

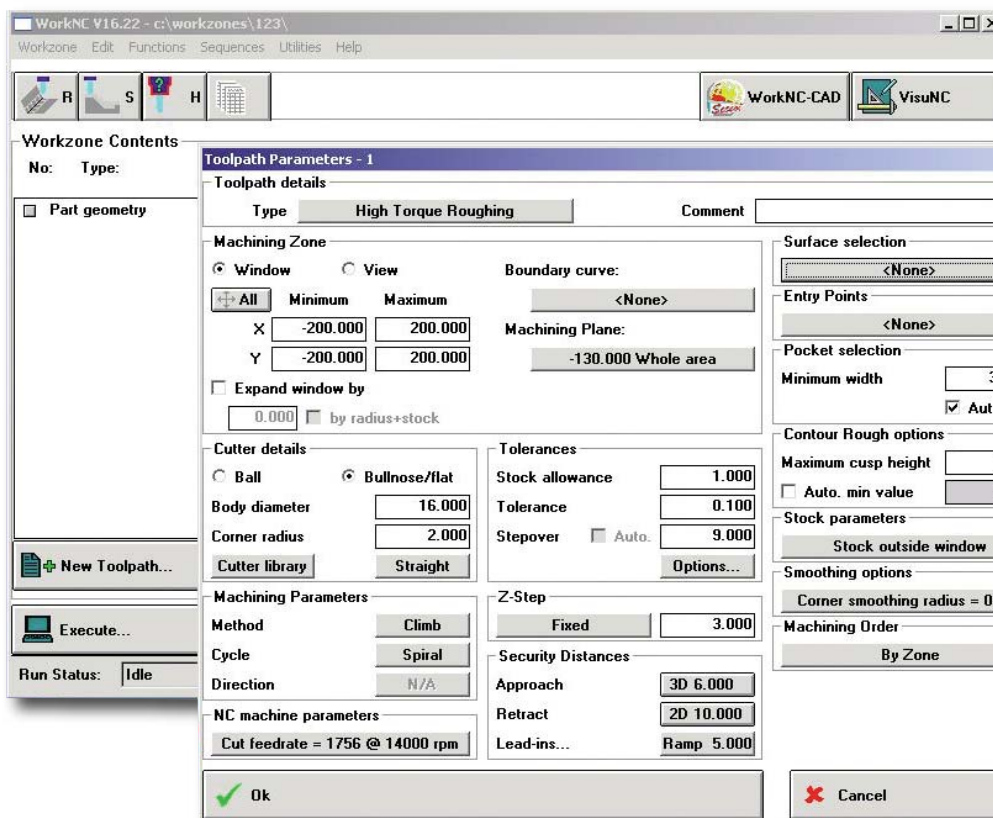
Bordeaux' Grand Cru CAM

Andrew Allcock visited a famous wine-growing region of France to sample Sescoi's CAM software developments and more. A vintage display, but one demanding the eye of a connoisseur, as he reveals

Give Tony Grew 20 minutes at Lyon airport and he'll confirm the two underpinning strengths of Sescoi's WorkNC CAM system – automation and ease-of-use. Of course, it doesn't have to be Lyon airport – or any airport, in fact – but that's the closest one to Macon, France where Sescoi (pronounced ses-kwa) is headquartered and where *Machinery* recently travelled. Macon is the most southern of towns in the Burgundy wine growing area, located between Beaune and Lyon.

Mr Grew is Sescoi UK's sales manager and he reckons that if he can get in to demonstrate WorkNC to a company, then a sale is a very high probability. But with Sescoi's focus on automation and ease of use, its founder and owner Bruno Marko, who established the company in 1987, says that CAM users more familiar with graphics-focused packages, heavily populated menu bars and intensive 'mouse-clicking' can feel slightly uneasy; cheated even. Indeed, colour was a late addition to the software, he reveals with a Gallic shrug.

WorkNC is a surface machining CAM package with a mould and die focus, with 70 per cent of its sales in the automotive sector. Other sectors remain important, however – indeed, a turbine blade machining cycle is a new option in Version 17 due for release in September/October this year. There are 4,000 user companies worldwide with 6,000 licences; the UK lays claim to over 150 licences.



