Knowledge-based machining with DS PLM delivers quick returns in a tough economy

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Overview

With today's unsettled economic conditions, gaining efficiencies in your operations, making the most of worker time and optimizing the output of production assets is no longer a nicety. It's a necessity, especially in the manufacturing industries.

Companies forced to cut staff are still heavily pressured to get work done. They need to accomplish more work with fewer people, and may also rely more on high-turnover contract workers to keep up with demand. At the same time, manufacturing processes are often highly visible, both internally and externally, and influence downstream processes. If processes aren't standardized and optimized, they can lead to large production inefficiencies, and even disastrous production outputs.

To overcome the economic pressures of downsized staffs and the recession-driven competition to produce parts faster and at lower cost, companies increasingly are turning to knowledge-based machining (KBM). KBM enables improved use of high-value machine tools, helps reduce production part cycle times, advances Lean Manufacturing initiatives, and helps improve external supplier audit results. While the technology has been available for several years, and is production verified by early adopters, economic pressures are accelerating its spread, and the results are impressive.

Successful knowledge-based machining initiatives can result in ROI in excess of 200%, with the potential for first-year payback. Although budgets are tight everywhere, companies are still quick to fund initiatives that deliver focused strategic process improvement and solid returns to the bottom line, and KBM is an excellent candidate.

The concept

Leveraging the knowledge-based machining capabilities of CATIA offers an intelligent and efficient way to streamline NC programming and machining. The technology ensures quality and consistency through the use of best practices; it also frees a company's most senior and knowledgeable workers to focus their efforts on applying the latest manufacturing technologies for continuous improvement – a focus that will help companies emerge from the recession with advantage.

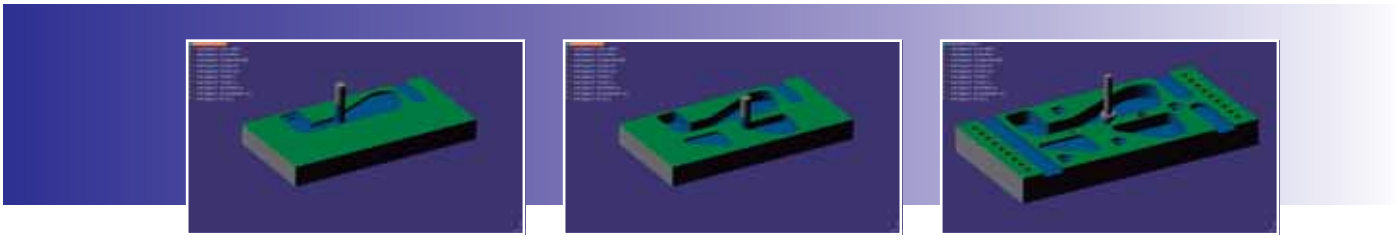
Knowledge-based machining with CATIA defines manufacturing processes and captures company-specific information about the materials, geometries, tooling paths, machining speeds and feeds, fixturing, holding devices and strategies required to manufacture parts. Once catalogued in CATIA, these processes leverage all of the resources, technology and best practices resident within an organization to ensure manufacturing needs are addressed in the most cost-effective and productive manner. In short, KBM can take a company to a new level of excellence in providing world-class manufacturing services to its customers.

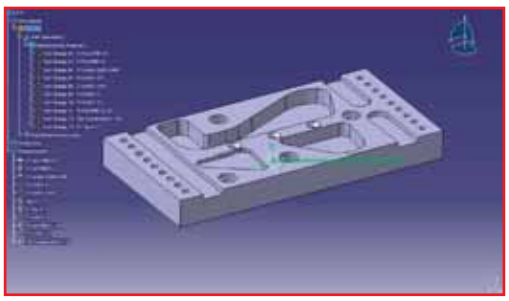


Protecting your greatest asset – knowledge

A commonly referenced industry statistic indicates that 5-7% of a corporation's knowledge is lost every year because it isn't captured or because the people who know it leave the company. Knowledge-based machining with CATIA ensures that for any given material type, all of the required parameters for each machining operation – including cutting tool information, criteria for engaging material, and geometric settings – are pre-defined using best practice methods. Such standardization renders geometry irrelevant to catalogued processes and ensures that any NC programmer, regardless of experience level, can utilize best-practice processes. Once the standards are established, creating tool paths can be done automatically, saving time and money and raising quality to unprecedented levels.

Knowledge-based machining also minimizes the "gap" between design and manufacturing. A designer or shop floor resource with very little programming knowledge can develop toolpaths with the expertise of the organization's best programmer, because the application is so easy to use and the knowledge is built in. People who have never generated an NC program in their life can step through the application interface and create successful programs. All of the information is in the catalog; users simply apply to the geometry and let it work. Best of all, when both design and manufacturing use CATIA, applications are completely integrated, eliminating the need for data conversion required by standalone software.





CATIA technology speeds toolpath development by finding the relevant CATIA geometry automatically, applying pre-defined machining operations, specifying what cutter to use and the most efficient strategy for using it, and then applying all of the information to machine the part. Using this information, the software intuits the toolpath directly from the design, accomplishing in minutes what an NC programmer would take days to achieve. For example, a toolpath for the prismatic model illustrated in this paper could be developed manually by an experienced worker in about 35 minutes. **Using the KBM capabilities of CATIA, the toolpath for this same part can be developed in just 3 minutes – a savings of more than 90%.** Once the toolpath is complete, a visual simulation can be run for formal verification by an expert prior to production.

Getting more out of your workforce

Knowledge-based machining with CATIA also helps improve contract programming by providing contractors with a company's specific processes and tool catalogs to ensure machining consistency. The work contractors perform can more easily be controlled and made to fall within an organization's standards. KBM also can capture contractors' best-practice techniques for ongoing use.

Because NC programs are developed with proven best-practice methods, manufacturers ensure optimum productivity. Toolpaths are computed in seamless order, and programmers can multi-task while computation runs in the background. Process reuse provides instantaneous machining operation content. Programming time is vastly minimized versus manual programming.

It is not uncommon to see 20-50% improvements in programming time following the incorporation of process catalogs and knowledge-based machining. Although many NC programmers fear this and see it as a threat to their jobs, improved efficiencies can be a lifesaver for resource-strapped companies in times of economic slowdown. When economic recovery occurs, the most strategic companies capture the time saved for higher-value work, funneling their senior people into more strategic continuous improvement roles. In this way, KBM with CATIA helps companies weather downturns and emerge with advantage, poised to benefit from the upswing in business that invariably comes with renewed investment.

Best of all, process-oriented KBM can be implemented in stages, allowing adopters to move at their own pace. The effort typically begins with a few days of process assessment. The assessment defines logical next steps for internal resources to follow, supplemented by external resources where needed. After initial training, the organization leverages the new techniques on a program-to-program basis until it permeates the organization.

As the Baby Boom generation marches toward retirement and younger, less experienced programmers and machinists join the ranks, process cataloging using knowledge-based machining with CATIA facilitates the capture of both intellectual and mechanical corporate knowledge. By practicing KBM processes with CATIA, companies capture all of the knowledge held by NC programmers, shop floor personnel and management, preserving critical knowledge and techniques, and positioning companies for current and future success.

For more information on knowledge-based machining, visit Adaptive's web site at www.adaptivecorp.com. For more information on CATIA Machining solutions, visit the Dassault Systèmes' web site at www.3ds.com/catiamachining.

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