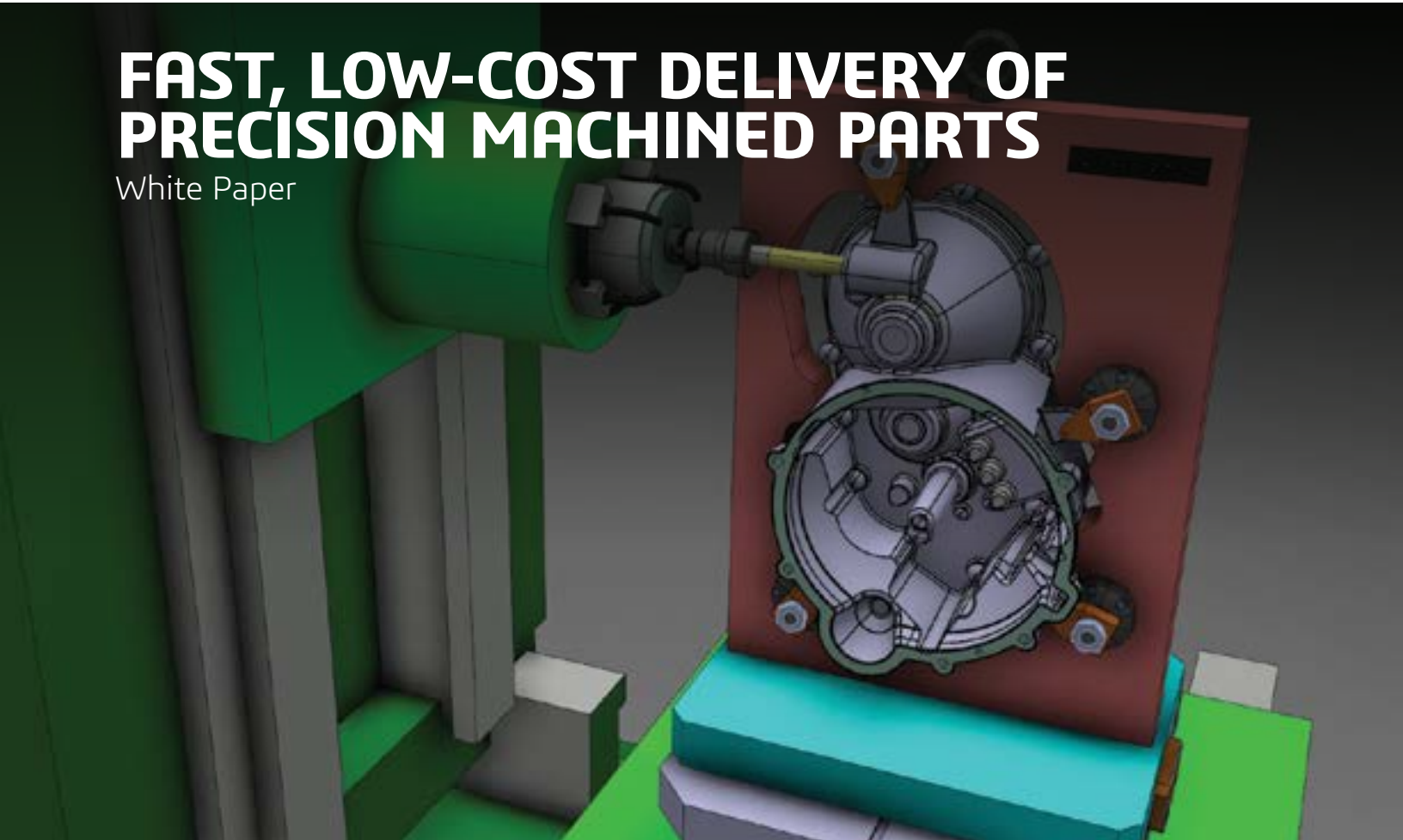


FAST, LOW-COST DELIVERY OF PRECISION MACHINED PARTS

White Paper



SUMMARY

Manufacturing companies that operate globally strive to achieve a couple of primary objectives: stay ahead of the competition and increase revenue by delivering machined parts faster while maintaining a competitive price despite geographic distribution. Making meeting those objectives even more difficult are supply chain disruptions and a lack of skilled talent. Overcoming today's challenging manufacturing environment requires optimized machining processes, strong links between design and manufacturing, and swift, efficient management of design changes. If that is not challenging enough, factoring in geographic, cultural and language differences adds layers of time-consuming complexity. These problems are often compounded by redundant, repetitive programming, incomplete simulations, time-intensive production methods, and the uncertainty of whether or not the shop floor is working with current data. Technology designed to mitigate these problems exists and is well-established.

BUSINESS CHALLENGES: MAKING GLOBALIZATION WORK

The Need For Global Collaboration

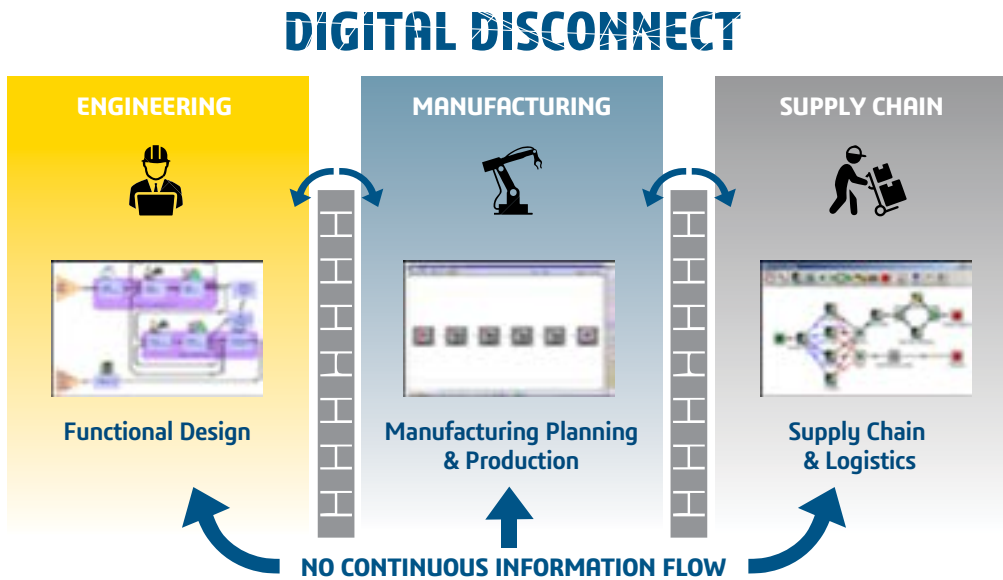
As manufacturing companies expand globally, manufacturing engineers need to be able to work concurrently across time zones with all participants in the process, from design to production. What they lack—and what would dramatically improve productivity—is shared access to a single source of current data that includes all elements of the process.

The Need to Reduce Development Time

Product Prototyping and development cycles are often slowed to a crawl with repetitive design and programming work. This is the most time-consuming phase, which could be mitigated by standardizing on design features and reuse of manufacturing best-practice cycles.

The Need for End-to-End Process Traceability

Living as we do in a period of major recall trauma, process traceability to reduce risk and liability—especially in the supply chain—is becoming essential for establishing innocence or accountability. It also points the way to improvements. This calls for technology that captures and stores complete end-to-end process data from all players.



THE CHALLENGES

- The costly gap between programming and production.
- Wasting time and productivity with repetitive programming.
- High tool costs for machining.
- Hard materials intervention to rotate complex parts.

