HEXAGON

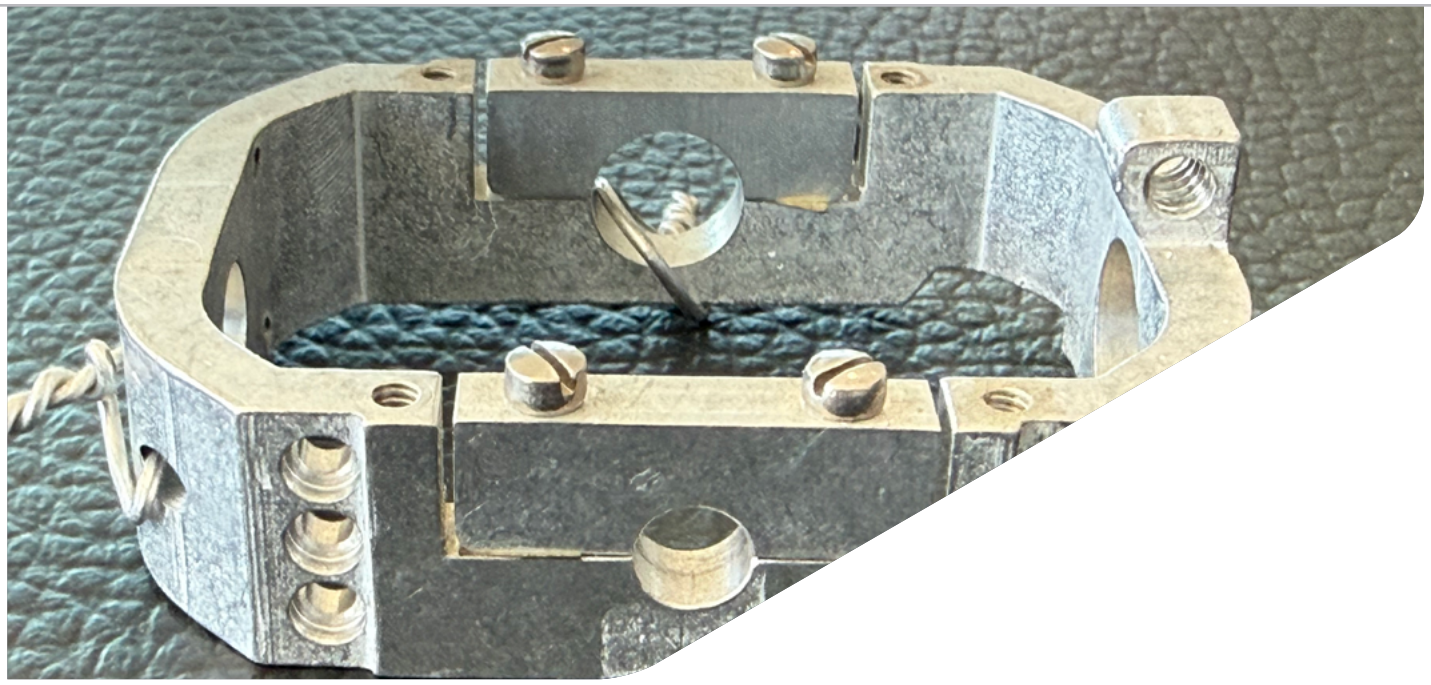
Forged by innovation

How Hartmann's Inc. elevated complex machining with ESPRIT

Introduction

Hartmann's Inc. has built its reputation on precision, craftsmanship, and a relentless commitment to solving complex machining challenges. Serving industries where quality is non-negotiable, their team is trusted to manufacture intricate, high-tolerance components that must perform flawlessly in the field. Today, under the leadership of **CEO Alan Hartmann,** the fourth generation of the family continues to uphold a promise the company was built on "Quality and Precision Forged by Innovation."

