SINGLE SOURCE FOR SPEED
FASTER GLOBAL DEVELOPMENT AND PRODUCTION FOR THE INDUSTRIAL EQUIPMENT INDUSTRY
White Paper

EXECUTIVE SUMMARY

As industrial equipment manufacturers expand and extend their geographic reach, they face challenges that prolong product lifecycles, increase costs, and make their output slow-to-market. Communication lags and misunderstandings between distributed engineering and production centers complicates and slows down processes. These time-loss problems are often compounded by repetitive programming, incomplete simulations, time-intensive production methods, and the uncertainty that the shop floor is working with current data.

The ideal solution enables global companies to design products at any location and produce them at selected sites, with all stakeholders from design to the shop floor working from a unique global data source. Single Source for Speed, a Dassault Systèmes Industry Solution Experience, lets all disciplines collaborate seamlessly across time zones, working from a single source of data. It accelerates production locally by providing integrated simulations, innovative milling strategies, and the modification and reuse of existing programs. Companies are using the Single Source for Speed **3D**EXPERIENCE® to optimize production globally while they shrink cost, time-to-market and delivery time.

MEETING THE CHALLENGES OF GLOBALIZATION AND COMPLEXITY

As industrial equipment companies expand on a global scale, one natural outcome is complexity. Operations are extended to widely distributed engineering, supply and production resources with varying capabilities. The challenge lies in connecting these resources in the most effective way to optimize production at the global level.

Collaborating on the **3D**EXPERIENCE platform, engineers, suppliers and production facilities in distributed locations can work concurrently in real-time from a single secure source to move at efficient speed through the product lifecycle. Design can be centered at any location—the corporate facility, regional centers, or geographic business zones. Planners can apply modular production techniques to expedite delivery, or use their overview to set up last-minute production for customers with urgent requirements. Newly acquired companies can be easily integrated.

All stakeholders in every product lifecycle, regardless of their locations, have access to a single source of current data that includes ideation, product requirements, project management, product engineering, process and change management, simulation, mold and tooling engineering and machining engineering.
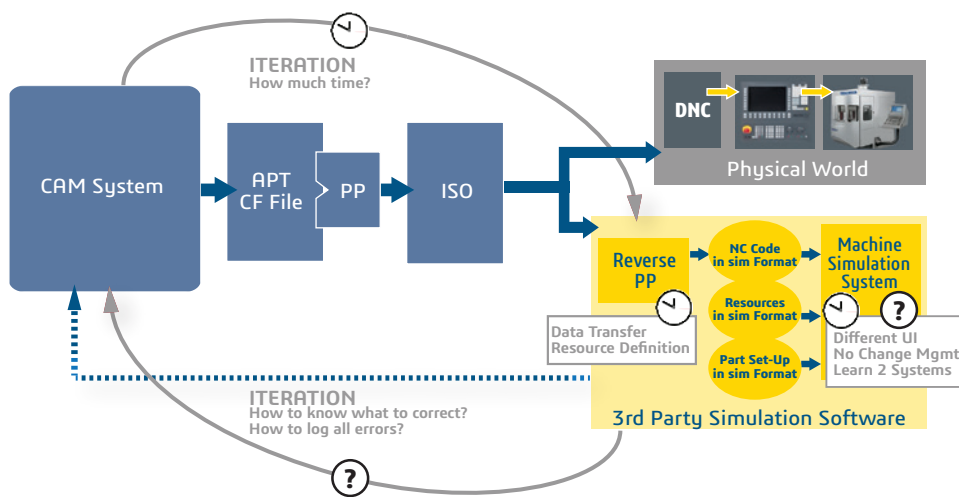
THE CHALLENGES

The costly gap between programing and production.

