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CATIA Machining



About Dassault Systèmes

As a world leader in 3D and Product Lifecycle Management (PLM) solutions, Dassault Systèmes brings value to more than 100,000 customers in 80 countries. A pioneer in the 3D software market since 1981, Dassault Systèmes develops and markets PLM application software and services that support industrial processes and provide a 3D vision of the entire lifecycle of products from conception to maintenance to recycling. The Dassault Systèmes portfolio consists of CATIA for designing the virtual product - SolidWorks for 3D mechanical design - DELMIA for virtual production - SIMULIA for virtual testing - ENOVIA for global collaborative lifecycle management, and 3DVIA for online 3D lifelike experiences. Dassault Systèmes' shares are listed on Euronext Paris (#13065, DSY.PA) and Dassault Systèmes' ADRs may be traded on the US Over-The-Counter (OTC) market (DASTY). For more information, visit <http://www.3ds.com>.

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Innovative Technologies

The tool-path programming interface was specially designed to optimize program operations.

CATIA Machining provides the NC programmer with an efficient, easy-to-use and innovative NC programming and machining simulation solution that significantly reduces overall manufacturing process time. Users can learn about machining solutions intuitively. The interface uses contextual menus and selection boxes with sensitive zones and the work environment adapts to each context and work phase. As a result, training time is short and effective, whatever the programmer's experience.

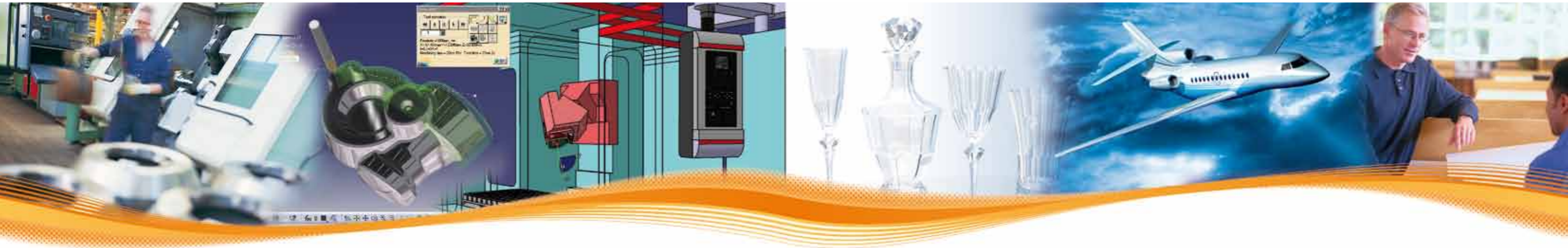
Dassault Systèmes' innovative PPR model (Product, Process, Resources) enables all manufacturing data to be implemented and managed together, including:

- The part to be machined, rough stock and management of intermediate stock
- Machining programs
- Production resources (machines, tools and end-tooling)

How to integrate machining into your industrial process

Dassault Systèmes is a highly experienced provider of machining solutions. For more than 20 years, we have been developing industrial, process-focused machining solutions.

As leader on the NC programming Market (ranked #1 via end user payments by CIMdata over several years), these machining solutions enjoy a strong reputation for reliability and robustness, from prismatic to complex parts machining in different manufacturing segments (prototype manufacturing, tooling manufacturing, Part manufacturing...) and in all industries (automotive, mold and dies, aerospace ...). Today they are widely used in large and small companies handling 2.5-axis milling, 3-axis dedicated to molding and tooling, 4- and 5-axis complex machining as well as for lathing.



Rapid tool-path computing time enables any choice of machining strategy to be factored in immediately. This helps optimize the fine-tuning and modification stages. Moreover, the OS 64bit support enables ultra large NC program management and faster computation time (up to 50% faster).

With CATIA, you can leverage your programmer's expertise by creating or re-using generic machining processes, and benefit from powerful machining automation capabilities to significantly reduce NC programming time.

CATIA Machining offers a unique and completely integrated environment for machining simulation ranging from the simulation of material removal, analysis of remaining material to realistic machine simulation based on ISO-code. This realistic virtual simulation enables NC programmers to validate, early on in the process, that the part will be correctly machined the first time and without any collisions.

Manufacturing documentation is generated automatically and includes the machining

phases, tools, machine and the cutting parameters to support increased collaboration throughout the company.

With these key features, CATIA can be implemented immediately, delivering significant productivity gains and a rapid return on investment.

