

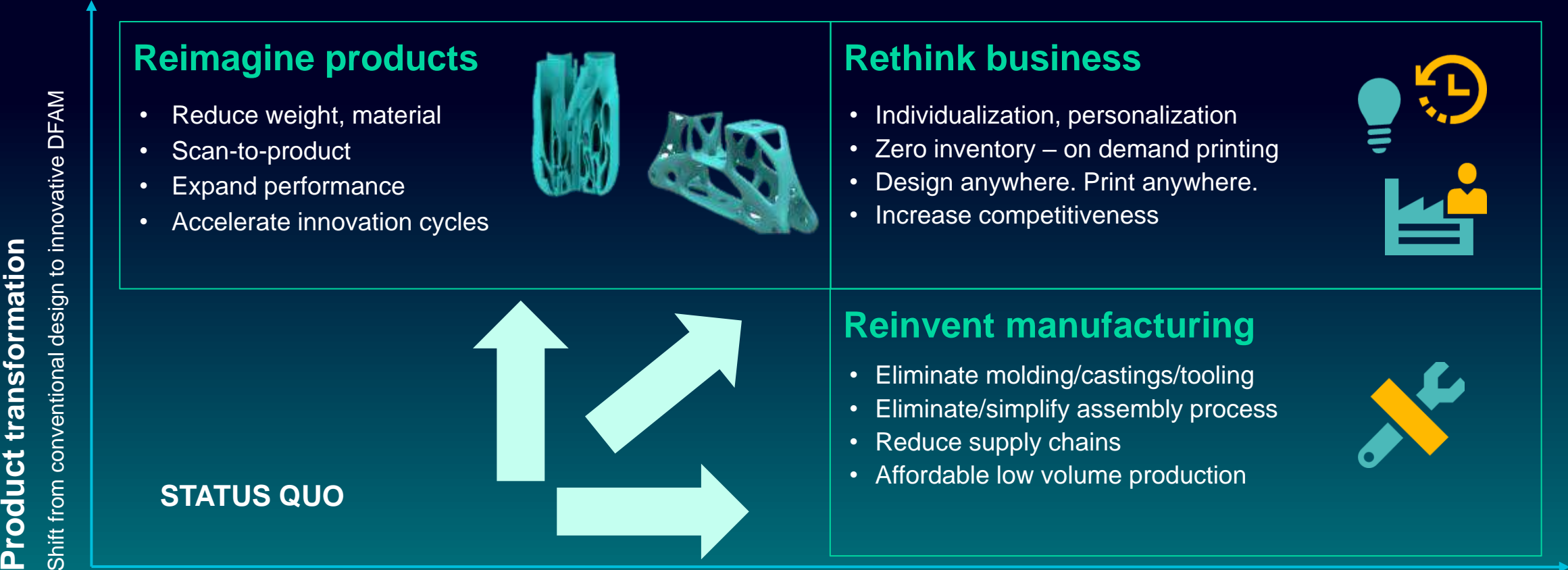


# Design for Additive Manufacturing

Reimagine products. Reinvent manufacturing. Rethink business.