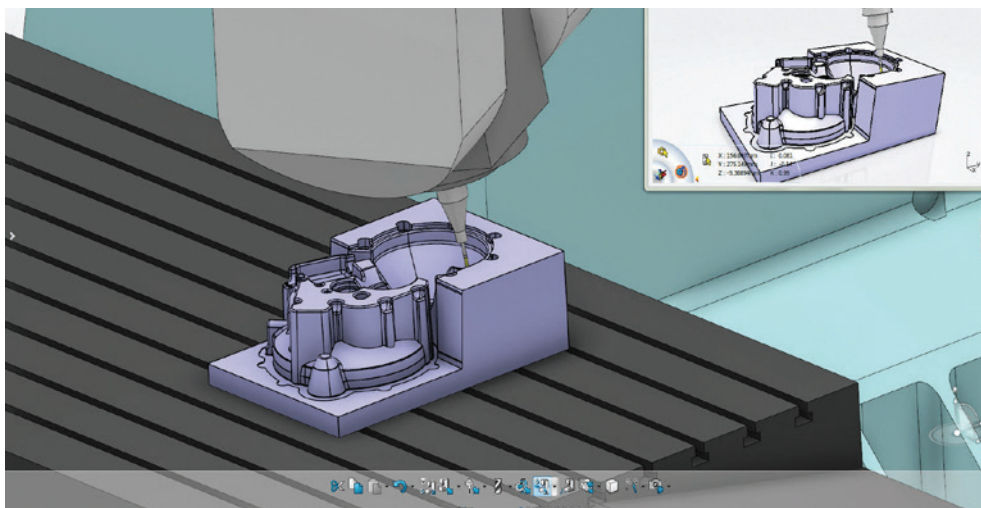Wasting time and productivity with repetitive programming.

High tool costs for machining.

Hard materials intervention to rotate complex parts.

3DEXPERIENCE: THE VEHICLE FOR THE SINGLE SOURCE FOR SPEED 3DEXPERIENCE

The **3D**EXPERIENCE platform unifies the user experience for all processes. Built to answer customer- and industry-specific needs for ease of use and lower training costs, its open architecture enables companies to customize enterprise data and integrate it into a single environment. It provides a single source of truth and a powerful process experience while helping to reduce the need for costly IT operations such as database replication. An intuitive, compass-like interface provides easy-to-use navigation, search, and collaboration.

Dassault Systèmes, the world leader in 3D design, 3D digital mockup and 3D product lifecycle management, provides **3D**EXPERIENCE solutions for every organization in your company—from engineering to manufacturing to marketing to sales – with a single collaborative interface for all disciplines. It powers solutions based on 3D design, analysis, simulation, and intelligence software in a new kind of collaborative, interactive environment.

SPEED BUMPS THAT SLOW DOWN PRODUCTION

1. 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 don't include the context of the NC machine. Some vendors, therefore, add third-party software for this purpose; to see a toolpath simulation in the context of the machine, the programmer must transfer it. If the third-party software reveals a problem, the programmer has to retrieve the file, correct the fault, and transfer it 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.

2. Reinventing the Wheel with Repetitive Programming

Programmers also have to deal with another major time-waster: iterations when designing a family of similar parts. For example: a programmer completes and validates an NC machine configuration for a mold for a 1.0-liter bottle. His next task is to deliver the same basic configuration for a 1.5-liter bottle. He has to start all over again—repeating about 80 percent of the work he did on the smaller mold.
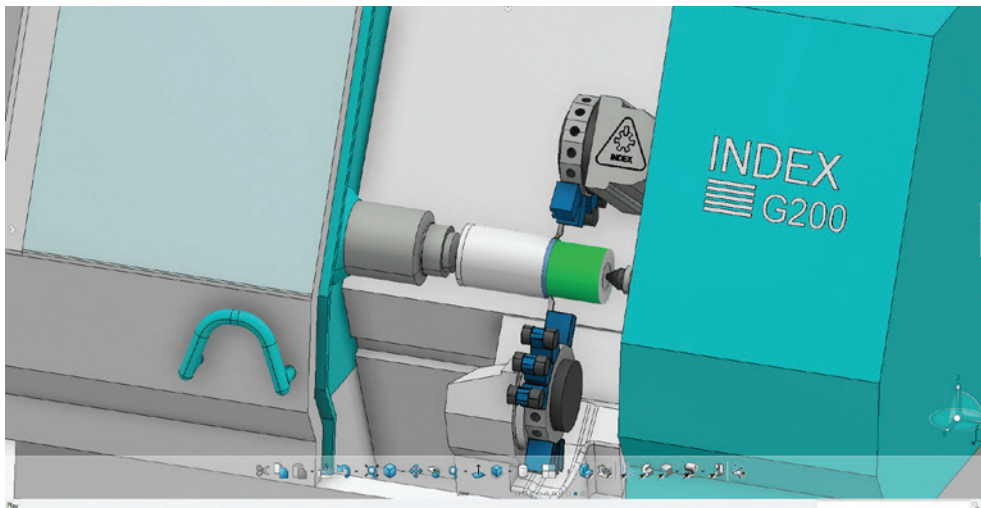
3. High Tool Costs for Machining Hard Materials

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

4. 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.

