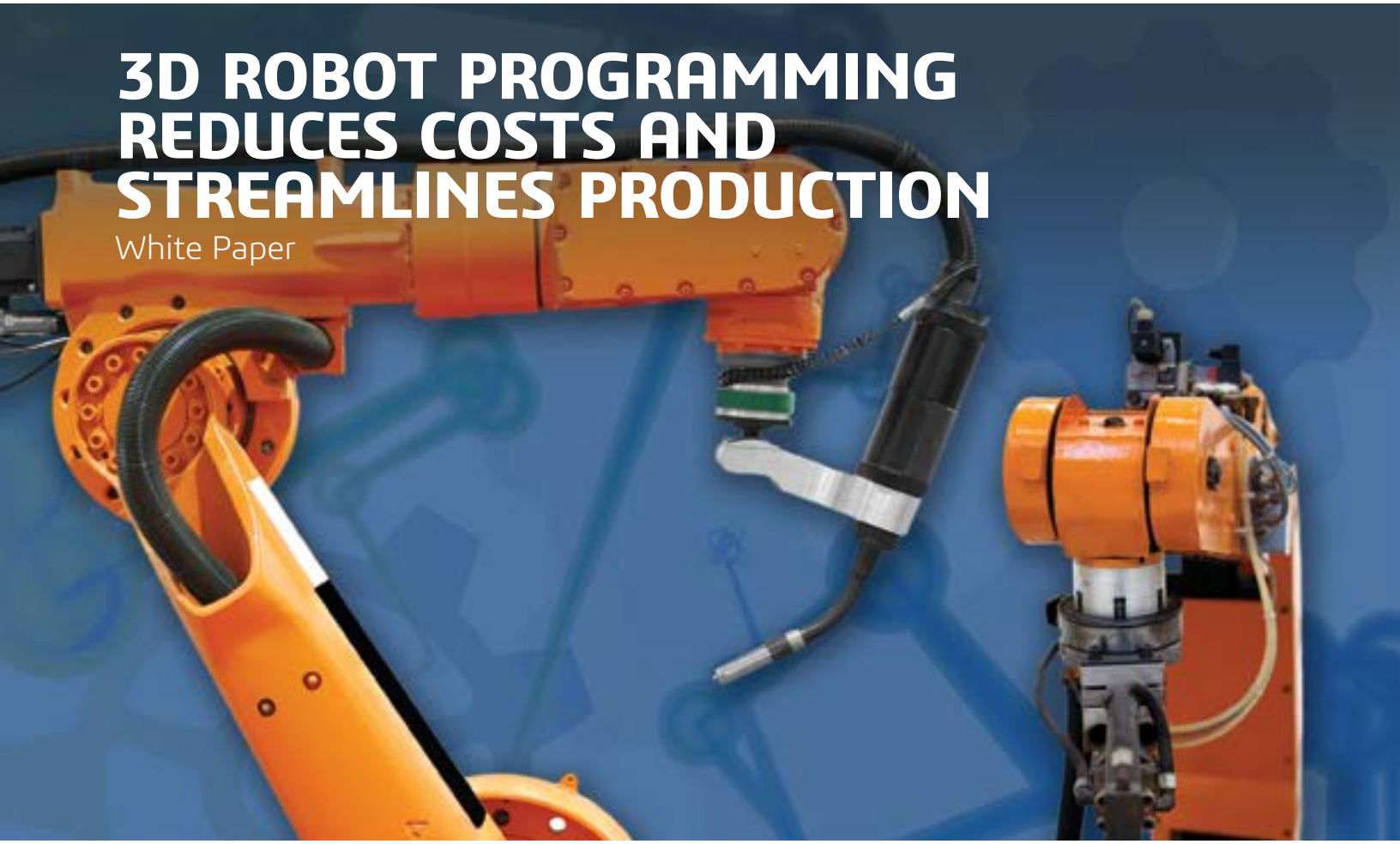
3DEXPERIENCE® Works

3DEXPERIENCE®



3D ROBOT PROGRAMMING REDUCES COSTS AND STREAMLINES PRODUCTION

White Paper

SUMMARY

Robotic manufacturing processes, with their clear advantages of speed, cost reduction and accuracy, are being widely adopted for a broad range of production needs. But robot programmers frequently find it challenging to deliver material handling, arc welding, spot welding, painting, or drill and riveting programs that work with certainty on the first run. Because robot programming is not part of the design phase, they are forced to implement fixes and workarounds on the shop floor. Costs escalate as production cycles expand and changes are made without knowledge of the shop floor impacts.