NAG – 3D Cluster Meeting – @BIC Eindhoven – 08-02-2022

# Additive Manufacturing is driving Innovation and helps to overcome current barriers by...



# Barriers to industrializing additive manufacturing



**Conventional thinking**

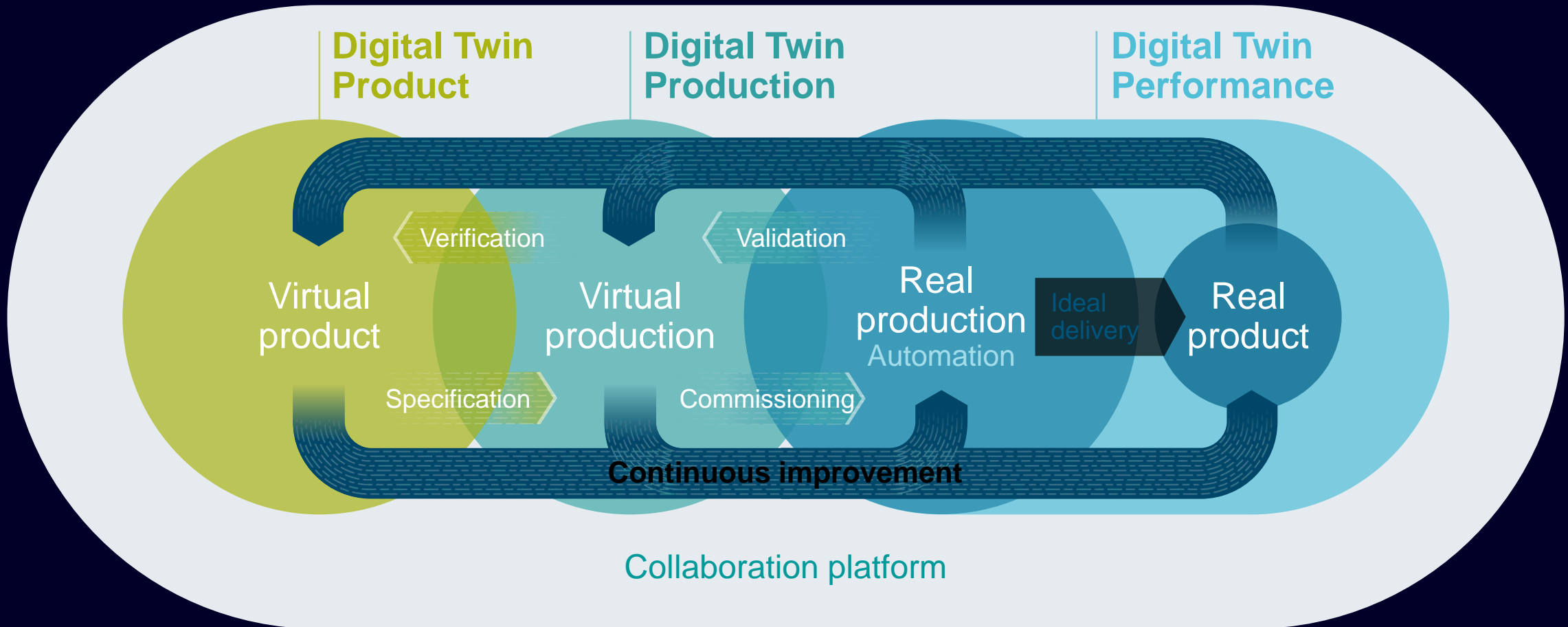
**Disconnected process chain**

**Multiple file conversions**

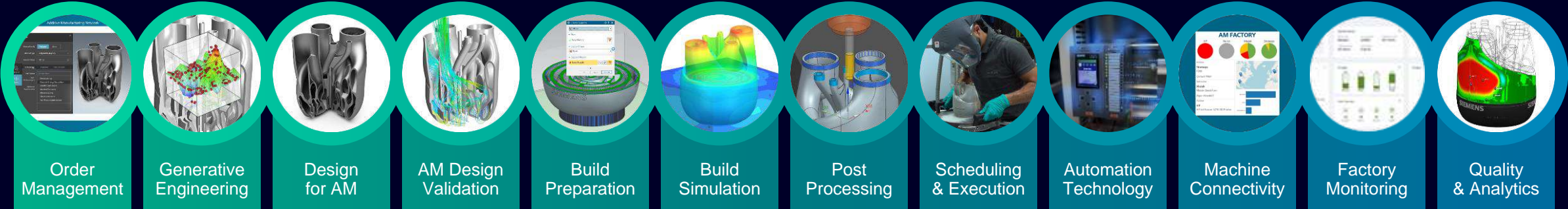
**Uncontrolled workflow**

# Siemens enables the most holistic Digital Twin

Improving Product Development and Production processes



# Siemens' end-to-end digital thread and machine control for planar Additive Manufacturing

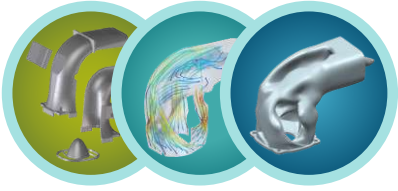


## Five Key Differentiators

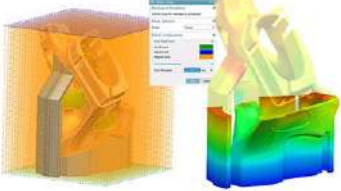
Unified solution for additive idea-to-part



Multi-disciplinary generative engineering



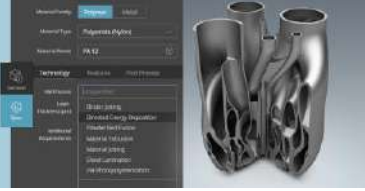
Simulation-driven first-time-right 3D printing



AM machine automation, control and connectivity



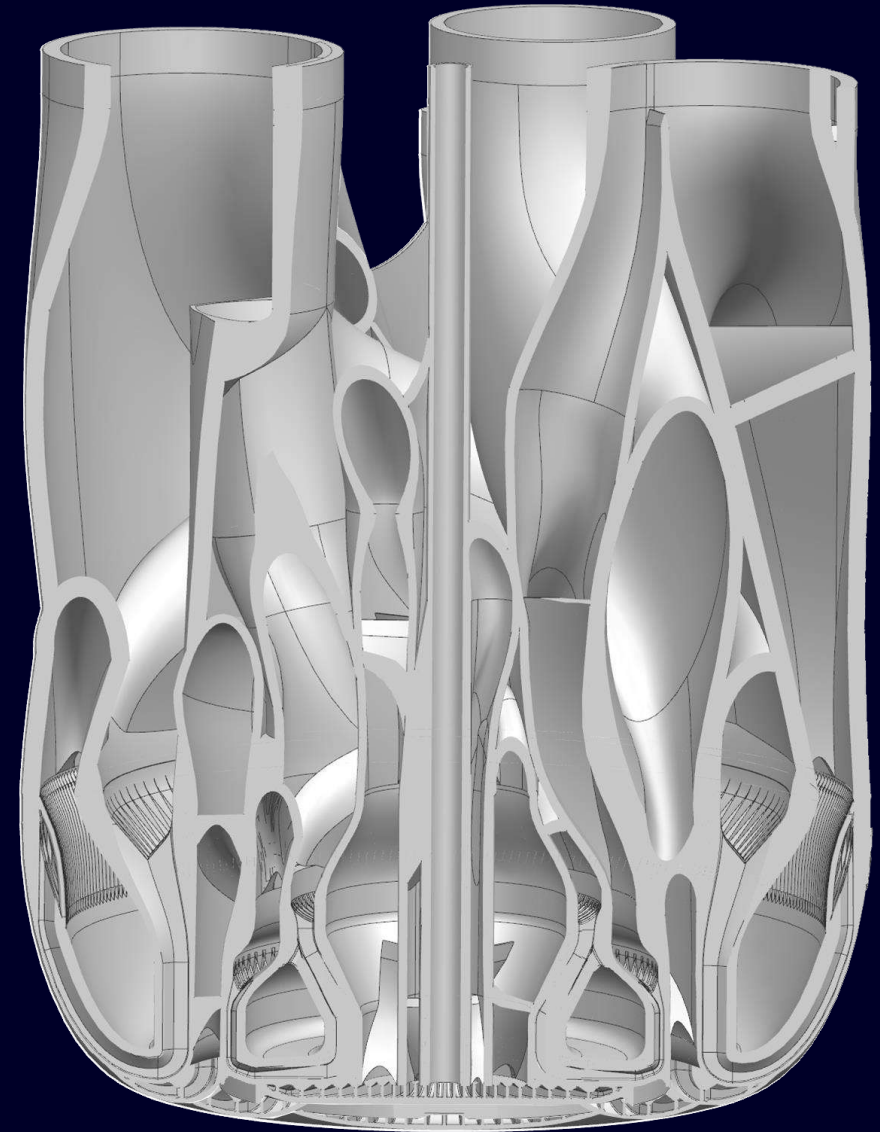
Managed environment from order-to-service



