - 11
-  Paris - 15
-  Linz – 1
-  Pasadena, CA
-  Novara



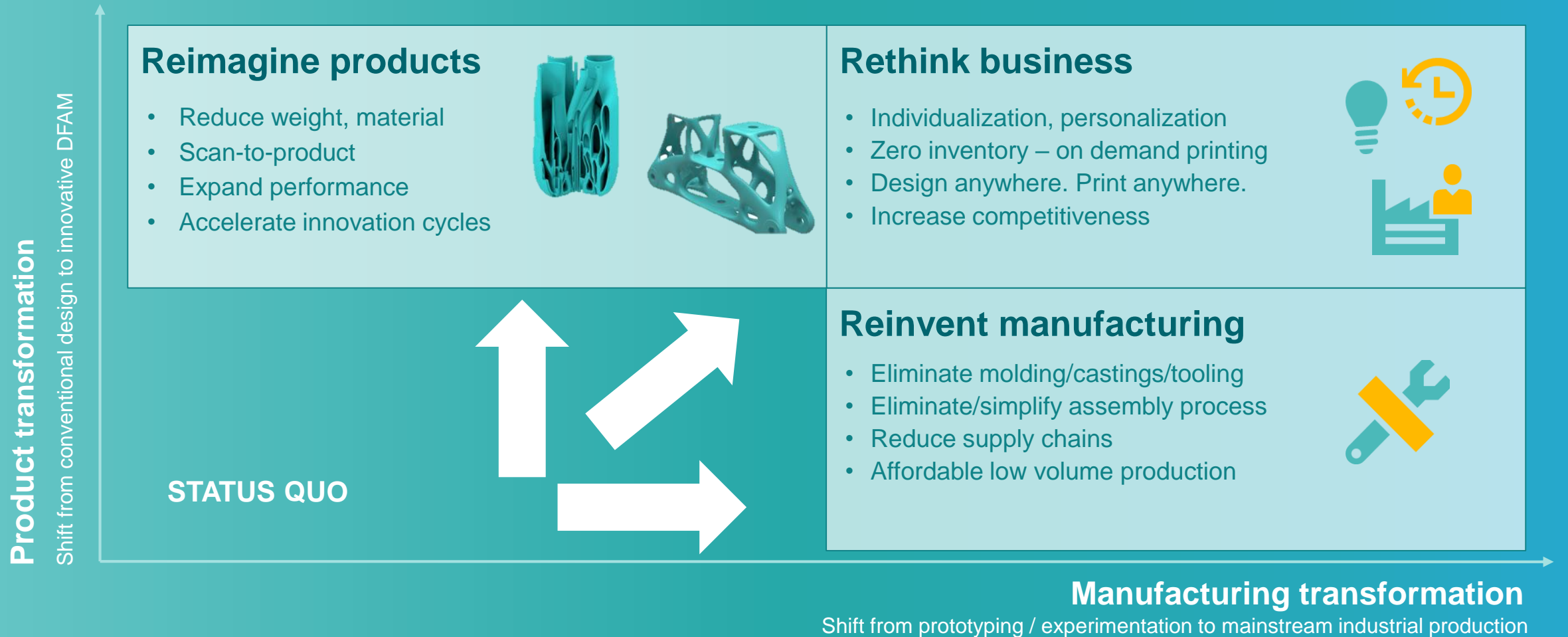
Partnerships

- Siemens PLM service, distribution and foundation partner for the products NX / TC
- Sales and Supportpartner from Celeritive for Volumill and Voluturn in Europa
- PLM- Partner network

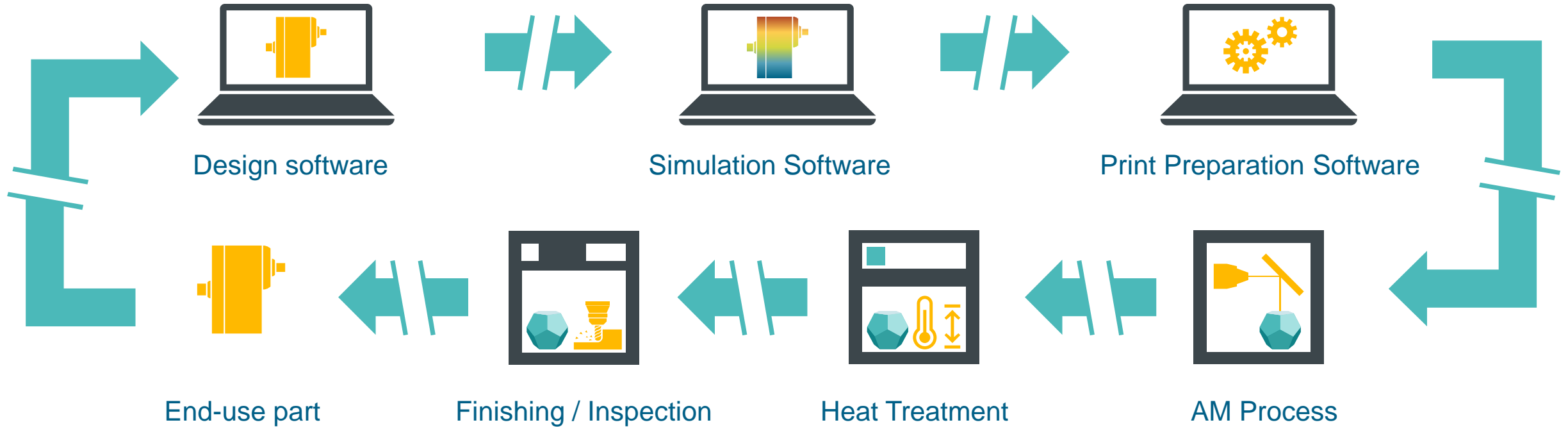
Janus Engineering - Portfolio



Additive Manufacturing is driving Innovation: Incremental progress isn't competitive enough



Barriers to industrializing additive manufacturing



Conventional thinking

Disconnected process chain

Multiple file conversions

Uncontrolled workflow

Siemens Vision: One integrated end-to-end system for industrializing additive manufacturing



Reimagine products

SIEMENS
Ingenuity for life

Weight reduction

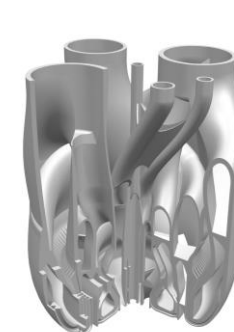
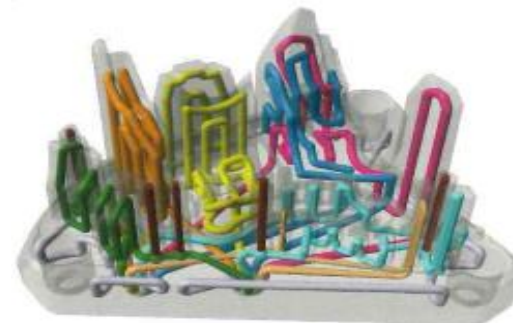
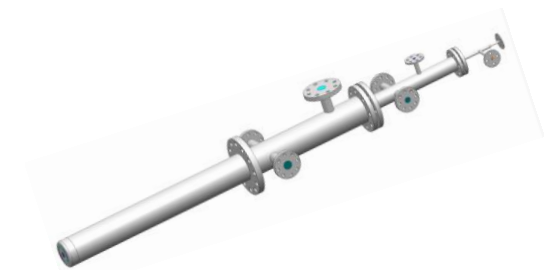
From where it all started....

