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TURNING

PRODUCTION TURNING FOR 2-AXES

> MTM MACHINES: Edgecam Turning provides functionality for a wide range of machine tools, including 2-Axis lathes, multiturret configurations, sub-spindle turning centres and mill/turn machines. On a mill/turn machine, C-, Y- and B-Axis milling and drilling take place within the same program as the turning to provide a fully integrated and associative programming solution.

- One single machining environment
- Full machine tool and toolpath simulation
- Reduce component cycle time
- Full collision checking on component parts
- Reduce machine tool prove out by graphically simulating the tool path
- Support for Twin Spindle, Twin Turret, Pickoff spindle, C, Y & B axis machining

vero Software

Edgecam produces advanced rough and finish turning cycles, together with support for facing, boring and drilling in either canned cycle or longhand format. Toolpath calculation takes into consideration the complete tooling insert and tool Holder including the “F” distance and previously machined material to avoid gouging and eliminate air cutting. Ease of use and an understanding that cycle times are critical, especially on multi-configuration mill/turn machines, underpin the development of Edgecam’s turning functionality. Edgecam offers support for Sandvik Coromant Wiper inserts for turning tools, allowing these productivity enhancing inserts to be used reliably in all aspects of production machining.

Update stock

Edgecam has the ability to keep the stock updated live within the sequence tree. The stock model is rest material, or material that hasn’t been machined. Subsequent toolpaths will automatically detect the rest material resulting in 100% efficiency for any turning toolpath throughout the Edgecam sequence. Update stock is supported from the most basic 2 axis turning centre, right through to a CYB multi turret sub spindle Mill / Turn. When back turning into a recess or groove it’s important that the back turning cycle knows the current condition of stock to avoid air cutting and potential collisions on the approach into the recessed area. On a sub spindle turning centre, when a component is transferred from the main spindle to the sub spindle, the live stock transfers with it. Any subsequent machining on the sub spindle will detect the stock in the state that it left the main spindle which ultimately provides the most efficient machining sequence possible.

Collision Detection / Simulation

It is imperative that not just the tool in contact with material is checked for collisions, but also tools that are not in use on a turret. Most turning centres offer a relatively small working envelope that can be collision rich. A good example of this is on static turrets where tools such as boring bars, can extend out further than the tool in cut. Edgecam will not only collision check the tool in cut but also all of the tools on the turret against the machine tool kinematics, fully supporting Mini Turrets, capto tooling and programmable steadies.

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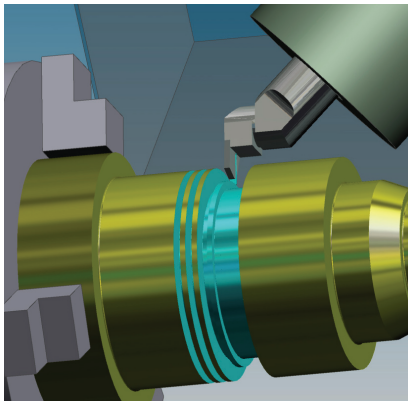
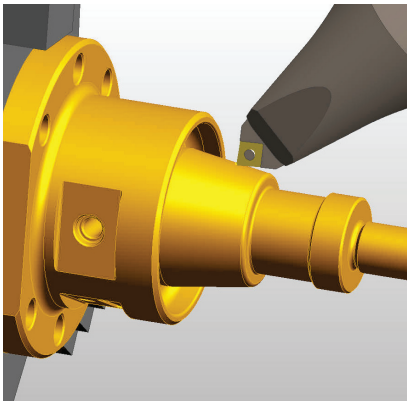
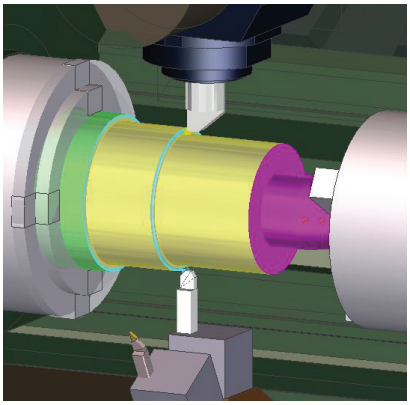
Edgecam fully supports all axis configurations from the most basic 2 axis turning centre, right through to a CYB multi turret sub spindle Mill / Turn







Swarf Clearance

When machining inside a bore, loose material can build up around the insert which can result either result in insert failure or severely decreased tool life. Edgecam will allow you to retract tool out of a bore or away from a diameter after a set numbers of cuts. The user can retract the tool mid cycle, to a known position, after a set number of cuts to clear any loose material out of the bore.