PRODUCTIVITY CHALLENGES: MACHINING SPEED BUMPS THAT SLOW DOWN PRODUCTION

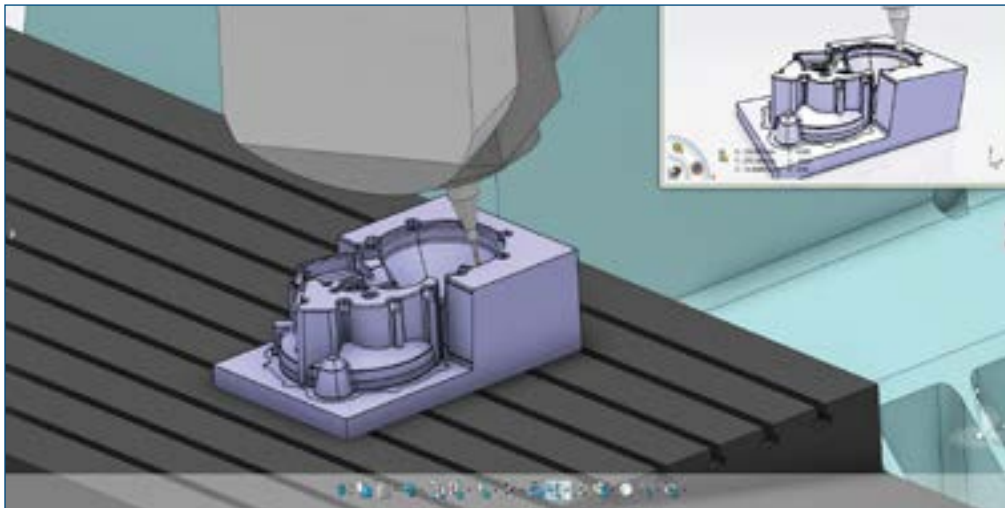
The Costly Gap Between Programming and Production

Programmers that work to create efficient, collision-free toolpaths for complex parts often suffer productivity losses. This is due to the lack of ability to capture know-how and to reuse proven processes effectively as desired. This results in reprogramming for every part that is released to manufacturing.

Adding to the productivity losses above is the fact that toolpath simulations provided by most machining software vendors do not include the context of the digital twin of the NC machine. Some vendors, therefore, add third-party software for this purpose—but to see a toolpath simulation in the context of the machine, the programmer must convert and transfer the file. If the third-party software reveals a problem, the programmer has to retrieve the file, correct the fault, and transfer it back again for a machine-context simulation. These back and forth transfer/simulate/rectify iterations are time-consuming and frustrating, and are responsible for lost productivity and production delays.

High Tool Costs for Machining Hard Materials

Milling materials like titanium, stainless steel and Inconel shorten the life of machine tools, which are a significant capital investment. The challenge is finding a way to accelerate hard-material production while extracting acceptable ROI from NC machines.



DELMIA, working with customers and tool manufacturers, has developed a very effective strategy called Adaptive Concentric Milling, which cuts hard material rapidly while prolonging the life of the tool.

MAXIMIZING GLOBAL PRODUCTIVITY

Manufacturing Engineering Solutions moves globalized manufacturing companies past these challenges to make them more productive and profitable. It combines the programming and production efficiencies of **3DEXPERIENCE**® Works Machining role, which is part of the **3DEXPERIENCE** Works portfolio, with the technological strength of the Dassault Systèmes **3DEXPERIENCE**® platform. It puts powerful tools in the hands of design engineers, manufacturing engineers, NC machine programmers, and process and production planners.

Transforming Productivity with a Single Data Repository

The **3DEXPERIENCE** platform lets product teams access process data from a single source of truth—a shared comprehensive data repository. It stores all process lifecycle information, from design through production. Its benefits are instantly clear:

- Confusion is eliminated between disparate data sources.
- Effective real-time communication is enabled between design and manufacturing regardless of geographic distributions.
- Manufacturers can capture experience and know-how and standardize corporate best practices across geographic and language barriers.
- Errors and ambiguity are eliminated in NC programming.