Mass customized parts

Quick, accurate, and cost effective mass customization

Eliminate the need for tooling

(and the design constraints)



Reimagine products Generative design

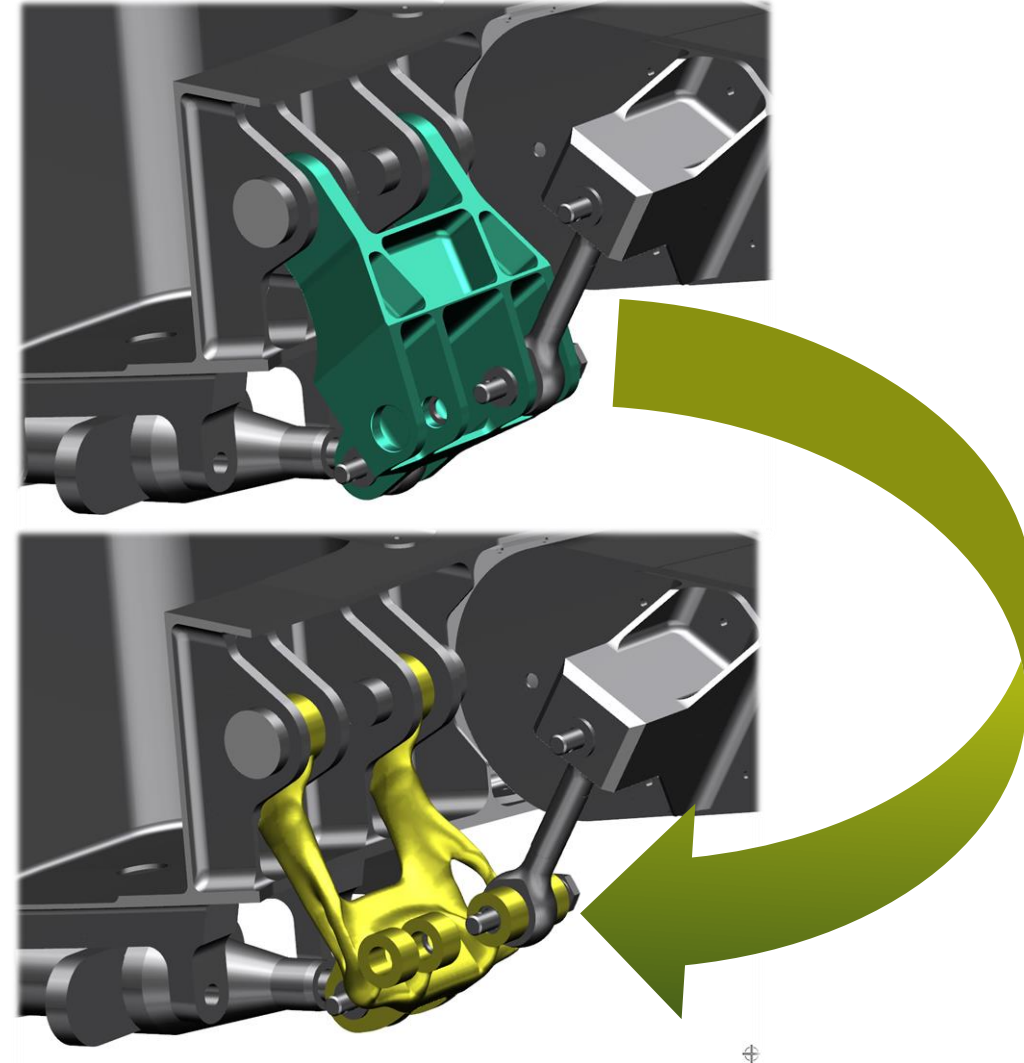
Topology optimization

Intuitive Integration into the
NX Design Environment

Fast generation of smooth design
proposals that may be used in the
engineering process

