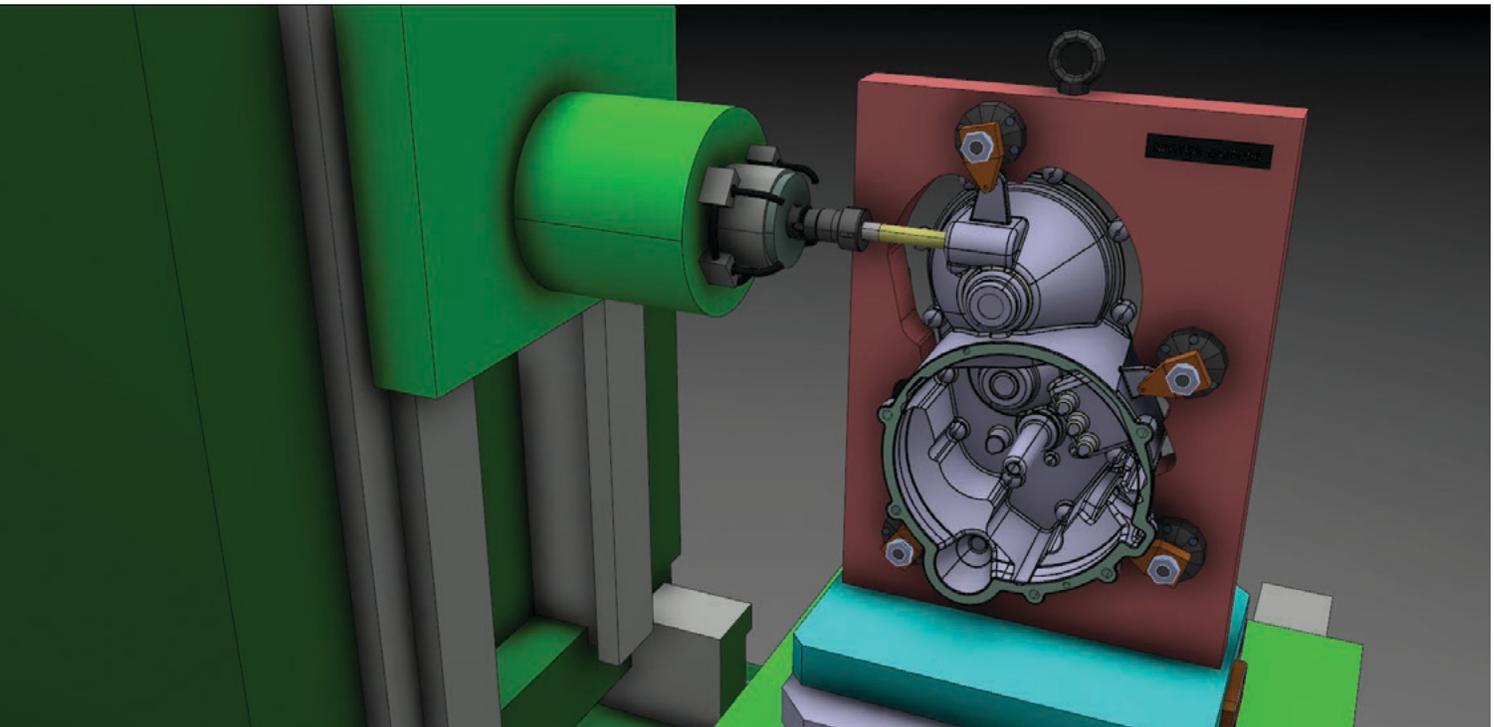# ACHIEVING FASTER, LOWER-COST DELIVERY OF MACHINED PARTS TO AUTOMOTIVE MARKETS

White Paper

EXECUTIVE 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 and less expensively despite geographic distribution. This requires optimized machine processes, strong links between design and manufacturing, and swift, fine-tuned management of design changes. That is 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 automotive 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 cycles are often slowed to a crawl with repetitive programming work, when existing programs could be reused or modified. This is a major time-waster that could be avoided by capturing and automating a library of design and manufacturing cycles and establishing best-practices standards.

