nTopology

Industry
Manufacturing
Robotics

Application
Lightweighting

CASE STUDY

DMG MORI Redesigns Robotic End-Effector using Topology Optimization & Reusable Workflows

The engineers of DMG MORI's ADDITIVE INTELLIGENCE team redesigned the Robo2Go head for additive manufacturing using nTopology.

The new design is 62% lighter, has 60% fewer components, and improves the handling precision of the robot by a factor of 16x.

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Background

DMG MORI is a leader in metal-cutting manufacturing equipment, producing high-quality CNC machines for over a century. The Robo2Go system is integral to the company's **factory automation** offering.

ADDITIVE INTELLIGENCE, DMG MORI's additive manufacturing design consultancy, was tasked with maximizing the **stiffness-to-weight ratio** of the head of the robotic end-effector while improving **handling precision** and reducing **manufacturing costs**.

A key design requirement was to keep the external **form factor** of the component unaltered. At the same time, the robot head had to house the **embedded channels** of the pneumatic system and the end effector's **electrical components**.

> *With nTopology, we were able to create a powerful and unique additive design. It wouldn't be possible to create such a component with a traditional CAD system.*
>
> — **Martin Blanke**
> Additive Manufacturing Project Engineer at DMG MORI

Lightweighting
62% reduced weight

Assembly Consolidation
60% fewer components

Robot Handling
16x higher precision

Pneumatic System
45% fewer sealing points

Material
Aluminum (AlSi10Mg)

Manufacturing
LASERTEC 30 Dual SLM

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Topology Optimization for Variable Shelling

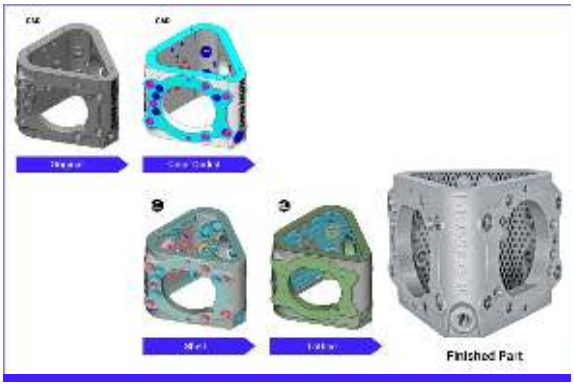
Since the engineers could not alter the external form of the part, the results of topology optimization could not be used directly as the final design. However, they could be used to vary the thickness of the outer shell. This process helped the team to grasp some of the structural benefits of topology optimization without changing the part's exterior.

Conformal Lattice for Stiffness & Support

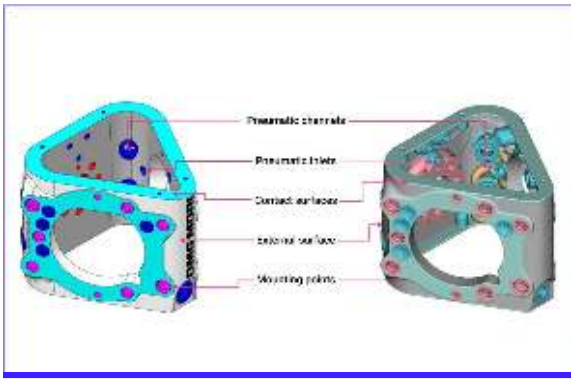
The engineers of DMG MORI filled the shell with a conformal lattice to increase the stiffness of the part and create a permanent support structure for additive manufacturing. The team used nTopology's engineering simulation capabilities to rapidly iterate between the available options and select a suitable lattice design.

Design Automation with Color-Coding

Instead of creating a one-off design, the engineers of DMG MORI developed a robust and reusable optimization process. Using as input the color-coded surfaces of each subsystem of the imported CAD file, the nTop workflow that the team developed can automatically rerun — even if the geometry changes due to design iterations or future projects.



Overview of the optimization process.



Reusable design workflow based on color-coded surfaces.

Business Value

- **Multi-system integration:** Consolidate entire system assemblies into a single easy-to-manufacture component optimized for additive manufacturing.
- **Higher Performing Products:** Increase your robotic systems' handling precision and load capacity to produce robust engineering solutions.
- **Streamlined Process:** Save valuable engineering time and augment your engineering software stack with generative and design automation software.

Request a demo

About nTopology

nTopology was founded in 2015 to enable engineers and designers to create any geometry — no matter how complex — and meet the requirements of high-performance products. Our software is used from research through production to create breakthrough processes and products for the aerospace, automotive, medical, and consumer industries. Our customers depend on nTopology's generative design capabilities to take full advantage of new hardware, optimize parts where performance is critical, overcome design bottlenecks, and augment their traditional CAD, simulation, and engineering software stack.