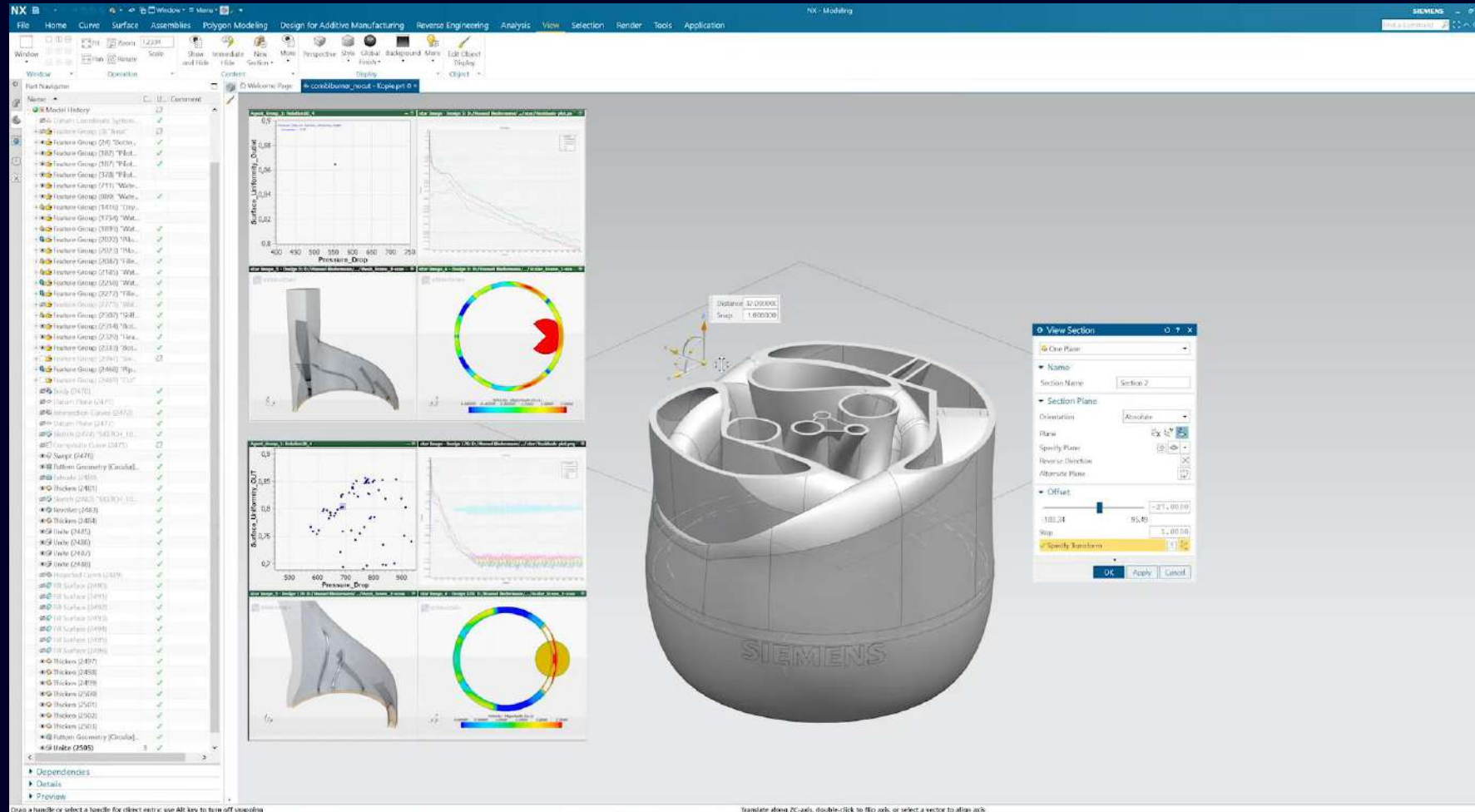




# Industrializing planar additive technologies



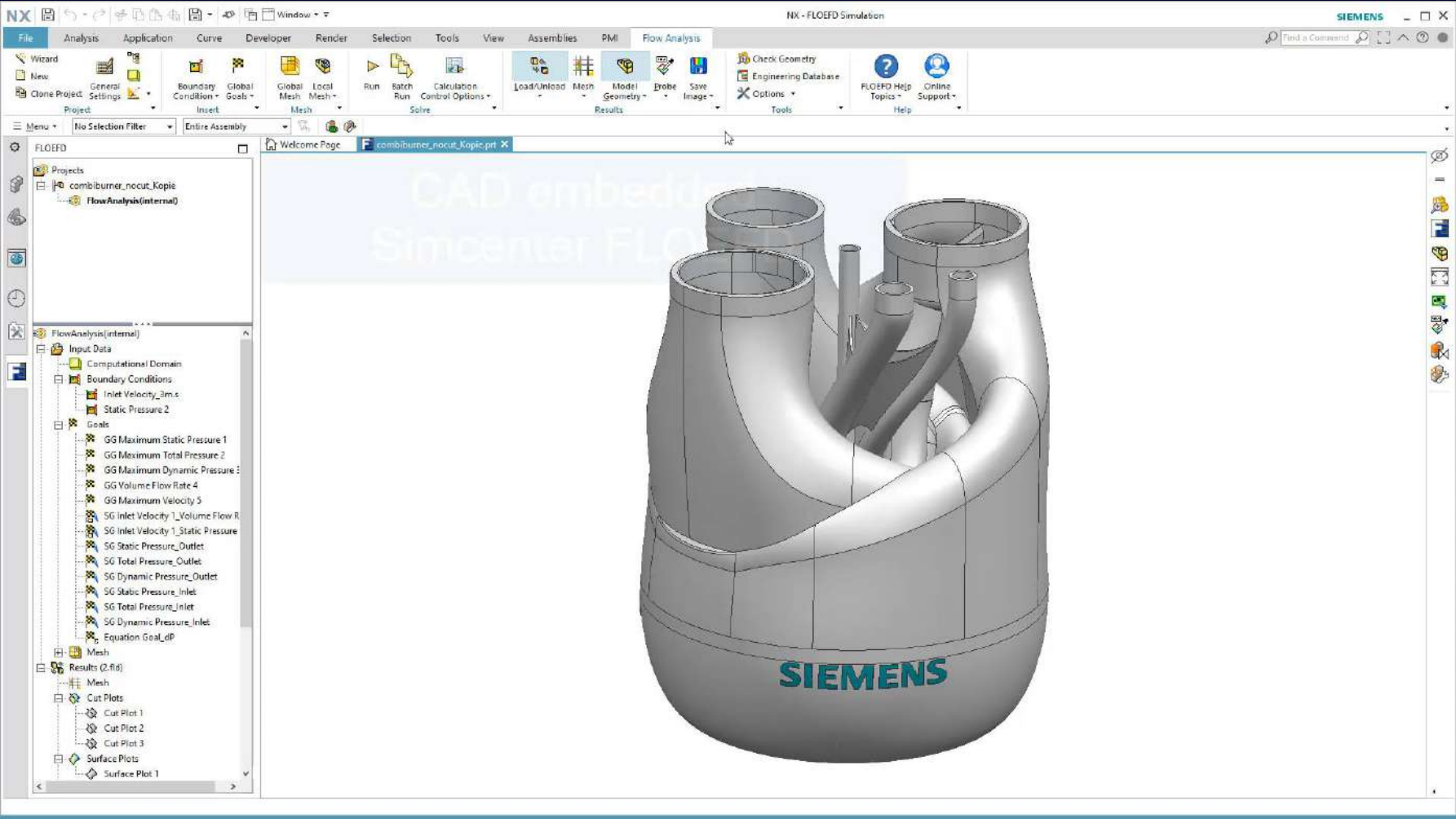
# For performance and design optimization, software-driven generative engineering can be leveraged



## Generative Engineering

The