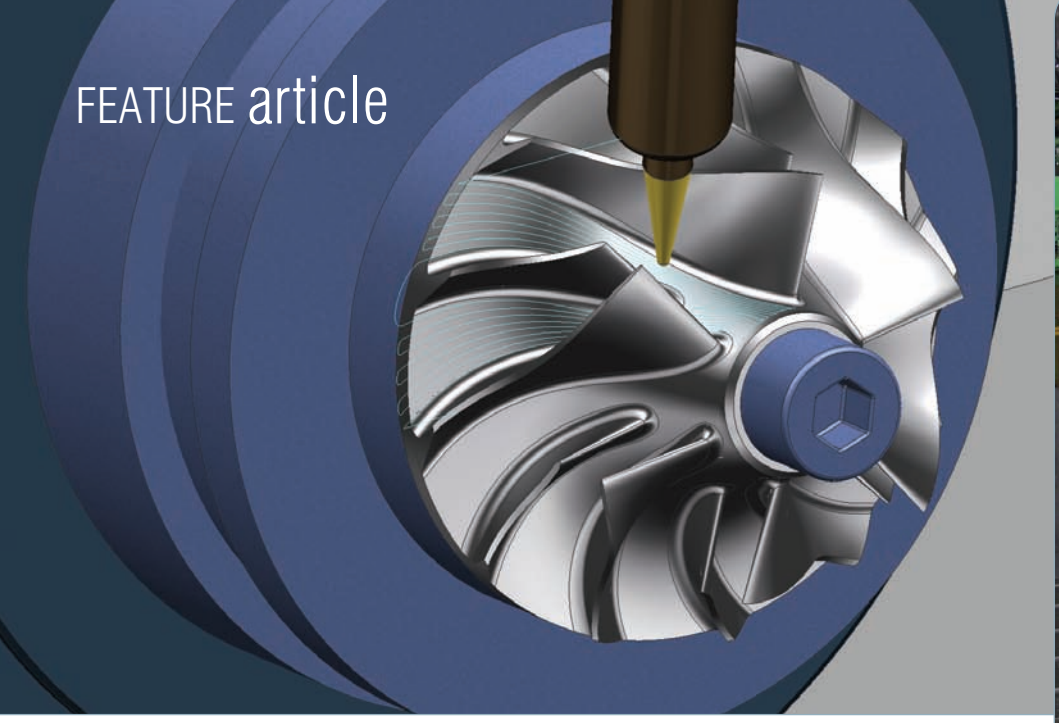

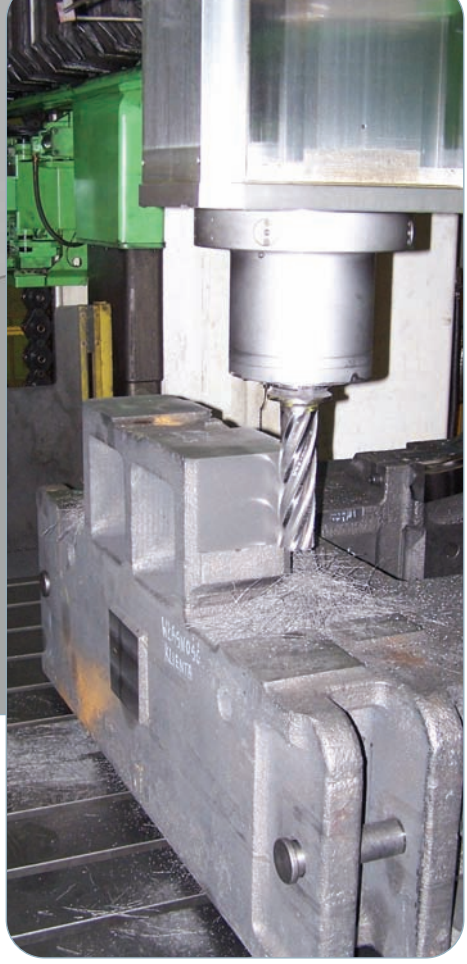

DEVELOPMENTS IN THE CAM SOFTWARE MARKET

Dr Charles Clarke

CAD/CAM technology has progressed to a point where functions that were once considered advanced, like 5-axis NC programming, are now much more commonplace. We are beginning to see new CAD/CAM extension applications (often referred to as add-ons) that address specific requirements in specific industries with a high degree of precision and performance. These add-on applications reduce the need to use specialist, standalone applications that operate outside of standard company PLM systems.

major aircraft and power generation engine manufacturers and suppliers being significant customers for Siemens. Also in-house divisions like Siemens Power Generation are significant users of the software.

Once upon a time these 'industry specific' solutions were regarded merely as re-packaging exercises of standard functionality often used to breathe new life into a 'tired' brand. Not so these days.