Multiple load cases

Optimized model can be refined with
Convergent Modeling

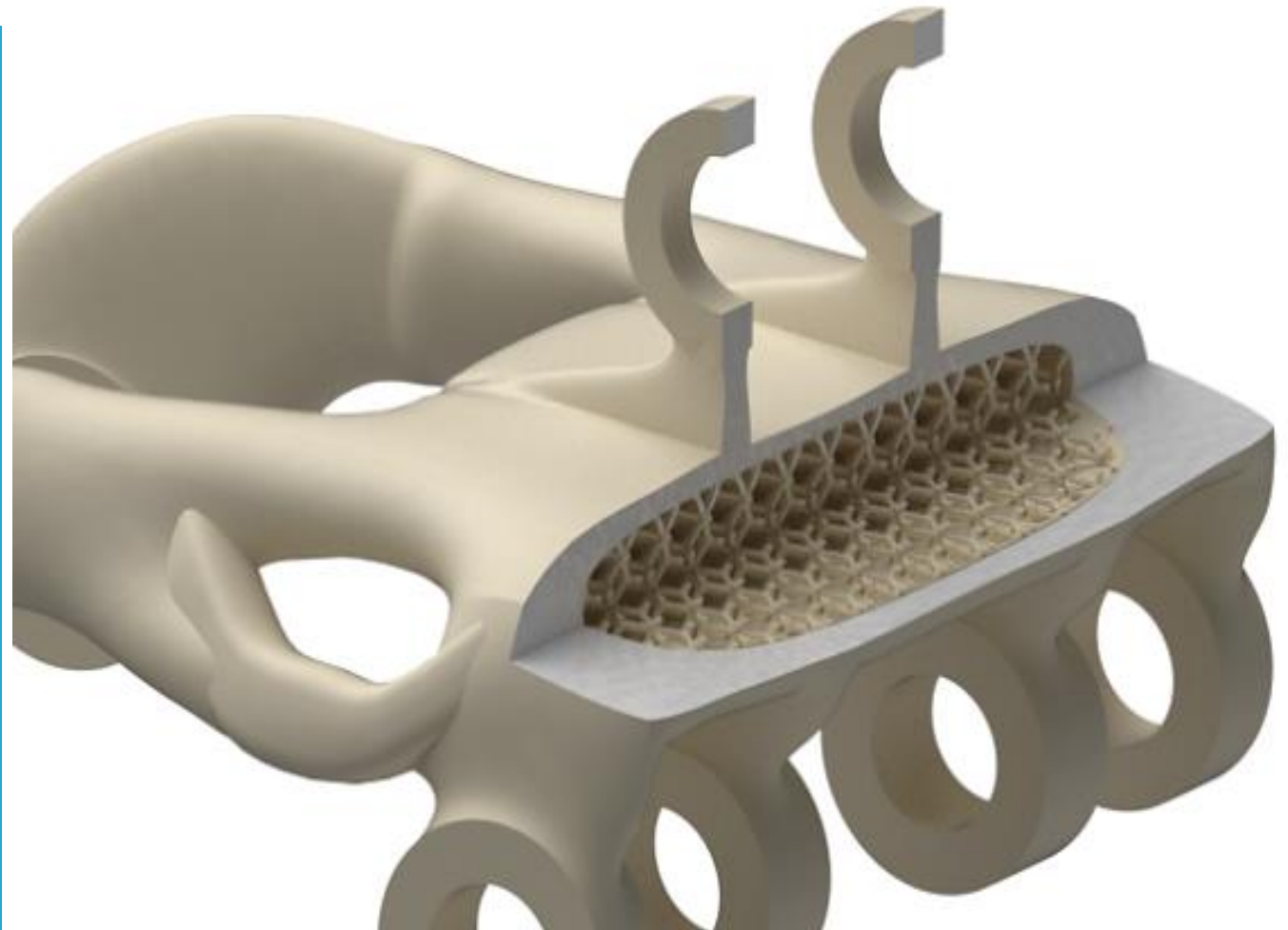


Lattices

Lightweight components
and structural integrity

Integrated lattice
structure development

Complex geometry
represented as facets



Reimagine products Converge Modeling

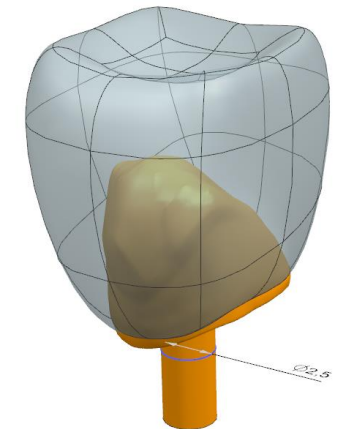
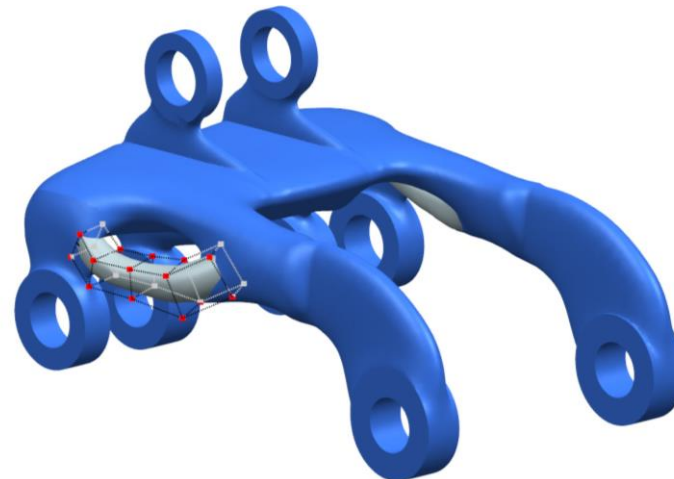
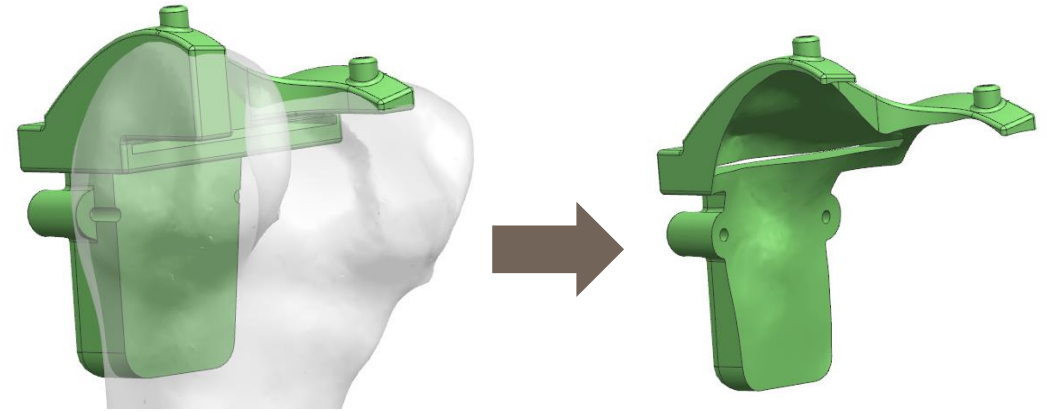
Convergent Modeling™ Technology

Work directly with facets
surfaces and solids

Unlimited flexibility to design
innovative products

No need for reverse engineering

SIEMENS
Ingenuity for life



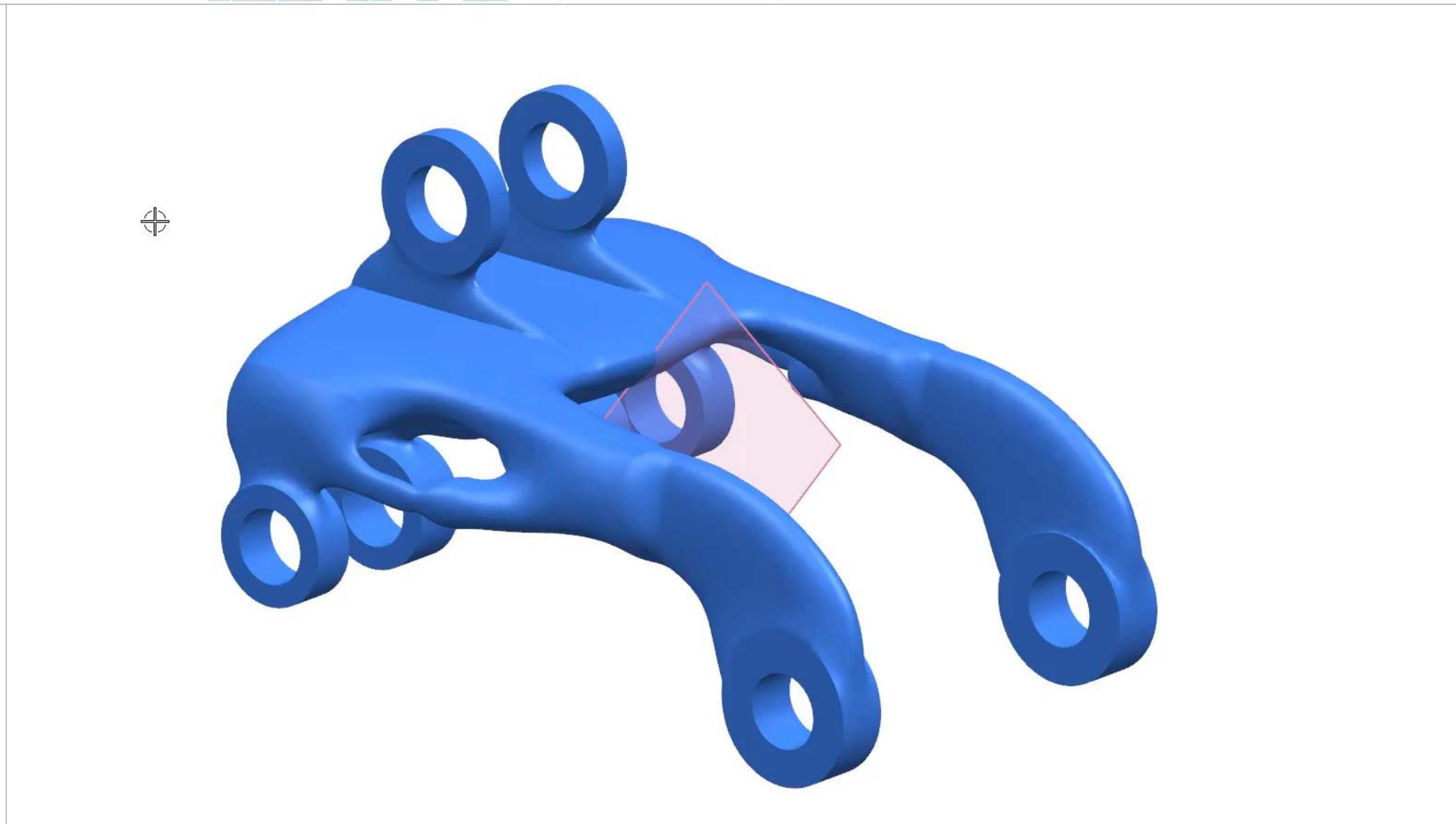
Assembly Navigator

Object

- Session Component Groups
- Component Groups in Part
- Sections
- eclipsepart_top/mm;1