Digital Enterprise portfolio offers tools for design space exploration, such as Heeds or Topology Optimization embedded in NX

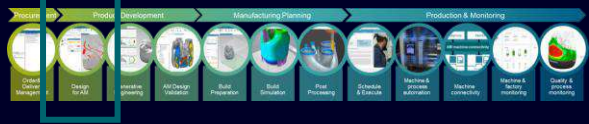
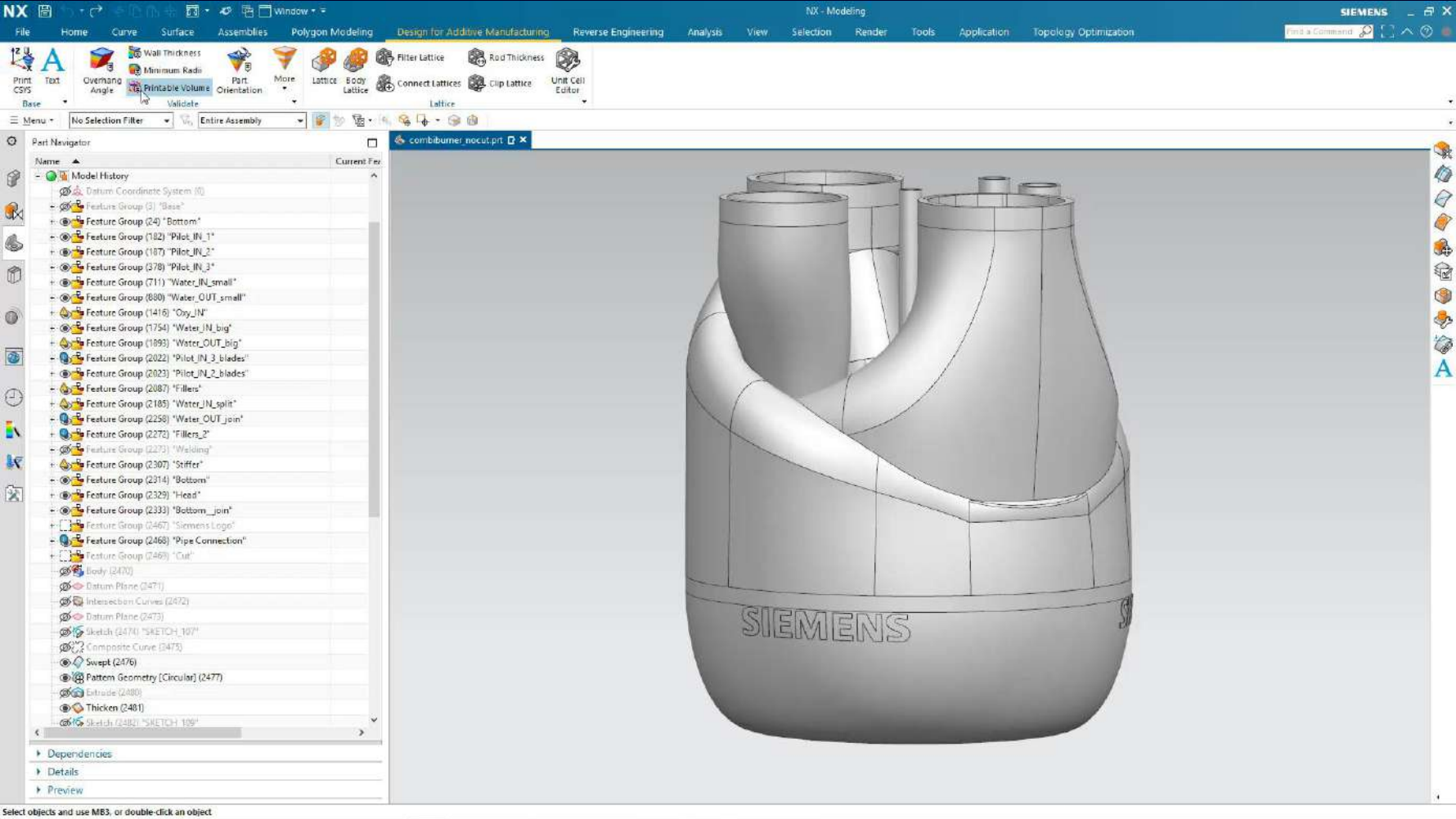
# CAD-based CFD simulation maximizes innovation and productivity