PROCESS-LED CAM

At its simplest level, WorkNC is a process-led toolpath creation package based around a series of data entry forms to define each process step, such as roughing, semi-roughing, semi-finishing and finishing. The 20-minute airport demonstration went as follows. Import geometry (or create it – surfaces currently,

but solids in V17) via WorkNC CAD; examine geometry for draft angles, smallest radii and so on; switch to WorkNC and choose roughing process details, typically for the whole geometry – cutter (from a library, or user-defined), toolholder (from a library, or user-defined), cutting technology (speeds, feeds, step-over, step-down), cutting

strategy (chosen from a menu of some 40 cycles); execute the process with toolpaths created in the background; define a second roughing process (while roughing is processing, if you like) to remove material not taken by the first, large roughing cutter, so constraining the

machine to tackle areas only with x amount remaining; execute as before; create and analyse a rest model (remaining material model) and determine cutter size required; a semi-finish step could then be used before going to the final finish stage. For the finish stage, WorkNC can tell the difference between upright surfaces and flat surfaces and apply the correct strategy to each surface. As the processes are created, a tree structure builds in a 'window pane' and each is individually selectable to view toolpaths and related settings.

Toolpaths are viewed both in 'line' format and in solid format via VisuNC, which is integrated within WorkNC. But, quite frankly, it is taken as read that toolpaths are good and safe, since collisions are automatically corrected, and this focus on the visual is very much a secondary, reassurance element. Of course, the underlying process knowledge can be tweaked to improve the efficiency of the outcome, but playing around with graphics is not WorkNC's chosen route. The completed set of process steps created in the demonstration was then saved as a template for use on other similar or even dissimilar geometry. In the latter case, if the process steps/strategies are irrelevant, they are

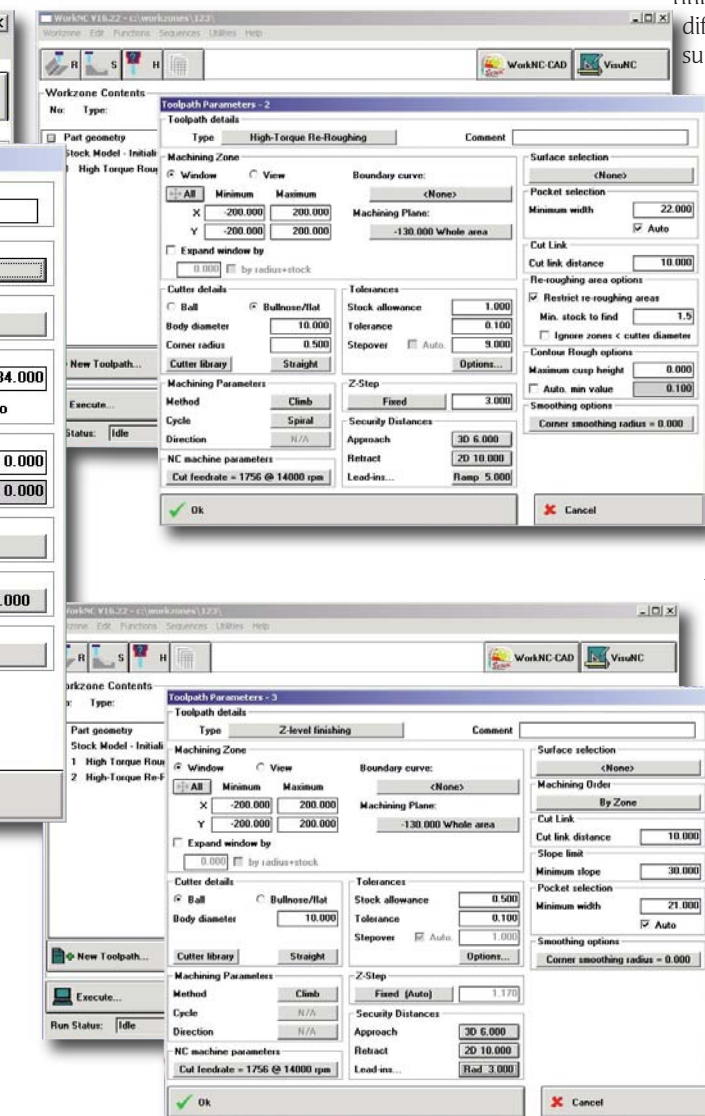
WorkNC

A WorkNC junior licence is the baseline. This is limited to machining geometry with a maximum of 200 surfaces. All machining strategies are available, and 2-, 2 1/2-, 3- and 3+2-axis machining are supported. A full licence has no surface limitations and an unrestricted full licence features batch processing, meaning you can define multiple process steps and batch process them unattended. The 5-axis module is an add-on, as are Auto 5, MPM and LMP (see main story).

simply ignored – toolpaths will still be generated, albeit that they are not finely tuned in this case.

The airport demonstration showed just how quickly it is possible to obtain usable toolpaths. A claim backed up by a story of one UK user whose WorkNC operator went off sick. The managing director created toolpaths for a job in his absence, with just a couple of telephone calls for basic information required. The most efficient toolpaths? Probably not, but very much better than no toolpaths.