Summary

Dependencies

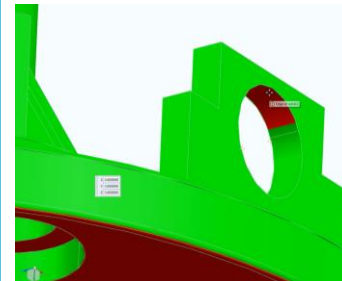


Design rules

Ensure the part manufacturability

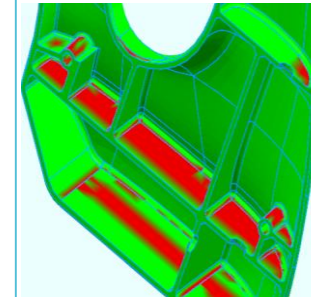
Avoid costly re-design when a part is designed and found to be inadequate during manufacturing

Overhang angle



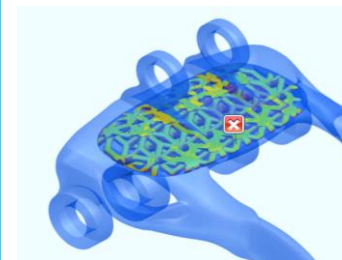
Recognize part regions that require support

Wall thickness



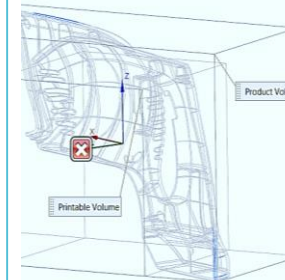
Set threshold for minimum thickness

Wholly enclosed volume



Identify fully enclosed voids within a part

Printable volume



Ensure that part fits within the 3D printer build volume

Reinvent Manufacturing Simulation

Simulate Manufacturing Process build up

Use Advanced NX tools

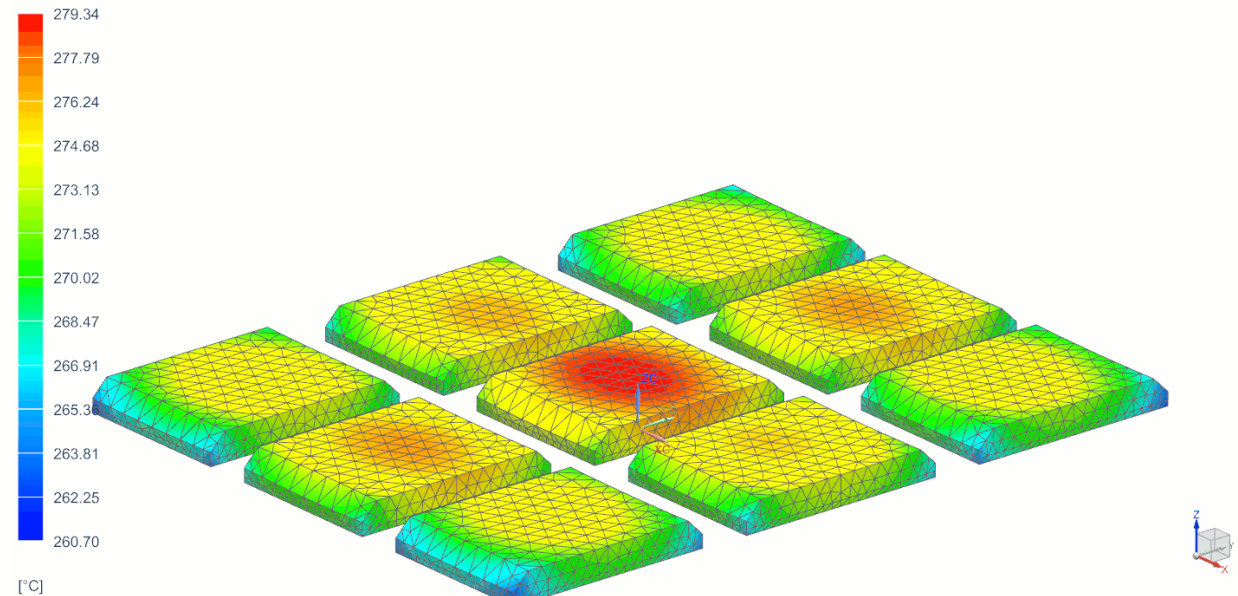
Identify & Display:

- Thermal Distortion
- Residual Stress
- Re-coater collisions
- Local Overheating areas

Generate:

- Pre-deformed Part Model (New Input Geometry)
- Deformed Part model representing state after removal from build tray

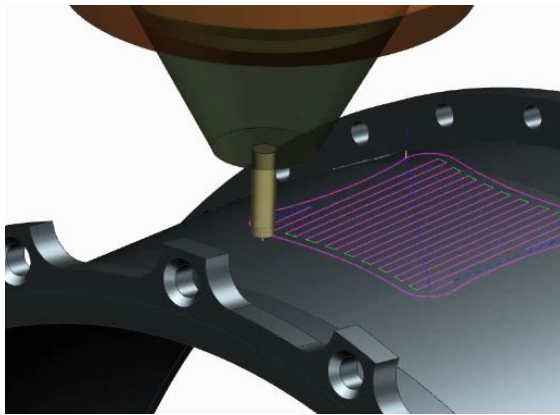
Small-Gas-turbine-blade_AM_fem_sim : Solution 1 Result
Subcase 1, Increment 2, 2 s
Temperature - Nodal, Scalar
Min : 20.00, Max : 279.34, Units = °C



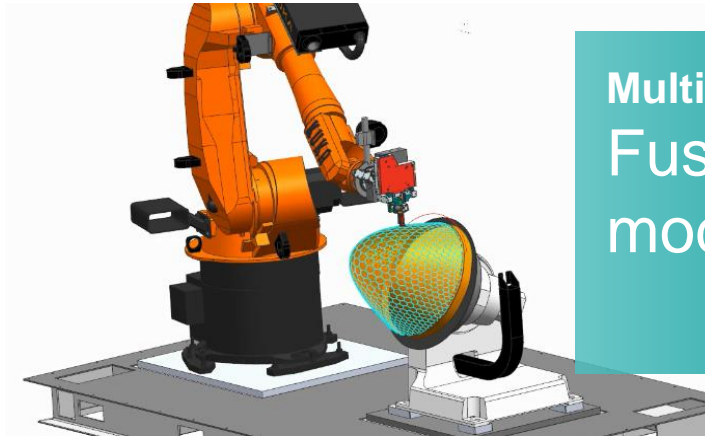
Reinvent Manufacturing

Major 3D printing technologies supported in one system

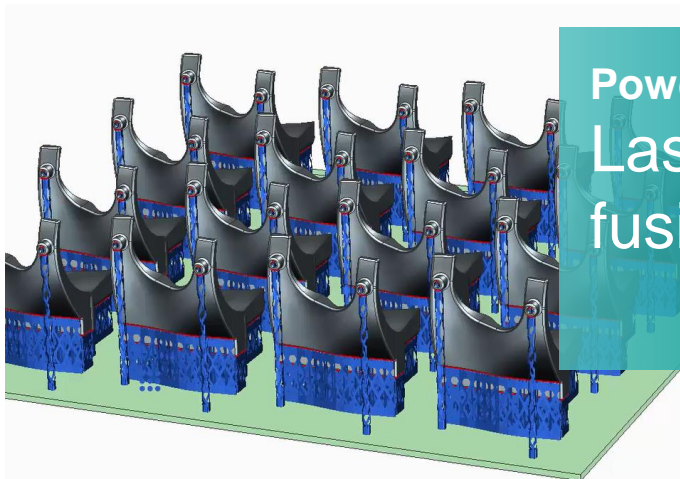
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Hybrid additive
Directed energy
deposition