As demand increased and part designs grew more sophisticated, Hartmann's leadership recognized that their CAM workflows needed to evolve. They needed a solution that could keep up with their ambition, a system that empowered their programmers, supported their machinists, and helped the company stay ahead of customer expectations.



Opportunity

Hartmann's programmers were spending too much time correcting and validating toolpaths, especially for multi-axis and contour-rich parts. Similar jobs had to be rebuilt from scratch, and tribal process knowledge wasn't fully captured in a repeatable digital format. These inconsistencies added unnecessary stress on the shop floor - slowing down setup, increasing back-and-forth revisions, and creating bottlenecks the team wanted to eliminate.

Early 2023, Hartmann's was increasingly asked to take on complex free-form surfaces, multi-contoured aerospace parts, medical geometries with micron-level detail, and assemblies requiring minimal setups. Their Mazak fleet — including Syncrex, VARIAXIS 5-axis platforms, and Integrex mill-turn machines — was more than capable mechanically.

But their **programming limitations were holding them back.**

Key challenges:

- Inconsistent free-form toolpath quality
- Tool orientation issues in 5-axis motion
- Variability between programmers
- Less predictable surface finishes
- Excessive on-machine edits
- Higher setup hours
- Difficulty handling complex geometries with confidence

Multi-setup workflows also introduced compounding error, making high-tolerance work riskier and more time-consuming.

The leadership team knew that to scale, compete, and continue delivering exceptional precision, they needed a CAM platform capable of matching the quality of their machines and enabling truly digital-first manufacturing.

Pain points in free-form 5-axis

When it came to free-form 5-axis machining, Hartmann's faced even greater challenges that slowed productivity and limited what the team felt confident taking on. Toolpath quality varied from part to part, and tool-orientation issues often forced programmers to spend extra time correcting or adjusting motions. Achieving high-quality surface finishes on free-form components was difficult, and the machine's movement during combined 5-axis operations could feel unpredictable, making the process less reliable than it needed to be. Excessive hand edits became the norm, and many jobs required multiple setups that introduced unwanted stack-up error. These issues created a bottleneck around some of the shop's most advanced work.

Why Hartmann's chose ESPRIT and the shift it created

Hartmann's began its ESPRIT journey in 2024, driven by a need for greater accuracy, smarter machining strategies, and a CAM environment that could keep pace with their expanding Mazak fleet. ESPRIT stood out immediately

because of its best-in-class digital twins for Mazak platforms, its ability to generate exceptionally accurate free-form and 5-axis toolpaths, and its robust collision-avoidance capabilities - all essential for the level of precision the shop demands. Just as importantly, ESPRIT aligned with Hartmann's long-term vision of building a fully integrated smart-factory ecosystem, one where digital consistency drives quality and efficiency at every stage.

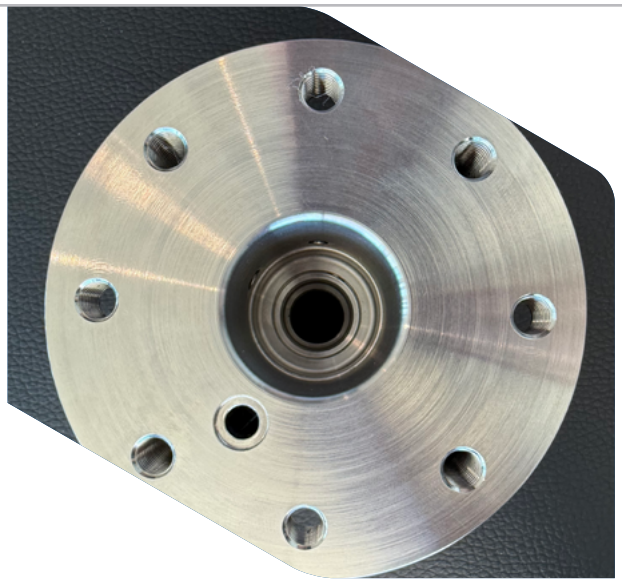
The transition represented more than just adopting new software; it marked a cultural shift within the organization. Moving away from on-machine programming meant bringing programming upstream, giving the team greater planning visibility and the ability to standardize workflows across machines and operators. The result was a more unified programming approach, reduced variability, and operators who could focus entirely on execution rather than code. This new structure didn't just elevate consistency - it strengthened the entire shop's rhythm, improving quality, predictability, and collaboration across teams.