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 for automotive OEMs and suppliers. It also points the way to improvements. This calls for technology that captures and stores complete end-to-end process data from all players.
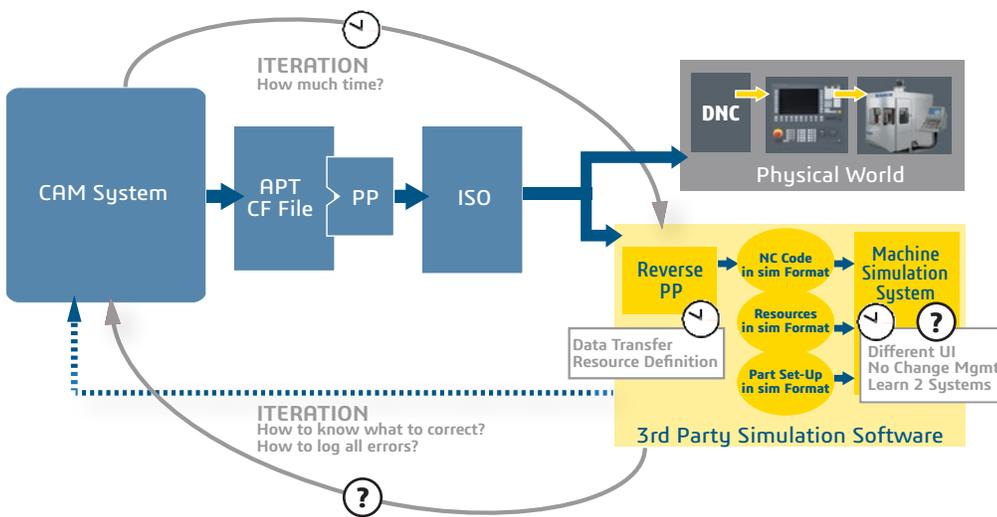

THE CHALLENGES

The costly gap between programing 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 costly surprises when programs reach the shop floor. Inadequate simulation is often the cause.

The toolpath simulations provided by most machining software vendors do not include the context 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 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 transfer/simulate/transfer/correct/transfer iterations are time-consuming and frustrating, and are responsible for lost productivity and costly production delays.
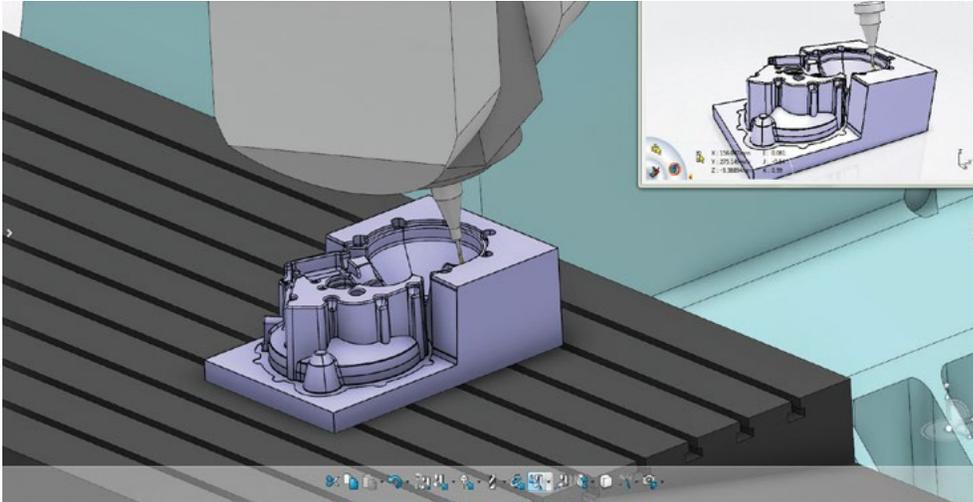
High tool costs for machining hard materials

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.

Intervention to rotate complex parts

Parts with complicated geometry often have to be reoriented so tool assemblies can reach all machinable features. This means stoppage time, human intervention, and a restart, all of which may introduce problems. When the part is repositioned on the machine, precision can be lost—including coaxiality, specificity and other absolute requirements for quality production.