Multi-axis
Fused deposition
modeling



Powder bed fusion
Laser material
fusion



Multi jet fusion
Agent jetting/
inkjet technology

Reinvent Manufacturing Laser Material Fusion

Powder Bed Fusion

Most widely utilized metal
additive manufacturing technology

Print fine internal details
and complex features

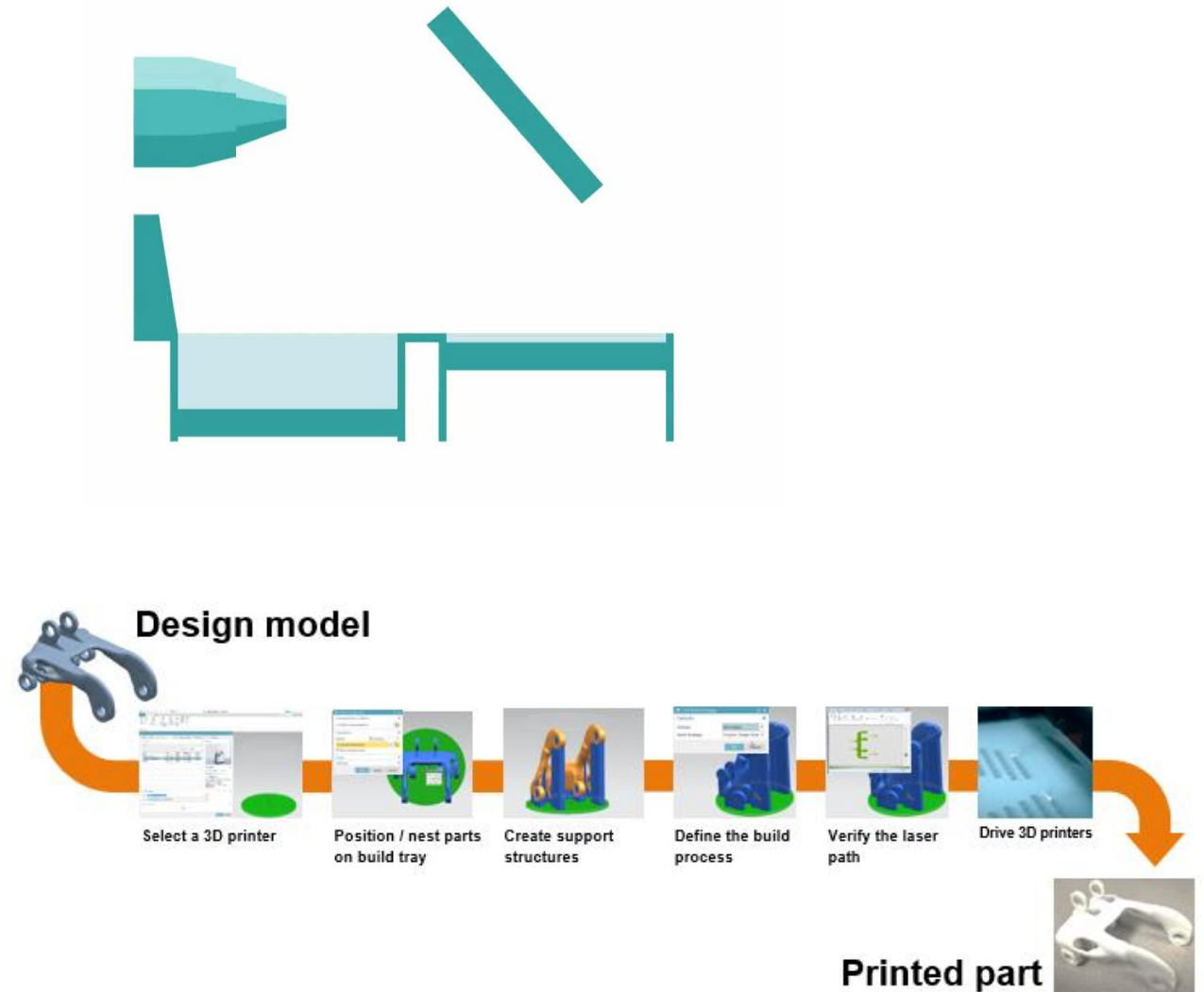
Near forged part
material properties

Material

Metal

Plastic

Ceramic



Reinvent Manufacturing Multi Jet Fusion

Multi Jet Fusion

Print plastic parts using a process similar to inkjet printing

Make parts with high dimensional accuracy and improved properties

Build parts 10 times faster

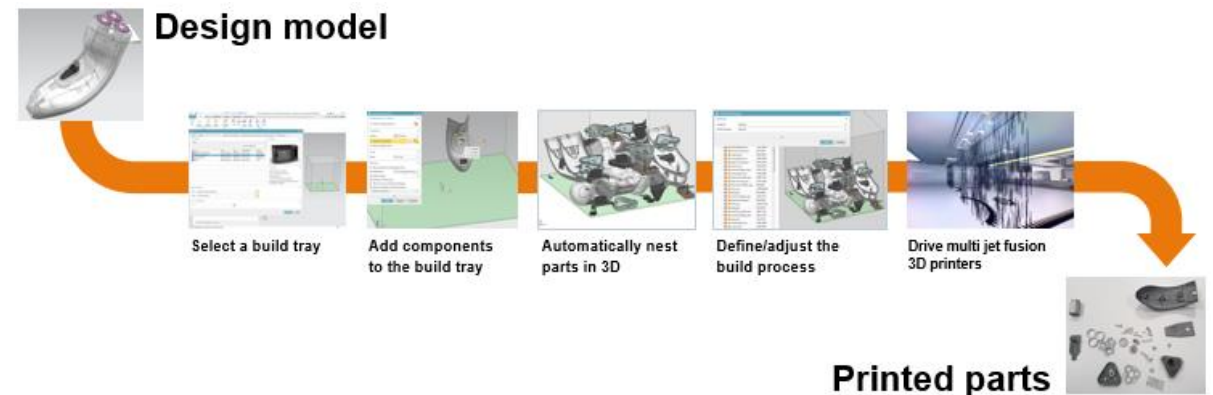
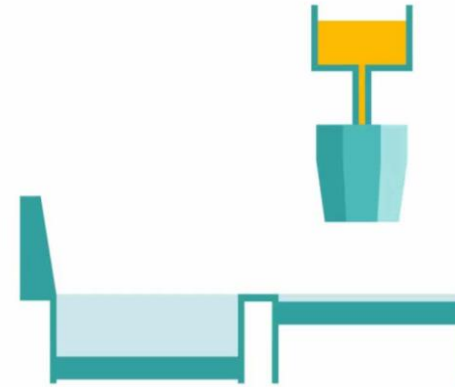
Material

Metal

Plastic

Ceramic

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Reinvent Manufacturing Hybrid (Directed Energy Deposition with CNC Machining)