With ESPRIT, the company established a clear programming structure:

- **Feature-driven workflows** that detect and automate machining steps
- **Smart toolpath templates** that capture best practices and dramatically reduce programming variation
- **Accurate digital simulation** that removes guesswork and boosts confidence before machining
- **Reliable post-processing** that ensures the NC code outputs exactly how machinists expect

As the team continued using ESPRIT, they found that even the most challenging parts with deep pockets, tight corners, complex surfaces could be programmed quickly and cleanly. The platform became the foundation for their modernized machining process.

"We now confidently machine **medical components, aerospace parts, space-flight hardware, and complex housings** with fewer setups and greater accuracy"



Workflow (Flowchart)

CAD model received

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Import into ESPRIT

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Feature recognition + templates

↓

Smart tool selection & toolpath creation

↓

Accurate simulation + verification

↓

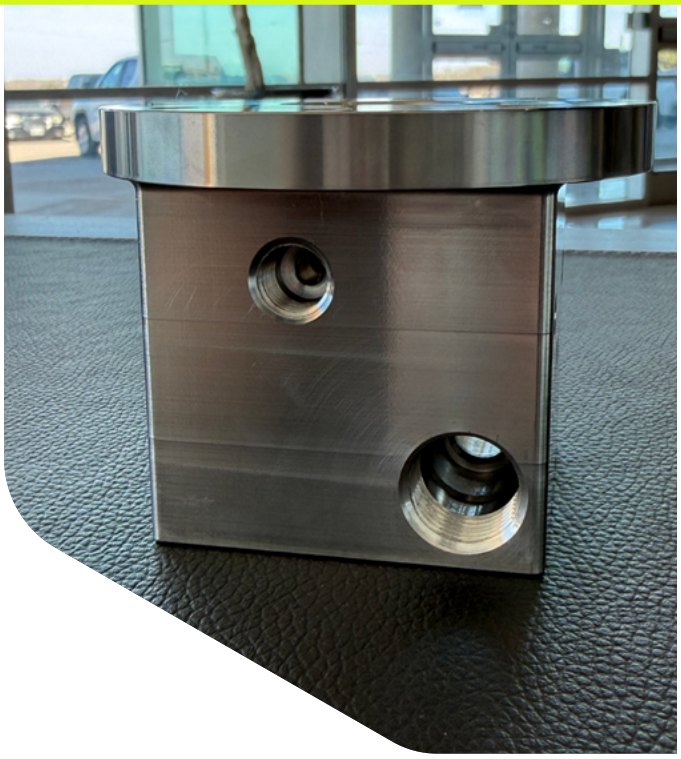
Post-processed NC Code

↓

Machining on the shop foor

Complex parts where ESPRIT made a difference

ESPRIT quickly became a turning point in how Hartmann's approached its most demanding work. The software's accuracy and control made it possible to machine free-form medical components with far greater confidence, while aerospace and space-flight geometries, once considered high-risk due to their complexity became routine. Critical components like the Paradigm dose pump assemblies benefited from more reliable toolpaths and cleaner surface transitions, and multi-contoured housings that previously required multiple setups could now be completed with fewer operations and tighter tolerances. Even the most intricate, high-precision assemblies began flowing through the shop more efficiently, supported by digital twins and validated toolpaths that minimized surprises at the machine. ESPRIT didn't just improve how these parts were programmed and it fundamentally elevated what the team believed was possible.