CATIA Machining solutions - users benefit from:

- Machining products which consistently address emerging functional needs in the manufacturing industry
- State of the art and proven machining techniques already supported by CATIA to reduce machining time: Optimized roughing strategies, HSM (High Speed Manufacturing) capability, strategy for hard materials, 5-axis flank milling, and more

- User-friendly and productive solutions benefiting from extensive automation and standardization using Knowledgeware
- Best in class surface machining quality, faster machining time, and ensured collision-free tool paths
- Accurate tool path verification and realistic machine simulation fully integrated in the NC programming environment
- Full coverage of manufacturing processes in a single environment fully integrated in the design

- Immediate machining solutions via the native retrieval of external files (STL, IGES, STEP, point files)

Dassault Systèmes continues to invest massively in research and development for its product offering. Manufacturing is a major strategic sector on the company's agenda.

Lathe Programming

CATIA Machining allows 2-axis and multi-axis lathe programming

Our lathe programming solution enables the machining of 3D cylindrical parts by combining, in a single program, lathing and milling cycles to drive a lathe equipped with a C-axis. As an option, the NC programmer can manage multi-slide lathe machining centers with multiple turrets and spindles.

The lathe solution enables programming using:

- Roughing cycles with different cycles:
 - Slide-lathing
 - Part casing
 - Parallel outline shaping
 - Internal, external, frontal and rear machining
 - Recess
- Grooving, rough-cutting, and finishing cycles
- Finishing cycles with specific options
- Threading and drilling cycles

KEY FEATURES :

- Use of predefined and customized machining macros
- Large number of axial strategies
- Use of intermediate rough parts
- Optimizes the use and productivity of lathe center machines with several turrets and spindles (option)
- Delivers smart steering synopsis for synchronizing turning and/or milling operations (option)
- Helps manage program quality via Time Based Replay review capabilities (option)

3-axis Milling Programming

CATIA Machining facilitates the milling of shaped parts.

Our 3-axis milling solution provides the programmer with all the functions needed to machine molds and dies.

A single program can include both 2.5-axis and 3-axis machining cycles.

Main cycles of 3-axis machining:

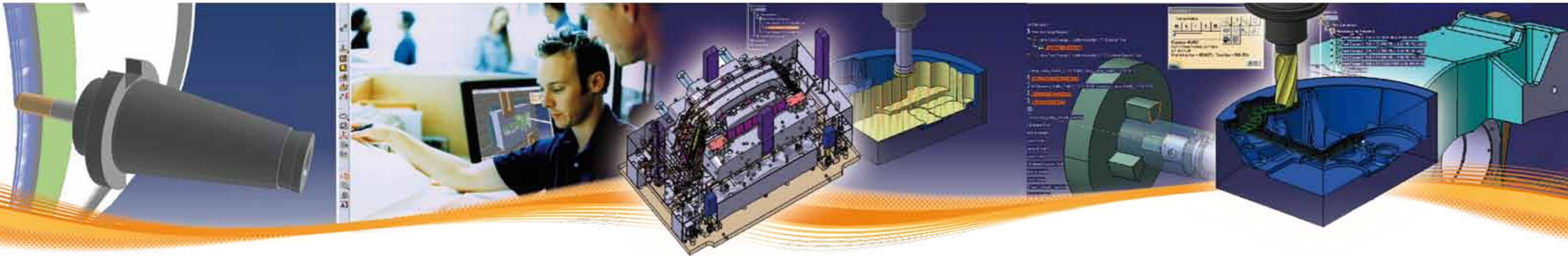
- Automatic detection and reworking of un-machined areas in roughing and finishing
- Roughing and finishing with HSM capability
 - Concentric machining
 - Constant chip-removal machining

- Trochoidal motion
- Automatic minimum corner radius
- Plunge milling
- Sweepings with various strategies (parallel plans, parallel to a curve, with constant Z and a large number of strategies to manage the step over
- Machining area definition (slope area : horizontal/vertical or intermediate)
- Full automatic or manual finishing rework

KEY FEATURES:

- Optimized computing time for tool path generation
- Flawless quality of generated paths
- Optimized multi-pocket draft cycles and customization option
- Automatic recognition of geometric specificities (plane zones)
- Tooling fixture and tool holder collision checking
- Management of a broad range of tools (conical tools with positive or negative cutting angles, groove cutter, etc.)

Although dedicated to shaped parts, the 3-axis milling solution includes 2.5-axis outline shaping and axial cycle functionality as a standard feature, making it particularly suitable for machine tools.



2.5-axis Milling Programming

CATIA Machining enables the milling of positioned multi-axis prismatic parts.

CATIA Machining architecture enables users to define all characteristics of the part to be machined, while factoring in their specific work environment (e.g. table, assemblies and clamps). Immediate access to geometry and machining options helps simplify the modification phases.