**FLOEFD in NX**  
Validation of design changes with CFD, integrated into the development process within the CAD environment



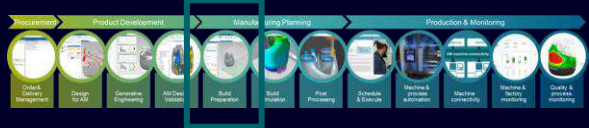
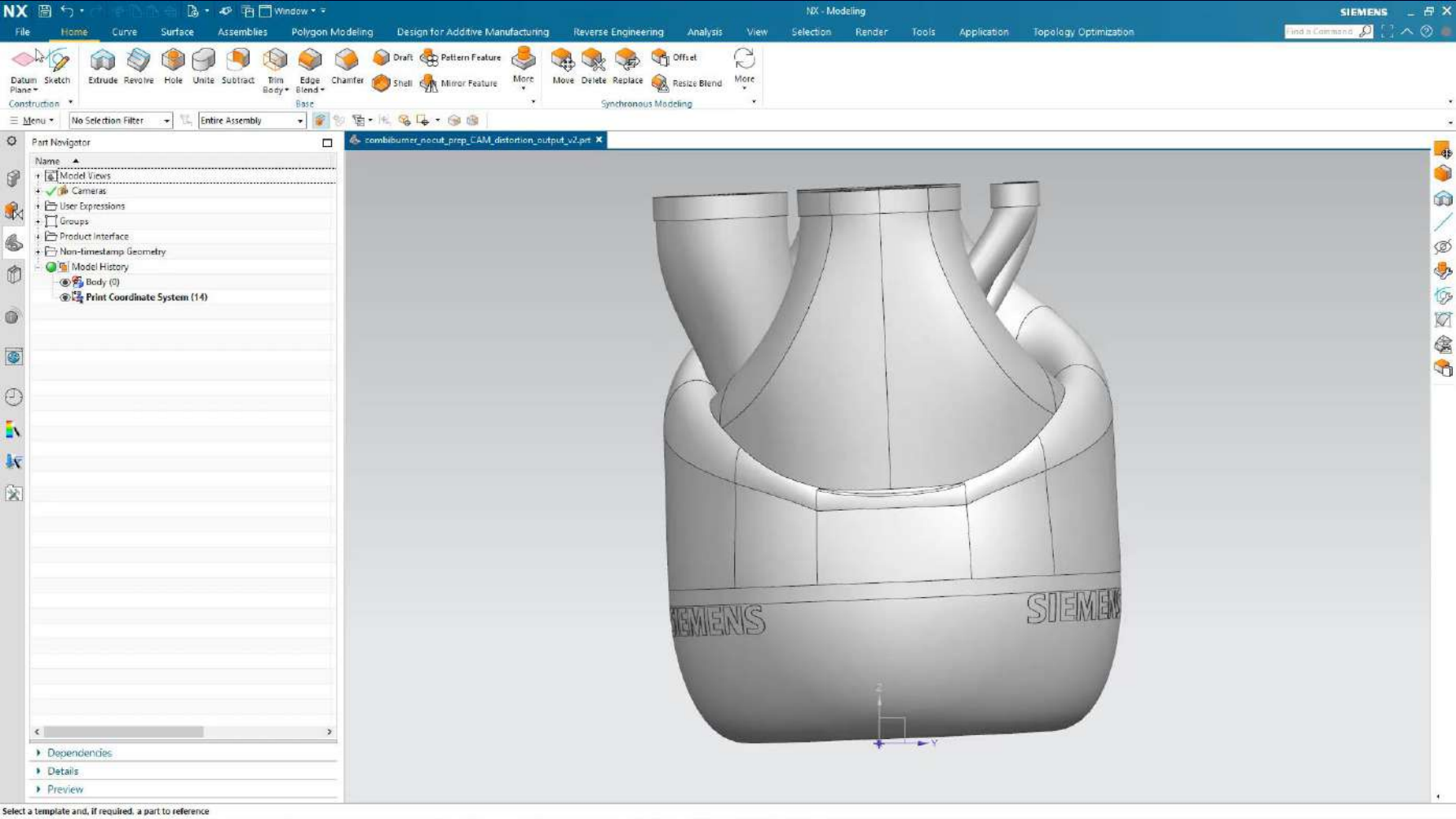
# Design checkers in NX help to quickly identify manufacturability challenges



## Siemens NX AM

Check printability in regards to minimum wall thickness, overhang angles, minimum radii or enclosed volumes