DELMIA, working with customers and machine-tool manufacturers, has introduced software tools and technologies into the Single Source for Speed **3D**EXPERIENCE that relieve these pain points to increase productivity and build ROI. These solutions enjoy all the advantages of the **3D**EXPERIENCE platform.
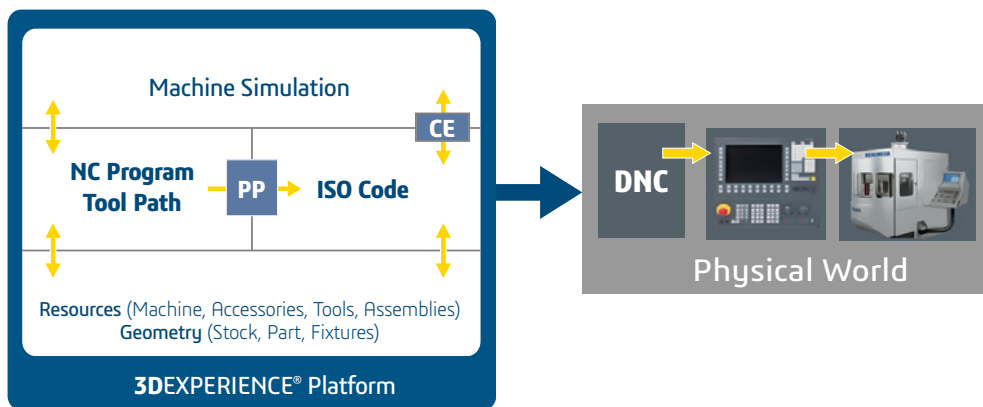
STREAMLINING THE PROCESS WITH DELMIA MACHINING

DELMIA Machining, a component of the Single Source for Speed **3DEXPERIENCE**, enables users to efficiently program multi-axis CNC machines and complex mill-turn machines with best-in-class toolpaths 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 with real-time immersive 3D chat, 3D snapshot exchange and Co-Review to make programming highly productive and efficient. The **3DEXPERIENCE** 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 tool paths, 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.

Machine Simulation

NC Program Tool Path — PP → **ISO Code** — CE

Resources (Machine, Accessories, Tools, Assemblies)
Geometry (Stock, Part, Fixtures)

3DEXPERIENCE® Platform

DNC → → **Physical World**

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.

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's no need to transfer data using a variety of standard formats.

When programmers select a tool and create a toolpath—especially for complex 5-axis operations—they need to see it in the context of the NC machine. DELMIA 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 to 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 recompute the entire program.

With integrated simulation, programmers know before they start to create a toolpath whether their program and its fixtures—any number of accessories—will work on the machine. Compare this with a typical scenario today: to validate a fixture, the programmer goes to the shop floor, stops the machine, puts the part on it, and works out a way to clamp it. With DELMIA Machining, this can be virtual. Early in the process, the software will alert the programmer if there are issues with the proposed toolpath orientation on the selected machine.
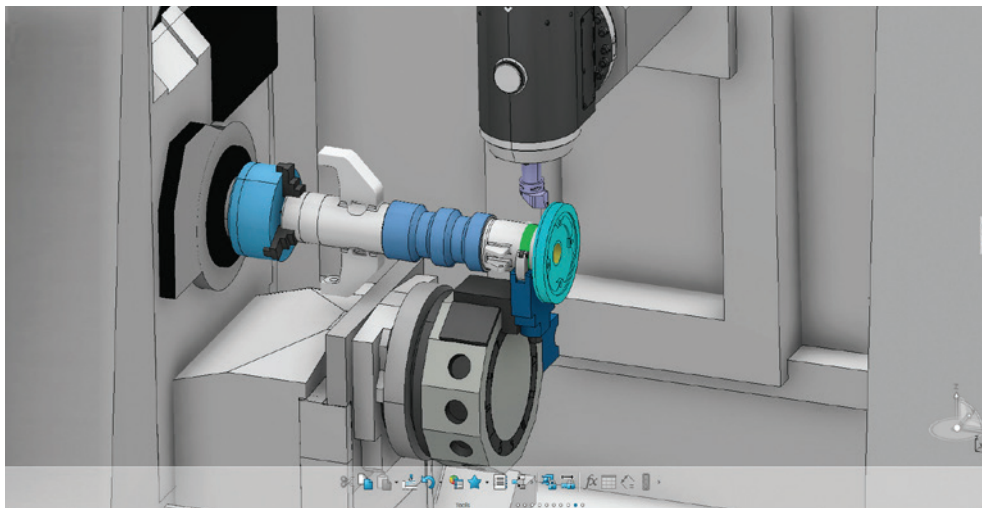
When thinking of ROI, it's useful to compare the capital cost of machine tools—complex machines that combine milling with turning, for example—with the relatively low cost of software. What would it be worth to save even one collision a year?