Hybrid Additive Manufacturing

Combining DED with CNC technology on
one machine

Complex, large-size parts with internal
cavities

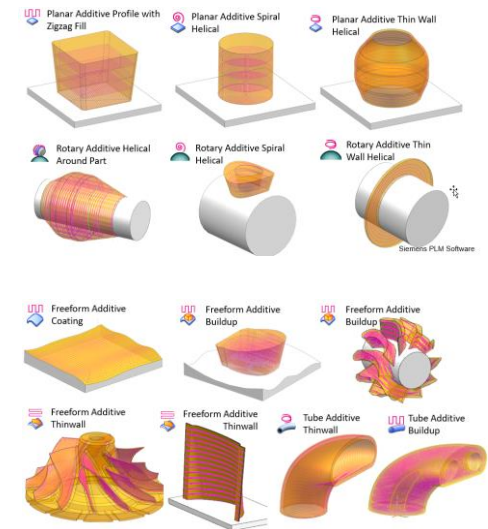
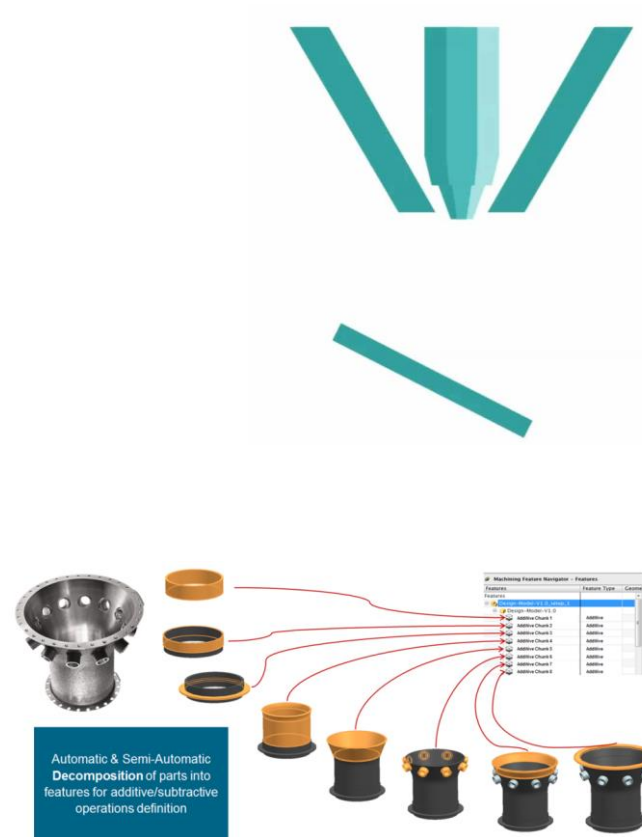
Eliminate support structures