# Print preparation in NX with plugins for various printer manufacturers



## Printer integration in NX

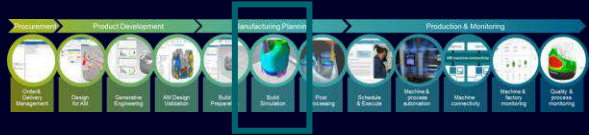
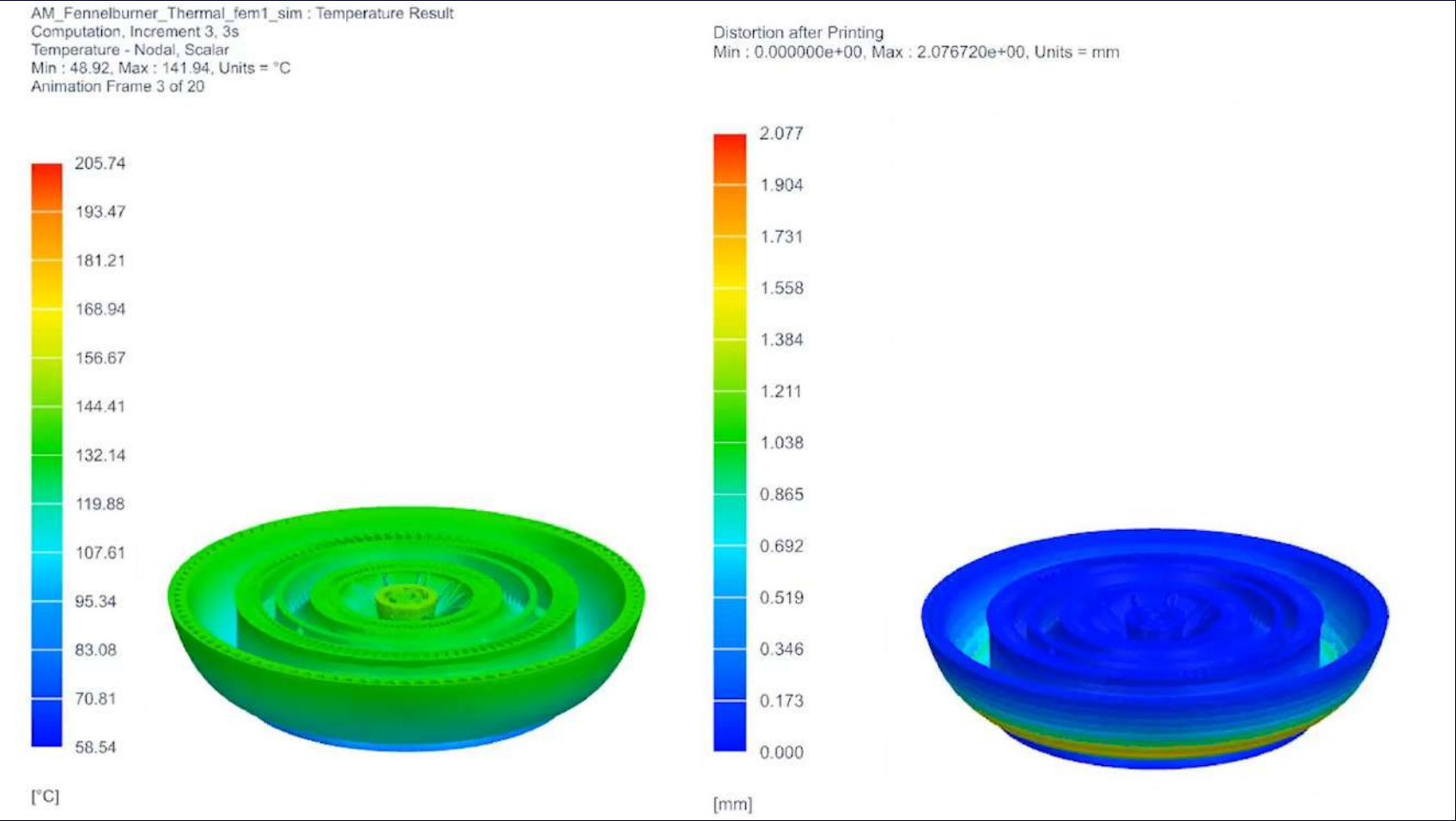
Set print parameters