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's not available to be modified and reused.

The Single Source for Speed **3D**EXPERIENCE lets you leverage this IP. Say you're creating a line of similar parts—a faucet mold or die, as an example. Once you store the shop-proven program for the first model, you can start recycling. For the next model, about 80 percent of your work is already done. Once you complete the finishing, 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.
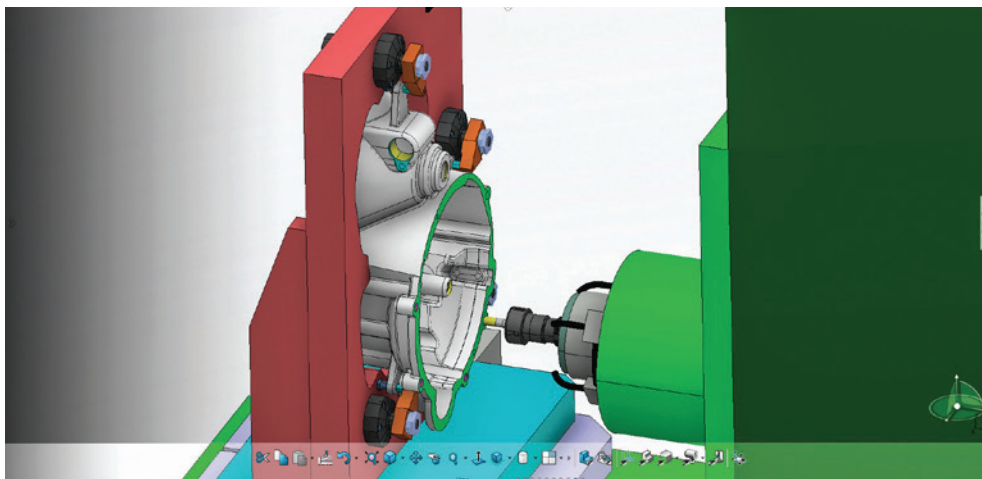
DELMIA, working with customers and tool manufacturers, has developed a very effective strategy called Adaptive Concentric Milling, which cuts hard material rapidly while prolonging the life of the tool. Its key purpose is to maintain constant constraint on the head of the machine in all toolpaths. The process has been subjected to a variety of tests and analyses with excellent economical results.

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 a circular part nearly two meters in length for aircraft landing gear. 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.

IN SUMMARY: OPTIMIZED PRODUCTION—LOCALLY AND GLOBALLY

Dassault Systèmes' Single Source for Speed **3D**EXPERIENCE lets industrial equipment manufacturers optimize production across time zones and geographies, matching engineering to production sites and letting them collaborate in the **3D**EXPERIENCE platform with a single source of information. It lets disciplines work concurrently to accelerate the production process, sharing integrated simulations from the start of the project without time-wasting file transfers. Programmers can be confident that their programs will work the first time, and that they can recycle and modify them to save hours of programming and speed up development.

Integrated simulation makes it easier for NC programmers to create programs for very complex 5-axis parts and for parts that require machine kinematic programming on mill-turn machines. They can confidently program hard-material machining that speeds production while extending tool life.

The Single Source for Speed **3D**EXPERIENCE lets industrial equipment manufacturers optimize production locally and globally to develop and deliver products faster—at lower cost.

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®

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