Material

Metal

Plastic

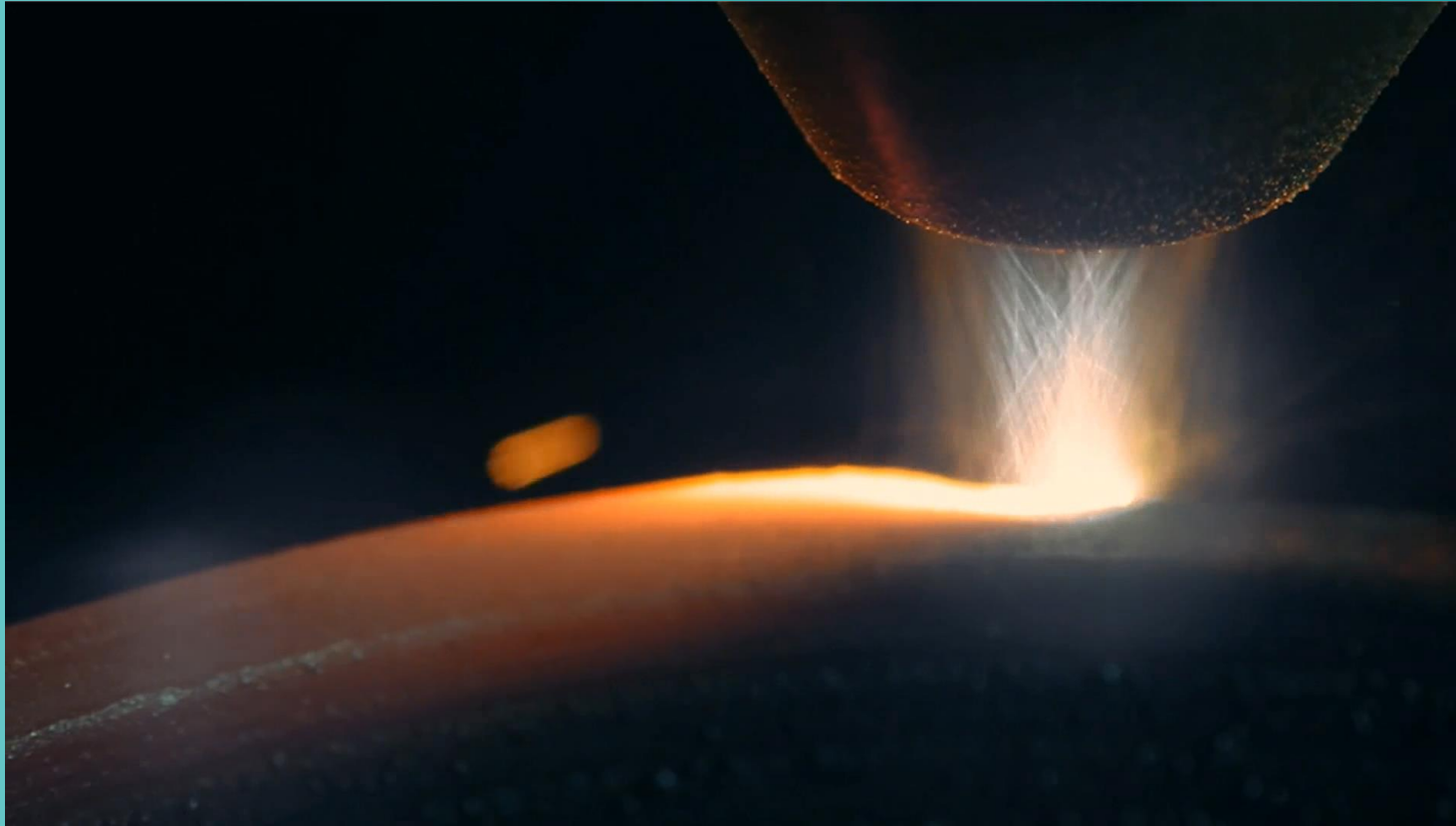
Ceramic



Reinvent Manufacturing

Hybrid additive manufacturing

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Marine industry example



FROM:
6-8 weeks

To:
36 hours



Reinvent Manufacturing: Multi-Axis Fused Deposition Modeling

Multi-Axis Fused Deposition Modelling

Build composite parts in various sizes

Leverage robots flexibility
to print parts of any complexity

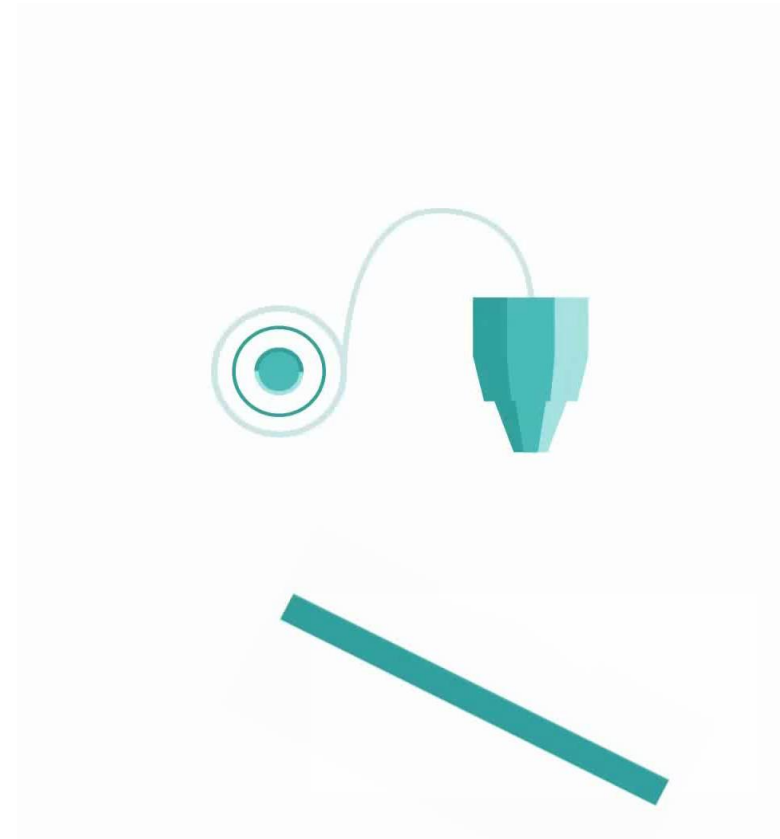
Eliminate support structures

Material

Metal

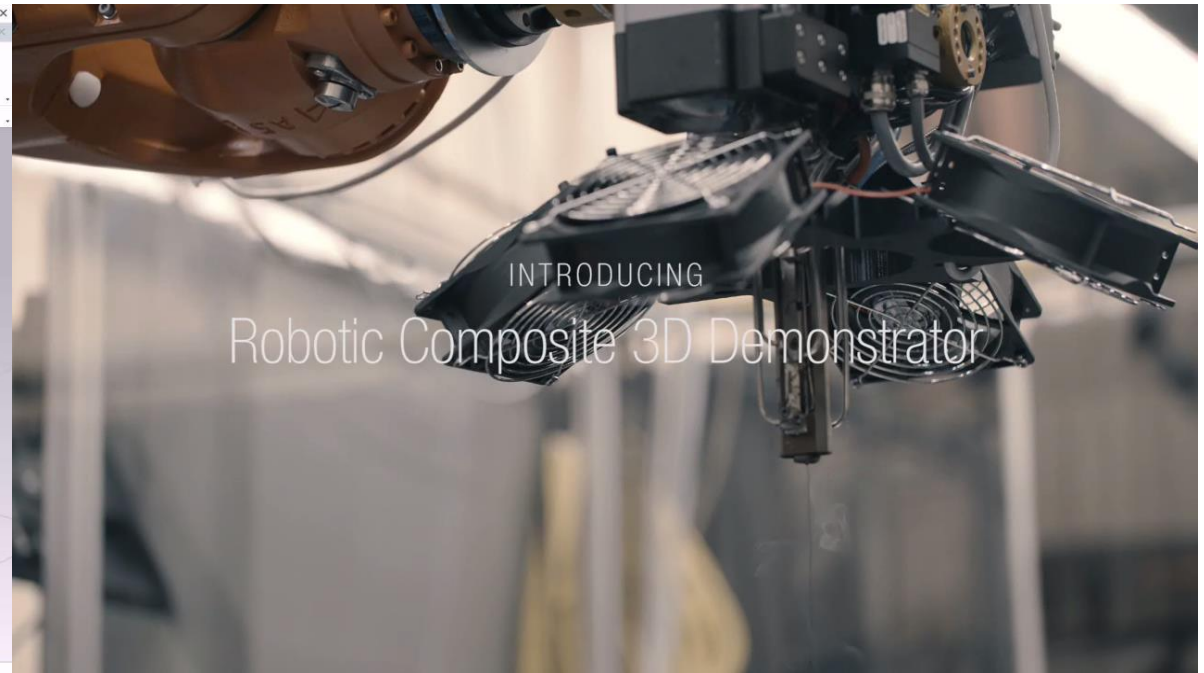
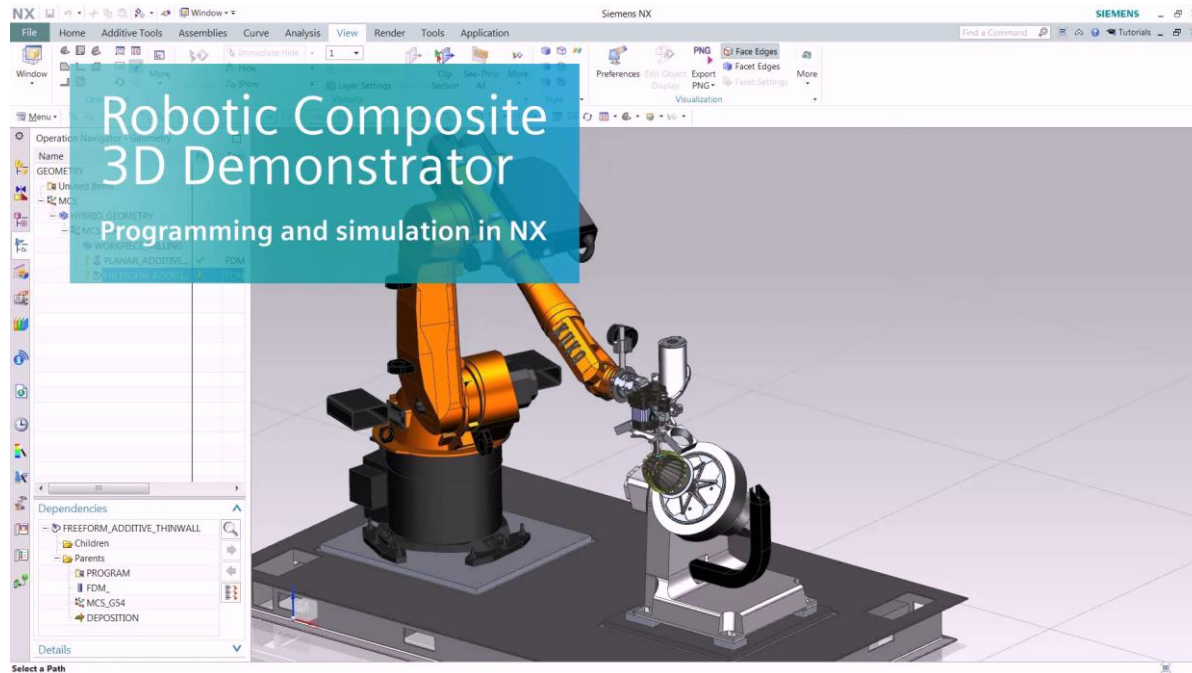
Plastic