Results

The transition to ESPRIT delivered measurable improvements throughout Hartmann's machining operations, creating a more predictable and efficient production environment.

Since adopting ESPRIT, Hartmann's has seen meaningful improvements across both programming and production. Setup hours have been reduced by up to **10%**, while cycle times have improved by as much as **20%**, allowing the team to push more work through the shop with greater efficiency. Surface finishes are consistently better, first-article success rates have climbed, and the variability between operators has narrowed significantly thanks to standardized, digital workflows. Machine motion is more predictable, shop-floor edits have dropped, and the team can now confidently take on more advanced, complex jobs that were previously difficult or time-intensive to attempt. ESPRIT hasn't just sped up operations — it has strengthened precision, consistency, and capability throughout the entire machining process.

These gains not only improved shop-floor performance - they strengthened customer trust, allowing Hartmann's to commit to tighter timelines without compromising precision.

Looking ahead: Expanding ESPRIT's role in the Hartmann's smart factory

Hartmann's sees ESPRIT as a long-term strategic pillar, and the next one to two years will focus on unlocking even more of its potential across the shop. With seamless program portability between Mazak platforms, the team aims to balance machine capacity more effectively and further standardize toolpaths and workflows across their growing equipment lineup. As their digital twins continue to mature, they expect even greater reductions in setup and cycle times, enabling them to push deeper into advanced 5-axis machining strategies and confidently take on more complex aerospace, medical, and space-flight components.

To support this evolution, Hartmann's is also exploring several expanded capabilities within ESPRIT. This includes advanced 5-axis finishing routines for higher-performance surfaces, automated deburring strategies to streamline

secondary operations, deeper optimization for their Integrex platforms, and more sophisticated tool-library management. Additional simulation and verification tools are also under consideration as the team looks to extend automation, improve predictability, and reinforce the precision-first culture that defines their smart-factory vision.

Conclusion

By embracing ESPRIT, Hartmann's Inc. transformed the way they approach complex machining. What began as a need for consistency and speed has become a new standard of excellence — one where machinists trust the output, programmers work with confidence, and customers benefit from higher quality delivered faster than ever.

About Hartmann's Inc.

*Hartmann's Inc. is a third-generation, AS9100 Rev. D and ITAR-certified precision machine shop that has served the Medical, Aerospace & Defense, Energy, and Commercial Manufacturing sectors since 1955. Built on a legacy of craftsmanship and strengthened by a forward-looking approach to technology, the company specializes in machining complex, tight-tolerance components that demand absolute accuracy. Their work spans an impressive range from CNC-machined parts that support over **17 billion** contact lenses per year for Johnson & Johnson Vision Care to patented Paradigm precision dose pump assemblies, where Hartmann's is the sole manufacturer. The team also produces advanced medical and aerospace housings, intricate multi-axis geometries, precision rebuilds for high-tech equipment, reverse-engineered legacy components, and multi-component assemblies for automated systems.*

With a diversified fleet of Mazak equipment and a digital-first ecosystem built around HiQA, PolyWorks, ESPRIT digital twins, and Fulcrum ERP, Hartmann's blends its heritage of quality with modern innovation to deliver high-precision manufacturing at scale.

> "ESPRIT has elevated the way we approach complex machining. The accuracy of the digital twins, the efficiency of the toolpaths, and the flexibility to move programs between machines have all strengthened our ability to deliver high-precision parts across medical, aerospace, and space-flight applications. Just as we are an all-Mazak house, we are an ESPRIT house—and the combination has helped us work smarter, faster, and with greater confidence.
>
> **Alan Hartmann**
> CEO, Hartmann's Inc.

Hexagon is the global leader in measurement technologies. We provide the confidence that vital industries rely on to build, navigate, and innovate. From microns to Mars, our solutions ensure productivity, quality, safety, and sustainability in everything from manufacturing and construction to mining and autonomous systems.

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