However, Robot Programmer, a role in the **3D**EXPERIENCE® Works portfolio, can deliver high-quality, collision-free programs in the native robot language with minimal intervention on the shop floor. In the virtual world, programmers and designers work in concert to create the most productive tooling operations and robot cycle times. Programming can move ahead independently without interrupting production, and robot programs perform predictably the first time. Costs of programming and production are significantly reduced, and products move to market more quickly.

SIMTEK
Real Time. Real Results

DASSAULT SYSTEMES

THE CHALLENGES FACING ROBOTIC WORKCELL PROGRAMMERS

Increased Complexity

Some of the latest developments in robot technology make it extremely difficult for robot programmers, particularly when there are multiple robot arms. Programming multiple robot arm systems is extremely challenging on the shop floor and increases the amount of risk to the product, tooling, and project schedule.

1. Spending time on the shop floor

Multiple variables can complicate robot programming, from changing part or tool designs to unreachable fastener placements and stringent cycle time requirements. Programmers cannot really be sure how a robot or tool will perform until the initial check on the shop floor. When design or programming changes are needed, validation can turn into a hands-on trial-and-error process while product designers and tool builders develop fixes. Time slips away, and project costs keep rising.

2. Lost production time

When robots are already in production, stopping to implement a change results in a loss of productivity. With no way to validate changes before taking the robots offline, every change made online is risky. Unexpected problems can lead to a lengthy production stoppage or even tool breakage.

3. Expensive shop floor damage

When workcells are validated on the shop floor, accidents can happen. Collisions are costly. Some of them happen because programmers lack first-hand knowledge of the physical process; they are working without the detailed process knowledge of how the tool operates.

4. The need to fine-tune workcell performance

To optimize task assignments for multiple robots, programmers need to equalize the task load so no robot is underutilized. Balancing weld spots or rivets between robots, for example, can significantly reduce cycle times for manufacturers—but this is a time-consuming challenge for programmers.

WHY MANUFACTURERS ARE MOVING TO OFFLINE PROGRAMMING

Moving programming off the shop floor to a virtual environment immediately results in significant cost and productivity benefits:

- Programmers do not need to wait until the tools are built to create and validate programs.
- Production on the shop floor can move ahead uninterrupted while new programs are being authored and validated.
- Programs work safely and predictably. Designs have already been validated. Programmers have a working knowledge of tool operation. Collision damage and delays are greatly reduced. There is no penalty for crashing a robot in the preproduction virtual world, where fixes are easier and quicker.
- Offline programmers are freed from the necessity of making shop floor fixes. They can use their time to make workcells operational within the project timeline and deliver consistent production quality.

WORKCELL PROGRAMMING ON THE 3DEXPERIENCE PLATFORM

Many manufacturing companies have turned to DELMIA for trusted and widely used offline programming tools, saving validation and production time and maximizing productivity.

The **3D**EXPERIENCE platform unifies the user experience for all business processes. Built to answer customer and industry-specific needs for ease of use and lower training costs, it 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. An intuitive interface provides easy-to-use navigation and search.

The **3D**EXPERIENCE platform enables real-time collaboration between design, manufacturing, and other disciplines to shorten product cycles and maintain high-quality production.

Reduce capital investment by designing and validating new robotic systems virtually.