An important aspect of WorkNC is that it employs a three-stage and not two-stage process. First, toolpaths are created independent of a machine, then the machine is chosen – catering for any specific machine kinematics – and, finally, the file is post-processed for that machine/control combination. The separation of the first two stages allows jobs to be processed easily for different machines. The second stage also allows for a visual representation of exactly how the job will be processed on a machine



without the aid of a third-party package to display the post-processed G-code, as would be necessary in a two-stage process.

This three-stage process is particularly relevant to 5-axis machining in the area of collision checking and also because the processor-intensive stage 1 is undertaken only once – any change of machine is made at stage 2, saving time.

WorkNC's recently launched 5-axis module employs the same forms-based entry of process details and cutting strategy as before to generate stage 1 toolpaths. It is possible here to limit, say, a-, b- or c-axis angles if you already know that you want to constrain these values, however.

Full geometric details of machine collision surfaces and clamps are incorporated in stage 2 of the process when the machine is selected, with the machine models created by SESCOI based upon machine tool builder supplier geometry. Collisions are detected and corrected, where possible, but if things have gone really badly, a calculation error message brings this to the user's attention.

THREE INTO FIVE DOES GO

In pushing the 5-axis boundaries still further, SESCOI is introducing a revolutionary new module for WorkNC with its automatic 3- to 5-axis conversion program Auto 5. With an even more processor-hungry stage 1, the separation of toolpath creation and machine selection is even more important.

In this module, there are six main conversion strategies; these essentially relate to the value of tool inclination relative to the surface as defined in different ways. Once again it is possible to introduce specific machine kinematic limitations at stage 1, such as limits of spindle tilt.

Stage 2 is more complex than for standard 5-axis machining as the toolpaths were generated for a 3-axis approach and remain unchanged. The kinematics of the selected machine may not allow some paths to be tackled, however. Where such instances occur,

WorkPLAN – managing information

Effective generation of efficient toolpaths for surface machining is one focus of attention for SESCOI, but another is efficient organisation of companies that perform this machining, specifically mould tool makers. And its WorkPLAN software is a solution for managing the "chaotic" one-off environment of toolmaking, with the functions within the software 'mapping' onto the various existing functions of a company. Fundamentally, to know whether a job is profitable or whether a machine's capacity is fully utilised, underpinning details must be known. "WorkPLAN optimises commercial processes and allows decisions to be made on facts not feelings," says product manager Rudolf Szegfue, and with cost transparency, profit and loss are quickly identified, he adds. New functions to be released include an MRP module to support series production of components, a multi-site module that allows companies working together to synchronise their data, improved management reports, together with improved capacity planning and scheduling facilities. There are 300 users worldwide, and Alan Spargo, High Wycombe and Woodhey Engineering Company, in Bacup, Lancashire are UK users. To get companies started, SESCOI is to introduce MyWorkPLAN later this year – a seven-day anonymous trial will be offered, together with a 30-day registered option (see also page 48).

the toolpath will feature a 'jump' over the offending area. These areas are revisited following part reposition to allow access prior to the creation of new toolpaths.

Another possibility is that, where, say, a axis has asymmetric movement of $+90^\circ/-15^\circ$ the machine may need to 'flip' – rotate c by 180° and change the sign of the a-axis angle. This is effectively 'approaching from the other side' using the part of the a-axis that does have capacity to tilt as required. It is possible to use so-called 'pre-angles' for the c-axis to avoid flipping, while there is also a user-defined flipping point feature.

A new feature in V17 WorkNC 5-axis module is to be drilling without hole geometry. This might be used in the automotive industry to drill holes at specified point locations of a polystyrene model for clay filling, for example. Only the point data has to be provided and WorkNC will drill at those centre locations.

Two additions made in V16, along with the introduction of 5-axis machining, are WorkNC Multiple Part Machining (MPM) and its Layer Milling Process (LMP) packages. MPM, as its name suggests, allows multiple separate WorkNC-programmed parts to be

machined together on a pallet with the fewest toolchanges. The programs are joined together such that common tools are loaded as few times as possible, with the maximum amount of work undertaken at a single tool loading.

A simple drag-and-drop interface allows 'projects' to be selected and dropped onto a pallet, while single parts on pallets can be replaced in a similar fashion. Standard pallet and clamping element libraries exist to help build a graphical model and support collision checking. MPM is intended for the machining of electrodes set on standard pallets, for example.

LMP automatically converts WorkNC machining programs into slices to allow the progressive machining of standard polystyrene, wood or aluminium sheets which are then bonded together to form a complete model.

This type of operation can either be preformed sheet by sheet on a standard machining centre or on the LMC Zimmermann machine – a combined sheet bonding and machining set-up. A European project is looking at this approach for the production of steel mould tools, in fact. **M**