These benefits alone add up to substantial savings in programming and production time. Manufacturers can move products to market more quickly at lower cost, despite the geographic distribution of design, engineering, and production facilities. They have greater flexibility for order fulfillment.



Streamlining the Process with 3DEXPERIENCE Works Machining

3DEXPERIENCE Works Machining enables users to efficiently program multi-axis CNC machines and complex mill-turn machines with best-in-class tool paths and integrated machine simulation. The 3DEXPERIENCE Works Machining role:

- Simulates the real behavior of complex machine tools.
- Gives manufacturers the ability to program and control NC machines with a complete lifelike 3D simulation of the entire machining process, including the tool assembly, the NC machine and the controller.
- Enables planners to determine and validate processes, resources and outputs before production starts.
- Optimizes manufacturing processes and minimizes shop floor delays.

Working with a data repository that acts as a single source of truth, teams and disciplines collaborate via real-time immersive 3D chat, 3D snapshot exchange and Co-Review to make programming highly productive and efficient. The 3DEXPERIENCE platform provides data management tools that improve decision-making by identifying the risks and benefits of engineering and manufacturing changes and by keeping programs current with changes. Faster change notification and advanced data management accelerate program development.

3DEXPERIENCE Works Machining gives programmers a standardized user interface for programming machines of all types, enabling them to familiarize themselves quickly with new tools and simplifying deployment. Using machine kinematics-based programming, they program NC machines for faster realization of error-free toolpaths, giving manufacturers significant gains in competitive advantage and ROI: fewer prototypes, higher quality, faster programming, faster machining, reduced rework costs, and shorter time to market.

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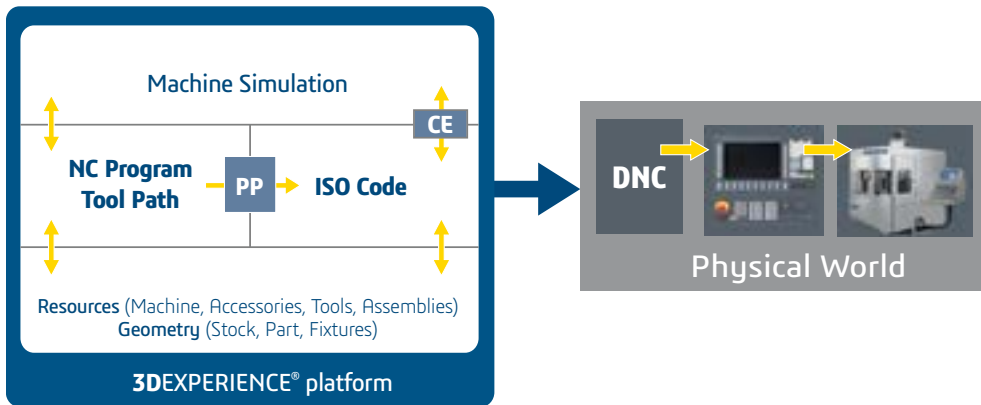
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WHAT IS 3DEXPERIENCE WORKS?

IT'S A COMPLETE INNOVATION PORTFOLIO PURPOSE-BUILT FOR THE MAINSTREAM MARKET THAT CONNECTS ALL THE PEOPLE, DATA AND APPLICATIONS NEEDED TO TAKE PRODUCTS FROM IDEA TO DELIVERY. BASED ON THE CLOUD-BASED 3DEXPERIENCE PLATFORM, THIS SUITE OF TOOLS MAKE INDUSTRY-LEADING TECHNOLOGIES FOR DESIGN, SIMULATION, DATA MANAGEMENT AND MANUFACTURING FROM DASSAULT SYSTÈMES ACCESSIBLE TO ANYONE INVOLVED IN THE PRODUCT DEVELOPMENT PROCESS. ANY BUSINESS INTERESTED IN LEVERAGING THEIR INVESTMENT IN SOLIDWORKS CAN INCREASE EFFICIENCIES, FACILITATE COLLABORATION, FOSTER INNOVATION AND GET TO MARKET FASTER WITH 3DEXPERIENCE WORKS SOLUTIONS. TAKE YOUR FIRST STEP ONTO THE PRODUCT DEVELOPMENT PLATFORM OF THE FUTURE TODAY.