MARKET DRIVERS

The machining of multi-bladed turbine discs, blisks or impellers puts extra demands on the NC programming needed to drive the kind of advanced multi-axis machine tool used for this kind of work. Although many CAM vendors choose these demanding components to illustrate their 5-axis software, the real tests come in productive programming. Unfortunately in many cases standard 5-axis software is not just multi-axis, it's also intended to be multi-purpose. Typically generic 5-axis CAM software does not offer the special operations designed for easy and effective programming of turbomachinery components.

An example of these new applications is the NX Turbomachinery Milling module that Siemens PLM has introduced to its line-up of part manufacturing solutions in NX 7.

The new software has been developed very closely with key customers — it is a market that Siemens PLM dominates from a generic CAD/CAM perspective with companies like Pratt and Whitney, GE Aircraft Engines, Rolls-Royce and many of the

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EXISTING SPECIALIST APPLICATIONS

For some time the specialist task of programming and machining the more complex turbine blades, blisks and impeller type components has been achieved using specialist machine tools and NC programming software provided either with the machine tool, or purchased separately from a very specialist software vendor. For many companies this is not an ideal solution, at least from the software perspective, as they would rather use an application that is consistent with the rest of their operations. Apart from having to deal with multiple vendors, and deal with data transfer or translation, it's also a data management and revision control issue. For larger companies it's a concern that such 'one off'

applications tend to reside outside the PLM/PDM system adding to the cost of effective data management. In addition, these unique and specialist packages can be very expensive to buy and maintain separately.

A NEW GENERATION OF SOFTWARE THAT PROVIDES FLEXIBILITY

With the latest release of NX, Siemens has introduced a specialised extension application for its established NX CAM software that is totally focused on the machining of turbomachinery components, including blisks and impellers, propellers or any other multi-bladed rotational parts.

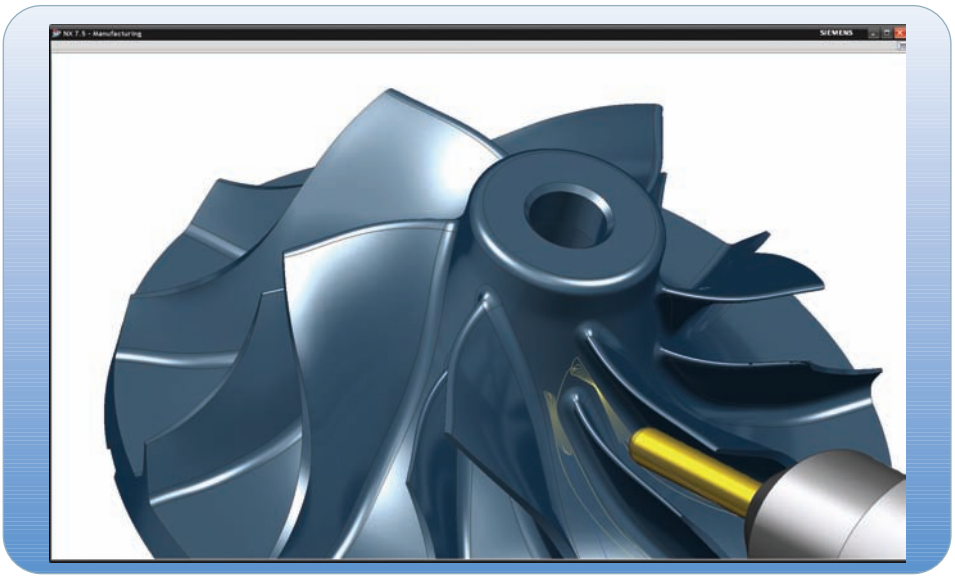
A key objective of the new NX Turbomachinery software is to allow users to do this complex programming as easily as possible. The system provides purpose-built options that put the user in the context of turbomachinery. The idea is to simply select the geometry and tell the software the kinds of blades you are interested in and the operation you need. You then press the 'go' button and the system will come back with completely gouge-free, collision-free tool paths for the entire component with no further editing or modifications required. With generic software it would probably take hours to generate a tool path just between two blades with a splitter. With NX Turbomachinery Milling it takes about 2 minutes. Real rapid programming.

The closest analogy I can find for this kind of approach is that it's a bit like knowledge-based engineering where you can develop complex components or systems just by specifying performance criteria to pre-programmed systems for creating the components.

Because all manufacturers tend to do things differently, the idea with NX Turbomachinery Milling was to keep the blade machining module as flexible as possible. There are some CAM software applications where you can only machine between the blades as long as the blades are straight. If the blades curve from the shroud to the hub, the system won't be able to machine them. There are no such restrictions in NX CAM. On some impellers there are smaller blades called splitters in-between the main impeller blades. Some systems won't even allow you to specify any splitters, and generally even the most powerful ones stop at one splitter. You can specify as many as six splitters in NX.