SOLUTIONS: MAXIMIZING GLOBAL PRODUCTIVITY WITH DASSAULT SYSTÈMES BID TO WIN

Manufacturing Engineering Solutions, part of Dassault Systèmes' Bid to Win Industry Solution Experience, moves globalized manufacturing companies past these challenges to make them more productive and profitable. It combines the programming and production efficiencies of DELMIA Machining with the technological strength of the Dassault Systèmes **3D**EXPERIENCE® 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 Bid to Win **3D**EXPERIENCE solution 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.
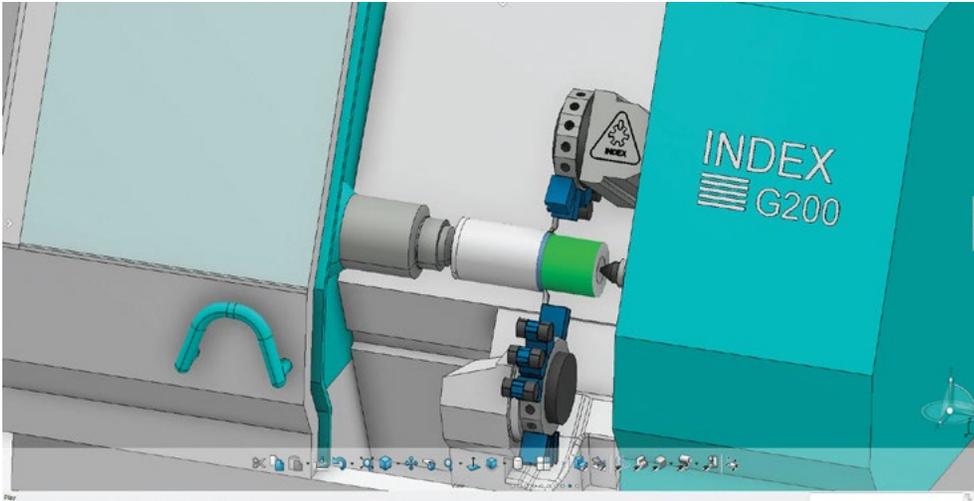
Simulates the real behavior of complex machine tools.

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 shopfloor delays.

Streamlining the Process with DELMIA Machining

DELMIA 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 DELMIA Machining portfolio:

- 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 **3D**EXPERIENCE platform provides PLM 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.

DELMIA 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.
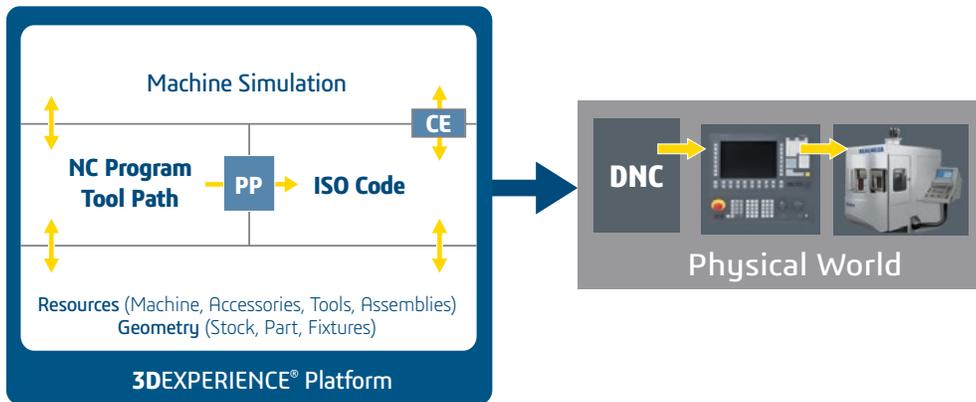
Achieving Major Efficiency Gains with Integrated Simulations

DELMIA 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.