[LEARN MORE](#)



3DEXPERIENCE Works Machining has integrated machine-tool simulation into its programming tools to deliver significant benefits:

Major time savings. Eliminating the need to transfer files to and from third-party machine simulation software does away with iterative processes and wait times that add substantially to NC programming costs.

Assurance that the program will work the first time on the shop floor.

Saved production time. Programmers can avoid shop floor surprises that idle machines. If a change or correction should be needed, it can be made rapidly without file transfer delays.

Achieving Major Efficiency Gains with Integrated Simulations

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- First time right. Assurance that the program will work as predicted on the shop floor.
- Saved production time. Programmers can avoid shop-floor surprises that idle machines. If a change or correction should be needed, it can be made rapidly without file transfer delays.

Integrated simulation means that all simulations—for tools, fixtures, accessories and the machine—share the same data. There is no need to transfer data using a variety of standard formats. The manufacturing model and resources are always displayed, and selection is fast and easy. The model of the machine, stored in the database, is always available.

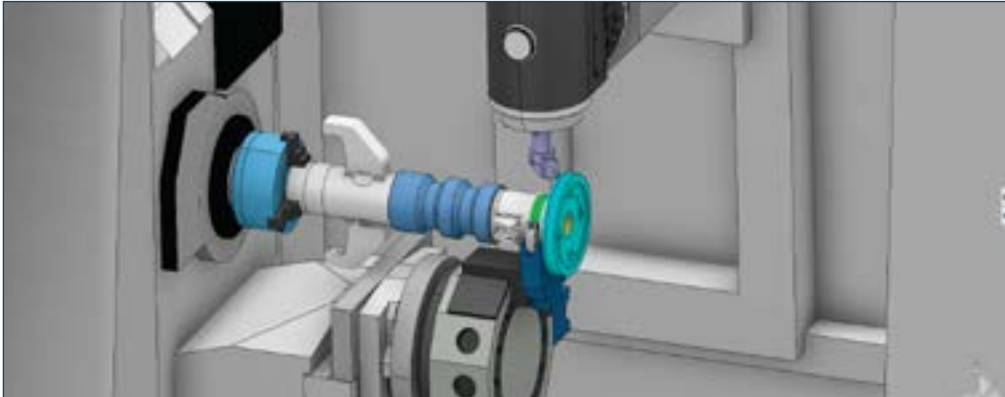
Machining simulations can display all shop floor resources, including the NC machine, at any time during the programming process. Programmers can work faster with fewer errors. They can check accessibility on any machine on the shop floor. They never have to wait until the end of the process to learn that they have to modify the operation or the tool, or find a different machine, or have to re-compute the entire program.

Capitalize and Reuse Know-How

One problem that has long frustrated NC programmers is having to start over again when programming a version or variant of an existing part. Most of the work they need—nominally, about 80 percent—already exists, has been validated, and has been used successfully on the shop floor. But it is not available to be modified and reused.

The **3DEXPERIENCE** platform lets programmers leverage this IP. Take the example of a manufacturer creating a line of similar parts - a mold or die. Once the shop-proven program for the first model is stored, recycling can start. For the next model, about 80 percent of the work is already done. Once the finishing is completed, **3DEXPERIENCE Works Machining** updates the toolpath automatically. What took days can now be done in a few hours.

Capturing and reusing programs also builds corporate IP and helps standardize best practices.



Multiple Milling and Turning machines can be replaced with a single Mill-Turn Machine that can be easily programmed and simulated with **3DEXPERIENCE Works Machining**.