Create support structures

Nest parts in build envelope

Slice component and generate hatching through plugins

# Mesh-based build simulation yields precise results for thermal and mechanical impact of the build process

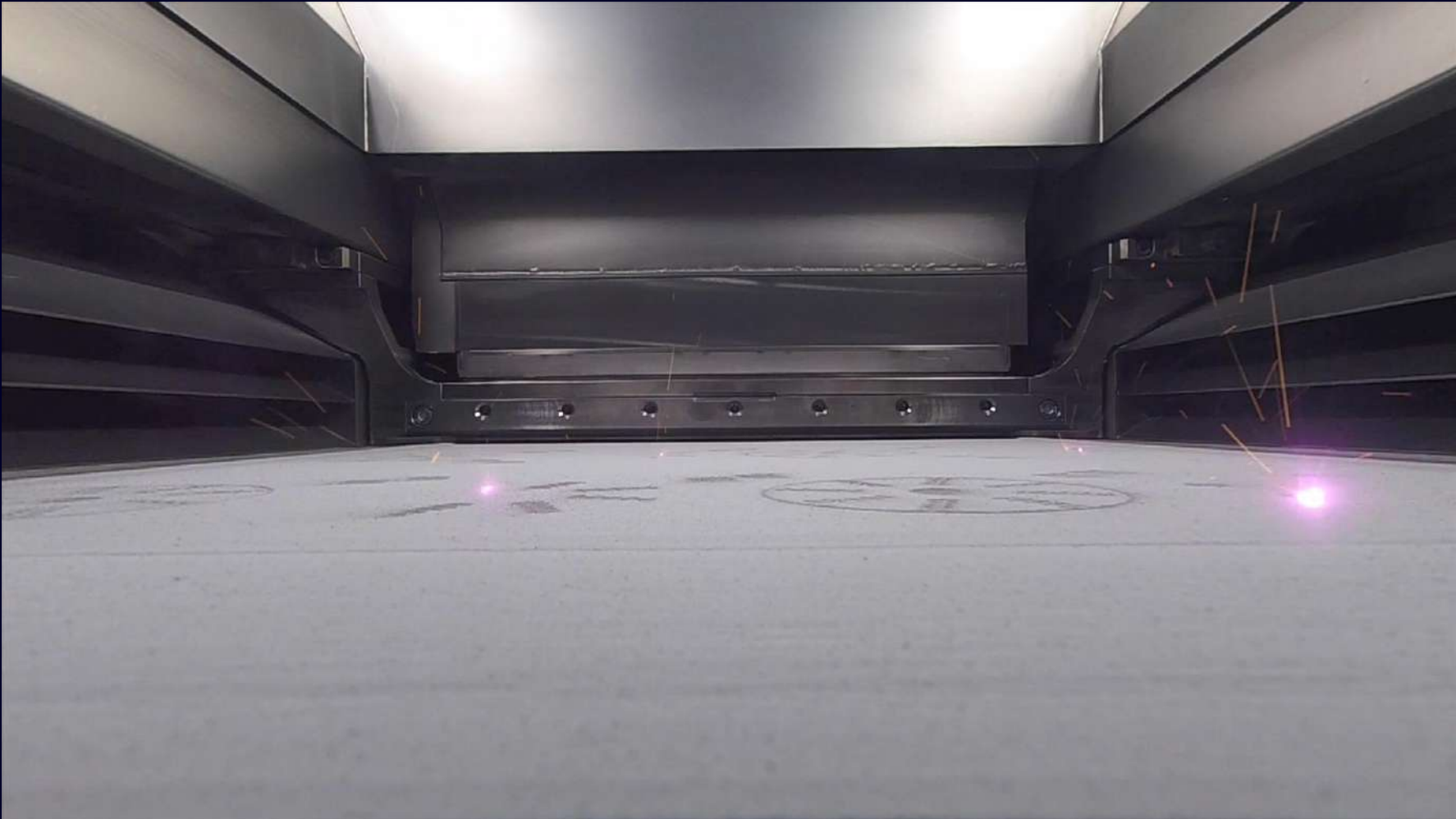


## Simcenter 3D AM

Tool for specialists to run build analysis for first-time-right printing

Deformation shown in the visualization of the build process

# The industrialization continues on the machine level with advanced AM systems, highly productive with multiple lasers



**Siemens partners with leading OEMs and offers industrial machine equipment and automation technology**

Industrial Security

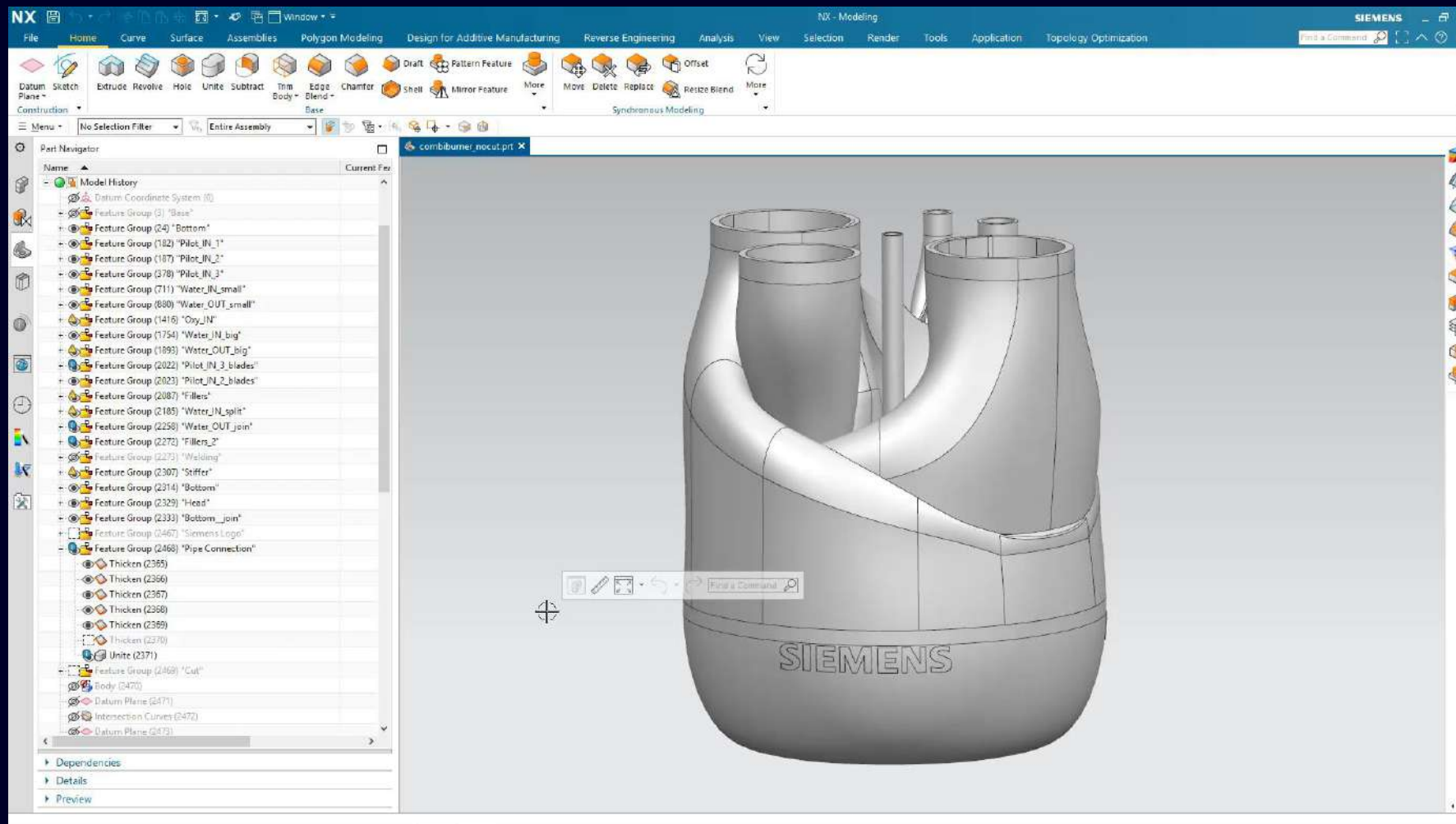
Industrial Safety

Industrial Communication

Uptime



# Efficient post-processing is an important part of leveraging an optimized workflow



## NX CAM

Simply design of fixtures

Programming of NC Code