CATIA provides complete functionality for the machining of prismatic parts:

- Roughing
- Surfacing

- Latest pocketing strategies such as plunge milling
- Outline shaping
- Numerous axial cycles, including helicoidal and thread milling cycles
- 2.5-axis cycles dedicated to HSM
- Point-to-point cycles
- Engraving

Although dedicated to prismatic parts, CATIA Machining's 2.5-axis solution also provides the ability to run 3-axis paths in

outline shaping and engraving. This makes it possible for a part with 3D forms to be completed without requiring the use of the 3-axis milling module.

KEY FEATURES :

- Recognition and use of technological functions built into the geometry
- Automatic creation of all prismatic geometrical machining features of a design part for milling and drilling machining (useful for geometries coming from external files)
- Use of predefined machining processes.
- Automatic sequencing of machining cycles in line with programmer criteria
- Powerful machining macros that boost automation of machining tasks

5-axis Milling Programming

CATIA Machining enables machining in 4- and 5-continuous axis via sweeping and outline shaping of surfaces.

A solution for milling in 4-and 5-axis is fully integrated with other milling solutions. This meets the needs of all industrial processes, and as the de facto standard, it makes it possible to machine the most complex parts for aerospace, automotive and turbines.

The programming can implement:

- Several 5-axis contouring and sweeping strategies (copying, following iso-parametrical curves, etc.)
- Advanced multi-axis processes
- 5-axis flank contouring
- 5-axis helix machining
- 5-axis Tube machining
- Global and automatic machining strategy for multi-cavity parts

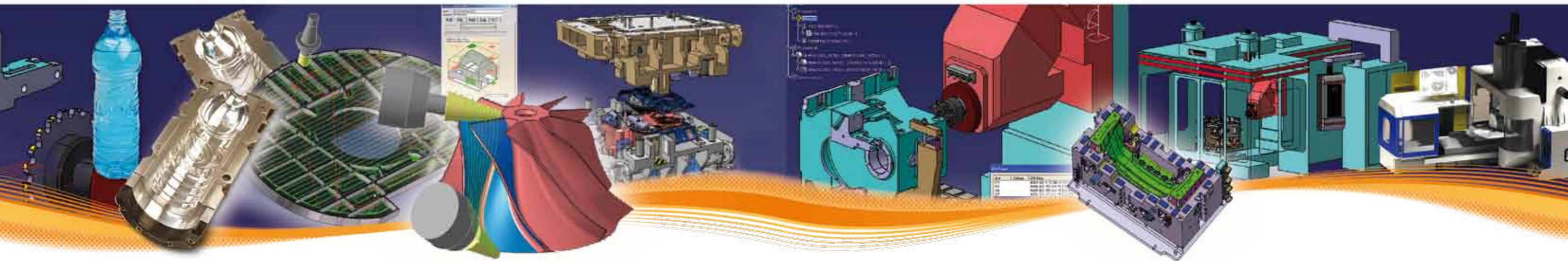
KEY FEATURES:

- Optimized computing times for tool path generation
- Rich range of strategies and machining options
- Factors in hole repetition with change of axis
- Dedicated aerospace and machine tooling configurations
- NURBS output for five axis machining
- Multi-axis machining of multiple surfaces with full collision avoidance

Simulating NC machine and tool paths on the ISO code in an integrated CAM environment at each step of the process definition

Dassault Systèmes' solutions enable the complete, real-time, spatial simulation of machining paths generated by the post-processor, including the machine's complete kinematics. Fully integrated in the PLM architecture, this seamless end-to-end solution enables NC programmers to easily switch between tool path definition and tool path validation without losing time due to data transfer or preparation. This eliminates interface issues and drastically increases cost effectiveness.

The simulation of tool paths or the ISO code has become a major factor in controlling the machining process before production starts. It helps reduce machine set-up and idle times, while ensuring the implementation of chosen machining strategies.



PRATT & WHITNEY CANADA

- Designer and manufacturer of turbofans, turboprop and turbo shaft engines for regional, business, utility and military aircraft as well as helicopters
- NC programming from 2.5 axis to 5 axis milling and Lathe machining



Benefits

- NC Programming up to 10 times faster
- Machining time up to 35% faster

KEY FEATURES:

- Native 3D simulation.
- Integrated simulation of the ISO code
- Emulation of numerical control controller
- Easy and accurate collision detection
- Synchronized display of ISO code during machine-tool simulation
- Simultaneous machine kinematics and material removal simulation
- Possibility to compare theoretical parts and machined parts using the ISO code
- Use of NC code created outside of CATIA
- This simulation allows:
 - Integration of the 3D machine environment.
 - Integration of end-tooling and cutting tools.
 - Implementation of the kinematics

ARC INTERNATIONAL, FRANCE

- Global leading glass and tableware manufacturer
- 16.000 employees
- NC Programming of prototype parts and molds

Benefits

- - 25-40% in NC programming time (123k€ savings per year)
- - 10% in machining time required for tool molds (40k€ savings per year)
- Improved quality of finished molds