Ceramic



Reinvent Manufacturing: Multi-Axis Fused Deposition Modeling

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Example: Stratasys

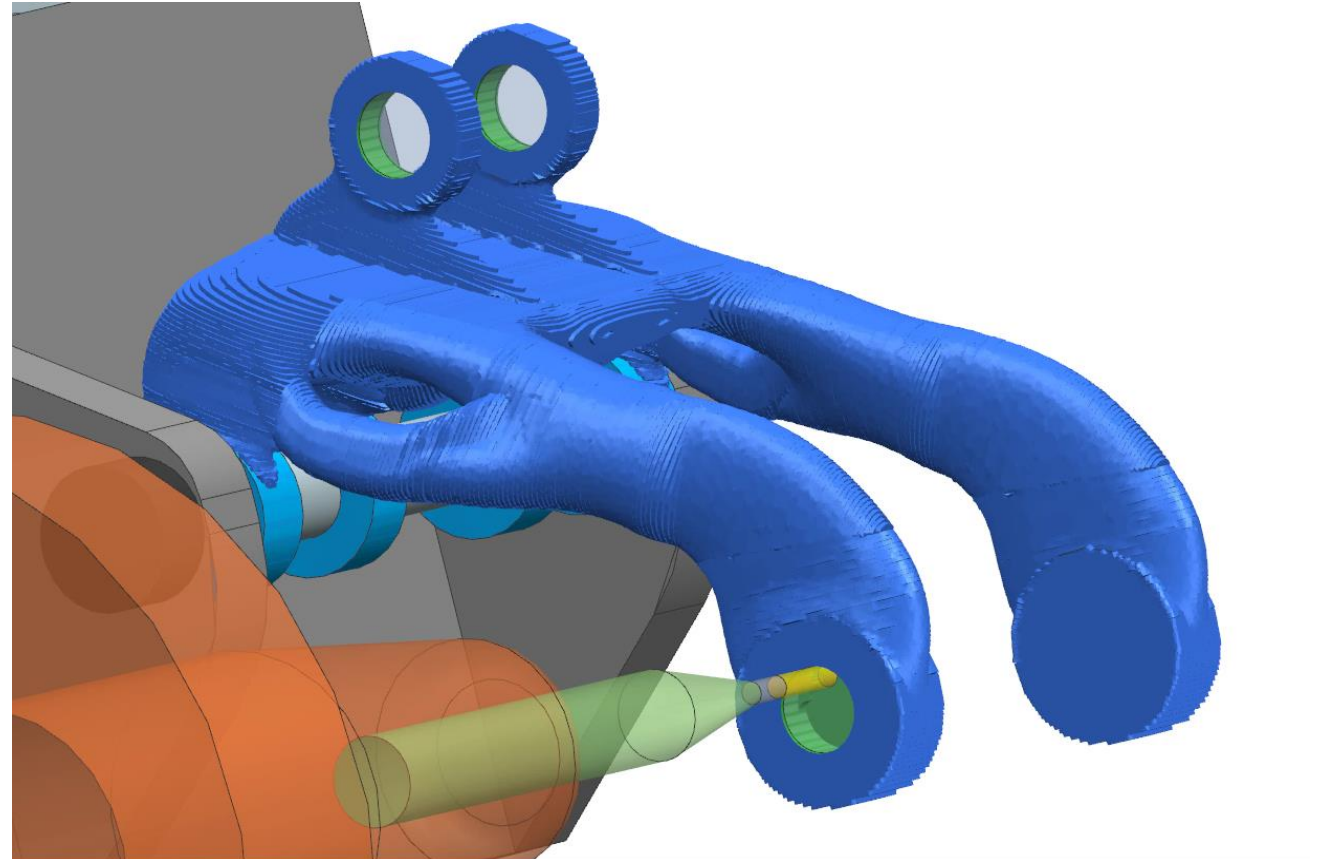
Reinvent Manufacturing Post-printing and Finishing

Integrate NX CAM and CMM

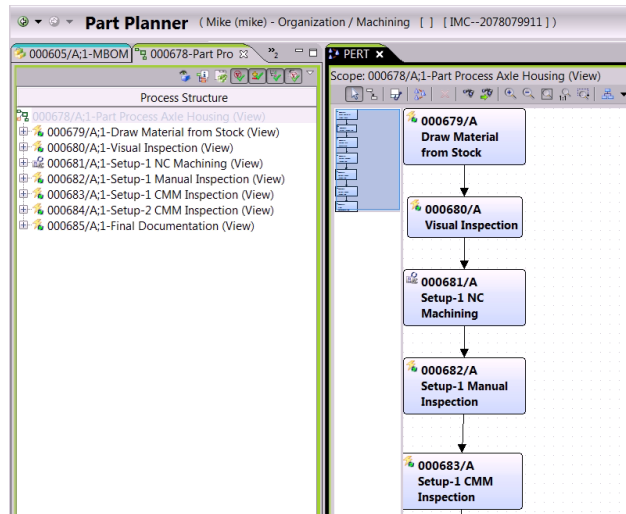
Use NX tools to finish the part

Final Machining and finishing with NX
CAM

Define Inspections steps and validate
product quality with NX CMM



Single source of data



Manage all the manufacturing data

Re-use proven data and processes

Connect engineering to the shop floor



Deliver the correct data to production

Establish a closed-loop process

Manufacturing operations management

Embed AM activities in the overall production process



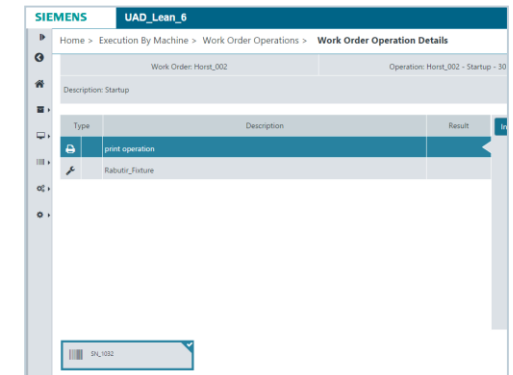
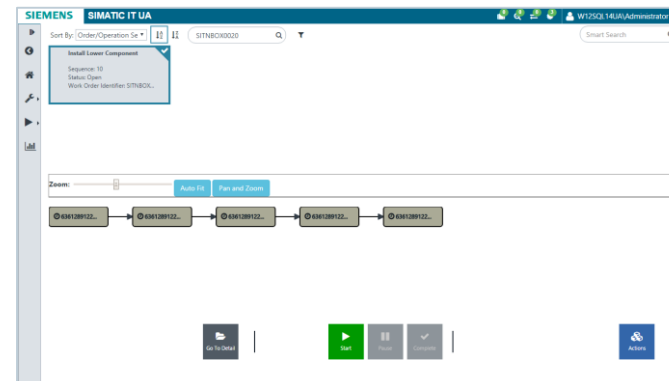
Manage all pre / post 3D printing operations*

Order management

Additive manufacturing management
Operator guidance and checklist

Print job file management

Powder and substrate management
Full production data tracking



Reinvent Business

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LIMITLESS AGILITY:

Print on demand

Zero inventory

Print where needed

Optimize spare part logistics

Accelerate Innovation

Flexible production with faster
innovation cycles



Additive Manufacturing Reshapes Everything

Handle the whole engineering and manufacturing process with an full integrated end-to-end software is a key to be success full.

Marco Steiger
Janus Engineering AG
Consultant
Müllerstrasse 7
2562 Port



Phone: +41 32 333 23 70
Marco.steiger@janus-engineering.com

Heinz Signer
Janus Engineering AG
Senior Account Manager
Müllerstrasse 7
2562 Port



Phone: +41 32 333 23 70
Mobil: +41 79 410 87 02
Marco.steiger@janus-engineering.com