Dedicated Hard-Material Strategies that Cut Faster and Extend Tool Life

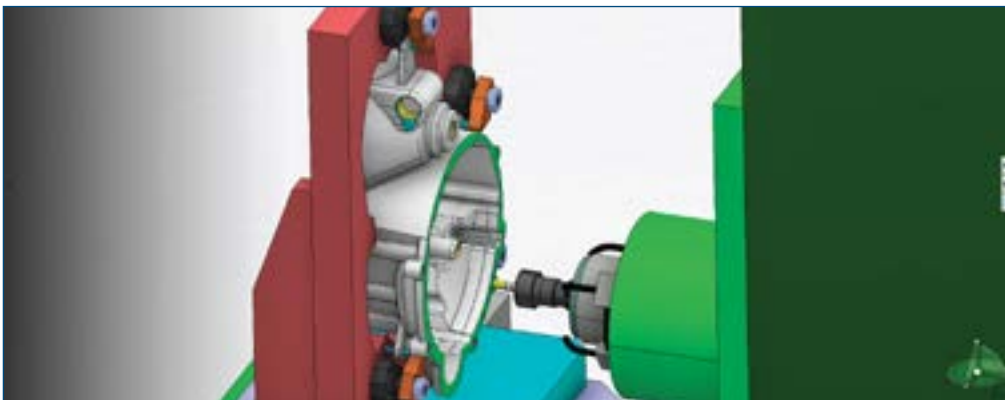
Hard materials such as titanium, Inconel and stainless steel take more time to cut and shorten the life of cutting tools. Manufacturers need to machine these materials faster, but optimize the life of the tools—goals that appear contradictory.

Based on work with customers and tool manufacturers, Adaptive Concentric Milling offers a very effective strategy that cuts hard material rapidly while prolonging the life of the tool. Its key purpose is to maintain constant radial engagement of cutting tools on toolpaths. The process has been subjected to a variety of tests and analyses with excellent economical results.

Smarter Programming for Mill-Turn Machines

When a machine set-up requires reorientation, integrated machine simulation becomes invaluable to the programmer. It provides visual confirmation of machinability based on the kinematic reachability of the machine. One real-world example is regarding a circular part nearly two meters in length. It was being milled by a gantry-type NC machine with four heads that use identical toolpaths. When one side was finished, intervention was required to flip the part so the other side could be machined. The repositioning could not be done precisely enough to prevent problems with coaxiality. Throughput and quality were suffering.

Today, this customer has replaced the big four-head machine with a mill-turn machine and has used **3DEXPERIENCE Works Machining** with integrated simulation to generate both the toolpath and the rotation. No interaction is required, so the machine can be in production 24/7 and turn out superior quality—a major step forward in ROI.



Built to answer customer and industry-specific needs for ease of use and lower training costs.

SUMMARY: NEW LEVELS OF PRODUCTIVITY FOR GLOBAL MANUFACTURERS

What do all these benefits add up to for globalized manufacturing companies? Dassault Systèmes' **3DEXPERIENCE** platform for Manufacturing Engineering offers significant gains in productivity, cost reduction and delivery time. It enables suppliers and OEMs to:

- Minimize risk of product recall and liabilities.
- Leverage the efficiencies of a single data repository.
- Reduce project management time.
- Increase productivity.
- Reduce new product time-to-market.
- Manage change, costs and delays with end-to-end traceability.
- Optimized global production at lower cost is an achievable goal.

► To explore **3DEXPERIENCE** Works solutions, for machining and production visit <https://www.solidworks.com/domain/manufacturing-production>

Our **3DEXPERIENCE**® platform powers our brand applications, serving 11 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the **3DEXPERIENCE**® Company, provides business and people with virtual universes to imagine sustainable innovations. Its world-leading solutions transform the way products are designed, produced, and supported. Dassault Systèmes' collaborative solutions foster social innovation, expanding possibilities for the virtual world to improve the real world. The group brings value to over 250,000 customers of all sizes in all industries in more than 140 countries. For more information, visit www.3ds.com.



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