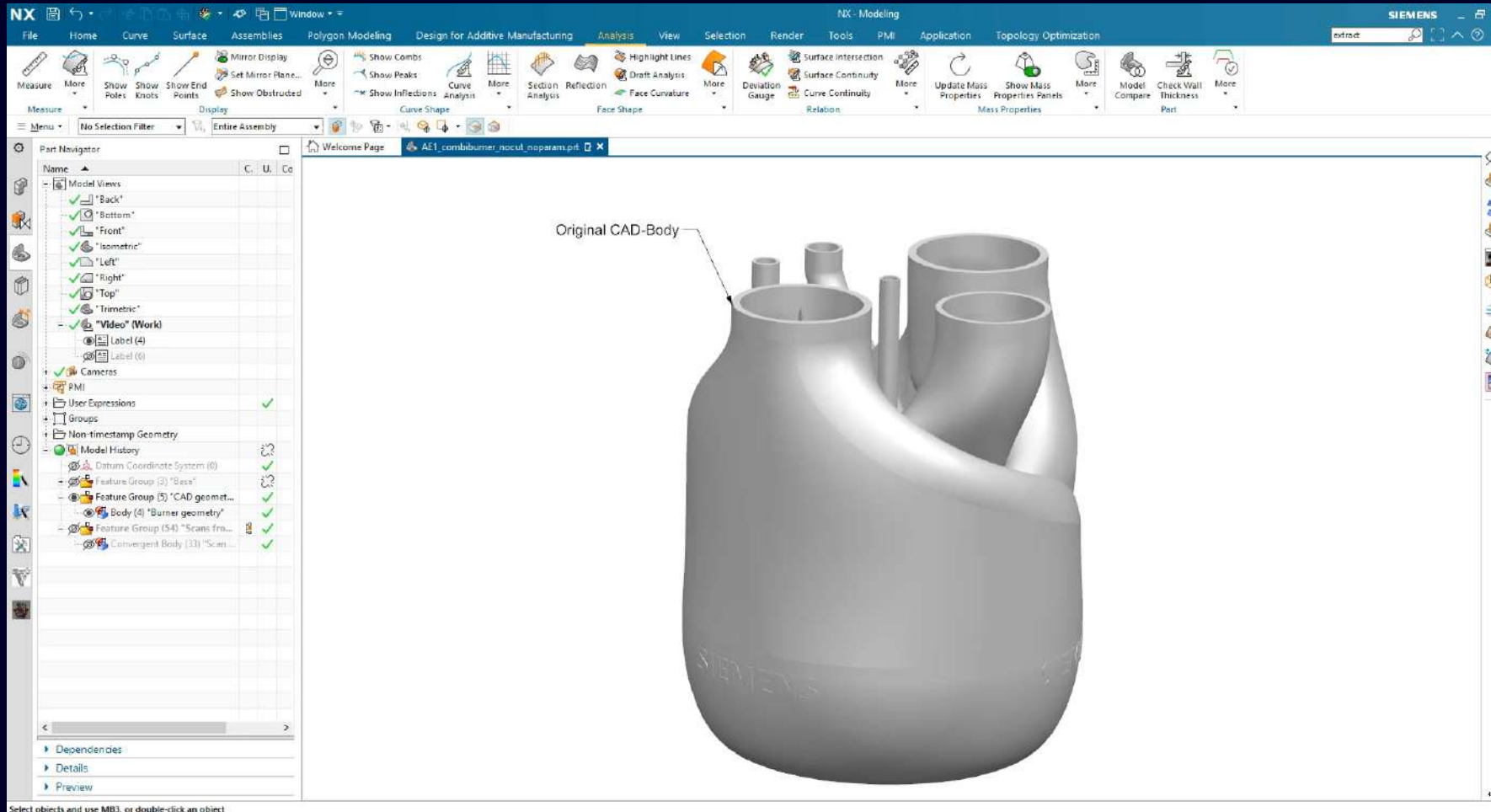
Usability of CAD/CAM integration

Validation of the milling program

Creation of functional surfaces or support removal



# Measuring final part and comparing the print to the CAD geometry is important for quality control



## NX Analysis tools

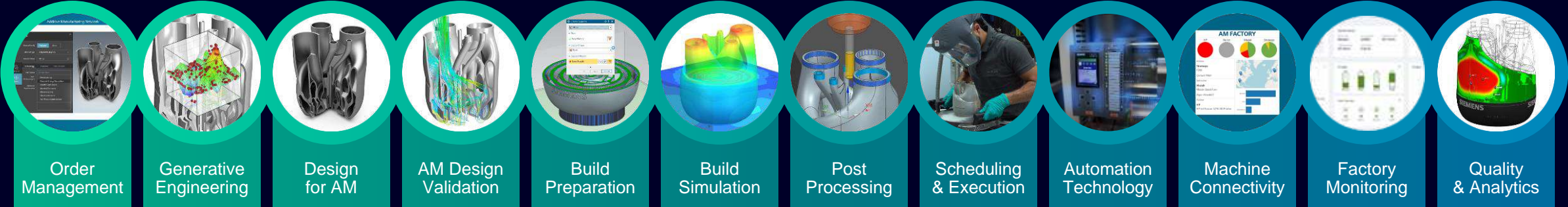
Integrating scan of part into NX

Merging scan and CAD manually through reference points or best fit in NX

Measuring deviation to understand dimensional accuracy of print

# Siemens' end-to-end digital thread and machine control for planar Additive Manufacturing

## AUTOMATION AS THE KEY TO SUCCESS FOR THE INDUSTRIALIZATION OF AM



The industry's most comprehensive AM software capabilities

The industry's leading totally integrated automation solutions

Cutting edge digitalization solutions

**Thank you for your time!**  
**Any questions?**

## **Contact**

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