REST MILLING

One area where the Siemens application appears to offer a particular advantage over some other systems is in rest milling. The NX software manages an active or 'in-process' model of the work-piece so that the system knows what has been machined and what material is left. When material is left by a larger cutter between the base of a splitter blade and a main blade, NX CAM is able to target this uncut material directly with the click of a button. This saves programming effort, and leads to much more efficient machining.



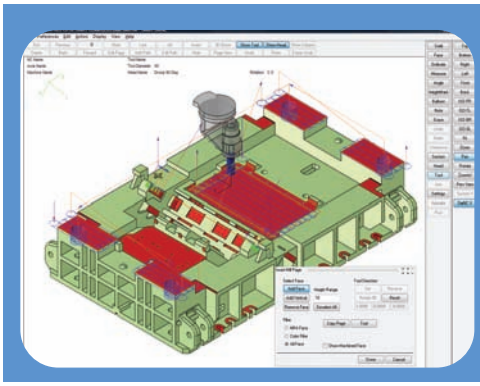
WORKING WITH POOR QUALITY 3D GEOMETRY

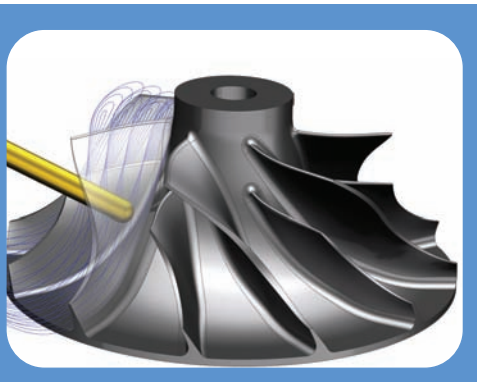
Other CAM systems are very specific about the kinds of 3D geometry that can be used as the basis for NC programming in these complex parts. Finding and fixing problems with the CAD data can be a tedious and time-consuming task. A big time saver with the new NX software is that it does not require you to resolve these geometric issues in the model before programming. NX CAM works directly with this imported geometry to create clean tool paths without the typical fixing and re-modelling — saving hours of model preparation time prior to NC programming.

THE VALUE OF A FULL CAD-CAM SOLUTION

Another significant advantage of the NX solution is that the CAM software is a part of a complete suite of applications that can be used in manufacturing engineering where everything is connected back to a common part model. With NX, the NC programmer has access to a full NX CAD tool box that enables the creation of a 3D model from a drawing if needed. Because of the consistent model approach, if geometry is updated then the dependant data, such as the NX CAM tool path or the NX CMM inspection programmes, is updated too. You can use exactly the same CAD functions to model everything else you will need to complete the process, from tools and fixtures to a complete 3D model of the machine tool with full kinematics needed for machining simulation.

Given the number of demo examples of CAM systems showing simulations of their 5-axis software applied to impeller type parts you might think that any CAM package could be used to programme these complex parts. While the availability of multi-axis CAM software has increased enormously over the last five years, there is still a big difference across the available packages in what can be achieved once you put the demo away. This difference is greater once established systems such as NX CAM (formerly Unigraphics CAM) move into really focused applications such as turbomachinery milling.





This new release takes Siemens into a new level of capability. As always, there is more that could be added and Siemens says that it has more specialised functions coming, including Mould and Die modules which be of direct relevance to TCT readers. They expect to add an out-of-the-box specifically designed fillet machining for blades rather than have you use the standard fillet machining options that come with NX CAM today.

PAPERLESS DIE DESIGN AND DEVELOPMENT

Vero Software is also getting on the rapid manufacturing bandwagon with its new Smirt Modules. Ford's Dearborn Tool & Die plant, a major customer, has managed to up production whilst reducing die-build times, by moving into Vero's software-based tools for die development, die build and machine-shop scheduling.

Dies are getting bigger and more complex and development time, from design through to first-part-to-gauge, is shorter than ever. Ford has made nearly a 300% improvement in diebuild timing thanks to the widespread use of the package of die-manufacturing planning software from Smirtware, Inc., a division of Vero Software.

Ford's Construction, Planning and Analysis Team of diemakers develops a procedure for every die it builds, then the Smirt DieBuild software provides the instructions for exactly how it wants to build each die, step by step. Those instructions route to every subcontracted die shop the team uses around the world, which also uses Smirt (Smirt DieShop) as a die-design information-management tool and 3D viewer. That way it can control how every supplier machines their tools.

The ease of use of the software and its ability to provide a roadmap to the technicians on the shop floor to optimise the die-build process has led to eagerness by all to adopt the technology and ensure that the company can continue to perform to the level of excellence expected by Ford. The Ford shop-floor skilled workers are highly educated, and really embrace new technology. They are committed to ensuring that their processes and procedures result in the most efficient and highest-quality die builds as possible, to keep their plants competitive in the global market.