- **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 DELMIA 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 Re-use 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.
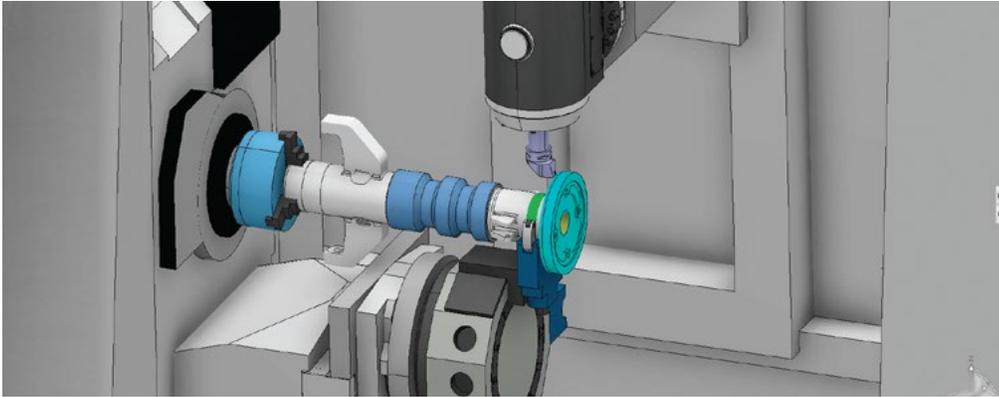
The Bid to Win **3D**EXPERIENCE lets programmers leverage this IP. Take the example of a manufacturer creating a line of similar parts - a mold or die. Once the shop-proven program for the first model is stored, recycling can start. For the next model, about 80 percent of the work is already done. Once the finishing is completed, DELMIA 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.

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 machine tools. Manufacturers need to machine these materials faster, but optimize the life of the tools—goals that appear contradictory.

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. Its key purpose is to maintain constant constraint on the head of the machine in all toolpaths. The process has been subjected to a variety of tests and analyses with excellent economical results.

DELMIA 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 shopfloor.

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

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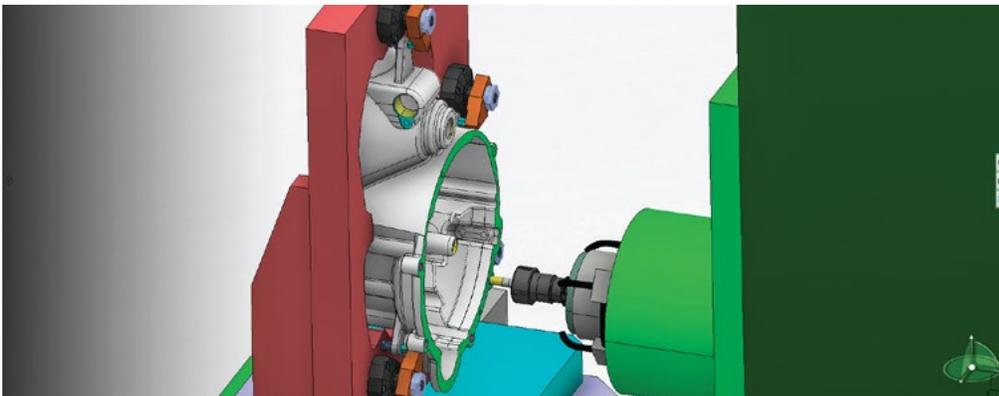
Built to answer customer and industry-specific needs for ease of use and lower training costs.

SUMMARY: NEW LEVELS OF PRODUCTIVITY FOR GLOBAL MANUFACTURERS

What do all these benefits add up to for globalized manufacturing companies? Dassault Systèmes' Bid to Win **3D**EXPERIENCE 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 DELMIA Machining and Bid to Win solutions, visit 3DS.com/DELMIA

Our **3D**EXPERIENCE® platform powers our brand applications, serving 12 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the **3D**EXPERIENCE® 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 190,000 customers of all sizes in all industries in more than 140 countries. For more information, visit **www.3ds.com**.

3DEXPERIENCE®

DASSAULT SYSTEMES | The **3D**EXPERIENCE® Company