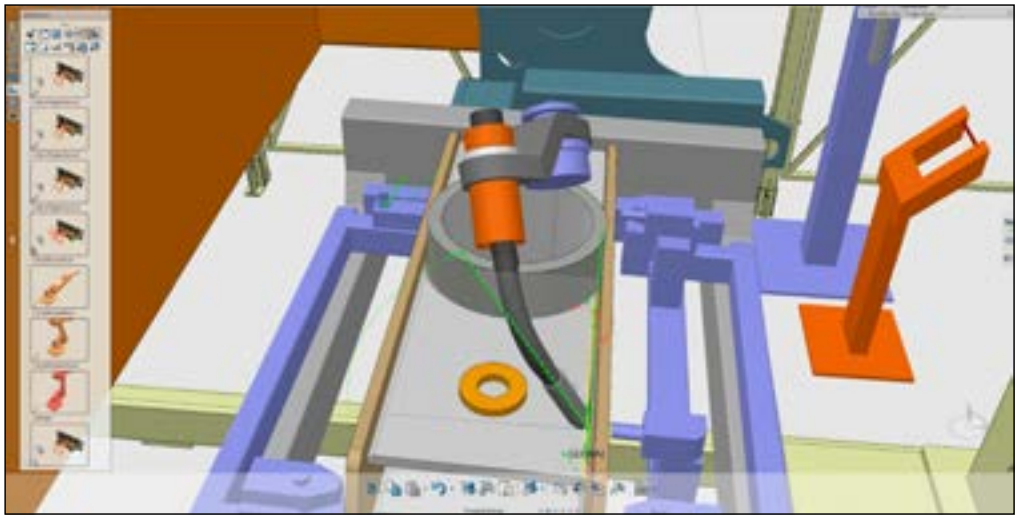
ROBOT PROGRAMMER TRANSFORMS THE PROCESS

Robot Programmer integrates programming and visualization. Working from extensive libraries of robots and controllers, programmers position resources, program individual robots, debug robot motion trajectories, and orchestrate workcell sequences between robots and other resources. They can use templates to store and re-use their specific programming practices as corporate IP. The **3D**EXPERIENCE platform lets multiple programmers work on different robots within the same workcell at the same time, reducing project man hours. They can collaborate with design engineers and other stakeholders at all stages of process development, leveraging integrated lifecycle and change management capabilities. The process becomes more flexible and moves more quickly. Robot programs are stored on the platform and sent to shop floor tools in the vendor-specific language.

Programmers use a context-based interface that simplifies engineering tasks and ensures that programs reflect the latest product design modifications. Multiple tools simplify tasks like tool selection, fastener assignment, clash analysis, reachability, collision avoidance and trajectory optimization.

In terms of straightforward ROI calculation, the cost-saving benefits of Robot Programmer are multiple. They include:

- Faster time to market
- Better resource utilization
- Improved process validation
- Optimal workcell operation
- Validated robot cycle time
- Reduced capital investment
- Reduced shop floor fixes
- Better understanding of tool operation
- Production-ready robot programs
- Improved collaboration across disciplines
- Increased workcell throughput

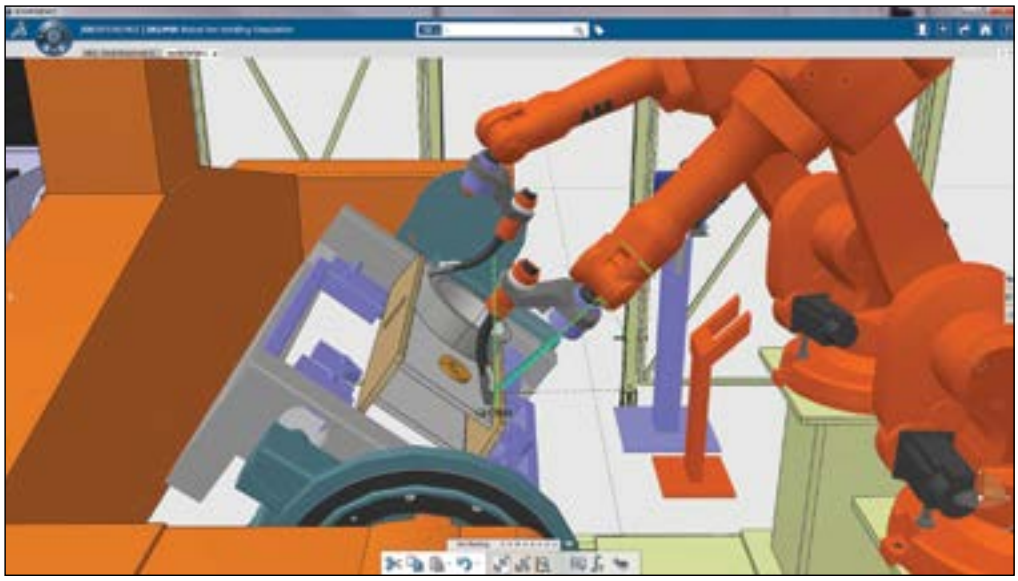


Advanced capabilities for robot path planning, weld gun selection, and analysis help programmers react quickly to new or changing product designs.

LESS PROGRAMMING. LESS COST. MORE PRODUCTION.

Reduced programming lead time

Robot programmers can create, verify and validate programs in a virtual world that is separated from real-world production and download programs in native robot languages. They spend less time on the shop floor implementing fixes and workarounds while production waits. Production keeps rolling and time-to-market shrinks.



Robot programmers create, program, simulate and validate an entire robot workcell before sending programs and setups to the shop floor.

The end of shop floor surprises

Because Robot Programmer provides comprehensive simulations of the workcell process, programmers can visualize tasks and ensure that robots move from source to target on collision-free trajectories. Design for Manufacturing (DFM) issues are identified early in the process, when fixes are simple and inexpensive and do not hold up production lines. Programs perform predictably the first time. Robot utilization is maximized.

Faster collaborative handling of design changes

As an example, workcell simulation may show that none of the guns can reach a specific fastener location. Programmers can easily and accurately communicate such issues to design or planning teams so the problem can be corrected before the start of production.

A single source of product and process data

The **3D**EXPERIENCE platform lets companies store and manage product and process data in the same environment. Manufacturers can capture and store production programs for modification and reuse, saving huge amounts of programming time, increasing their agility, and moving products to market faster. They can also build corporate IP and standardize on best programming practices.

Load balancing and reduced cycle times

Programmers can simulate robots singly or in parallel to analyze reachability and task assignments. The workload can be equalized among robots to meet cycle time requirements. Fasteners can be analyzed for the most optimum assignment across multiple robots in a line.

Early studies and workcell configuration

Robot Programmer enables companies and integrators to conduct early DFM studies, eliminating upstream and downstream bottlenecks. Robots can be raised or moved in the virtual world to ensure that all locations are reachable. Vendor proposals for new production cells can be visualized for evaluation.

Faster response to requests for quotation

Cross-discipline collaboration on the **3D**EXPERIENCE platform enables the concurrent validation of tooling and process plans—which means that companies can respond faster and more accurately to RFQs.

TIMESAVING, COLLISION-FREE PRODUCTIVITY

Robot Programmer offers a clear path to more productive workcells and product lines. Separating programming from production, and delivering collision-free, first-time-right programs to the shop floor, keeps production lines rolling and moves products to market faster. Programmers leverage the **3D**EXPERIENCE platform and a host of productivity tools to program high-quality workcells more quickly. Real-time visual collaboration with design and manufacturing engineers simplifies change management and keeps process planning on track. The ability to modify and reuse successful programs saves massive amounts of programming time. Robot Programmer offers benefits that can make manufacturers more productive and profitable.

WHAT IS **3D**EXPERIENCE 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 **3D**EXPERIENCE 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 **3D**EXPERIENCE WORKS SOLUTIONS. TAKE YOUR FIRST STEP ONTO THE PRODUCT DEVELOPMENT PLATFORM OF THE FUTURE TODAY.

LEARN MORE

▶ To explore **3D**EXPERIENCE Works solutions, for machining and production visit https://www.solidworks.com/domain/manufacturing-production

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

Dassault Systèmes, the **3DEXPERIENCE** Company, is a catalyst for human progress. We provide business and people with collaborative virtual environments to imagine sustainable innovations. By creating 'virtual experience twins' of the real world with our **3DEXPERIENCE** platform and applications, our customers push the boundaries of innovation, learning and production.

Dassault Systèmes' 20,000 employees are bringing value to more than 270,000 customers of all sizes, in all industries, in more than 140 countries. For more information, visit **www.3ds.com**.

3DEXPERIENCE®

SIMTEK
Real Time. Real Results

SIM Technologies Pvt. Ltd.

3rd Floor, "Mamanjee Centre" ,
S7-A, Thiru-Vi-Ka Industrial Estate,
Guindy, Chennai – 600 032

+91-8754447021 **marketing@simtek.in**