Sub spindles

Edgecam fully supports turning centres with a sub spindle & twin turrets, including:

- Bar pull
- Bar feed
- Part pick and return
- Running in conjunction with the main spindle

Twin turret support for both single and twin spindle lathes including:

- Balanced turning
- Z lag options improving metal removal
- Mirrored turning
- Turret synchronisation and simulation

Cycle control

Individual Element offsets
Edgecams turning cycles offer the ability to specify offsets to individual turned diameters, bores, grooves and faces. This function is useful where a turned component needs some elements to be finished turned, and others to be left a grinding allowance for subsequent machining or heat treatment. Most systems on the market today will only allow you to set a constant offset, where as Edgecam gives the user full control over offsets for each individual element on the turn feature.

Break Edges

Sub contract machinist do not always have the ability to go back to their client to ask them to revise the design to include the chamfers or break edges, even though they have been asked for on the engineering drawing. Edgecam turning cycles offer the machinist the ability to specify a break edge where a chamfer hasn't been included on the model supplied to them by their client.

Down Cutting

This function within the finish turning cycle alternates the cut direction on the finish turn profile so the tool is always down cutting or it never drags up the face. This give the enhanced tool life and achieves a superior surface finish.

Sequential Castellation grooving

Traditional grooving cycles wear the tool on one side after the initial full width cut. With Sequential Castellation grooving, the tool starts at one groove edge and moves to the other edge, producing full width cuts. It then goes back and removes the 'rings' left behind by the first cutting pass. This ensures that the load on the grooving tool is on the front of the tool, opposed to the sides. It also ensures even wear on the insert.

Rough Turn Sectioning

To keep the tool push off on a long diameter to a minimum, Edgecam have developed a section strategy where the user can break the rough turn cycle into sections. The user sets a Z break distance and the roughing cuts are divided into short sections.

Rough turn Variable cut Depth

This function is to Prevent notches wearing into the tool. Cuts are alternately 'ramped' then 'normal'. During the ramped cuts the cut depth gradually reduces to zero. The next cut (which will be 'normal' and starts at the same cut advance) then removes the leftover ramp. If a ramped cut is interrupted by the profile, it follows the profile until it re-joins its ramped path.

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WAVEFORM TURNING

Consistent Material Engagement:
Waveform roughing is a high speed machining technique that maintains a constant tool cutting load by ensuring consistent tool engagement into the material. The tool path moves in a smooth motion to avoid sharp changes in direction, maintaining the machine tool's velocity.

Waveform Roughing:

Reduces cycle time

Improves tool life

Lengthens machine maintenance cycles

Keeps constant chip load

Cuts deeper and faster

Constant Engagement

Traditionally plunge grooving techniques challenge process security. Issues with coolant access and swarf management can severely reduce tool life. With Waveform Turning more of the tool's cutting area is employed ensuring a more stable, productive & economical process.

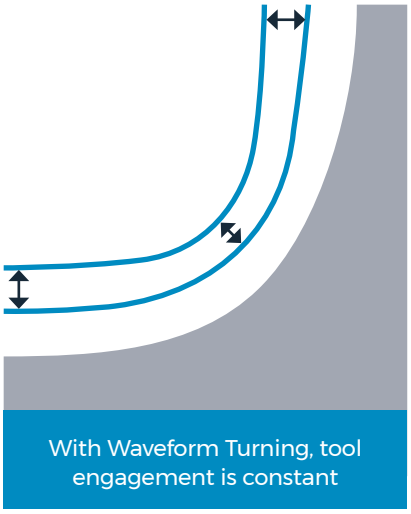
As Waveform maintains a constant engagement with the material, the feed rate can remain at the optimal value throughout the cycle. This will improve the tool life and greatly reduce the risk of tool breakage - it is very simple to switch from traditional roughing to Waveform to see the toolpath pattern.

Smooth Tool Path

By ensuring the cycle produces a smooth tangent tool path, the velocity of the machine can be maintained and the desired feed rates achieved. This also has the benefit of reducing shaking and vibration on the machine and component.

The Waveform Pattern

To maintain a constant chip load the cycle uses the philosophy that we machine from "Stock to part". This reduces the amount of intermittent cuts, particularly on external regions, which means the tool is engaged with the material for longer without lifting clear. Traditionally, cycles generally offset the component until they meet the stock. This can lead to the generation of sharp corners and discontinuous tool paths.



With Waveform Turning, tool engagement is constant

With traditional offset roughing, the tool load is different depending on engagement angle

WAVEFORM TURNING

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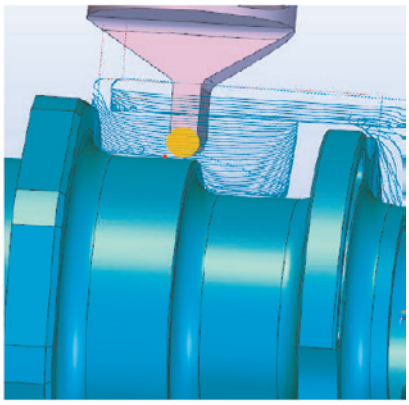
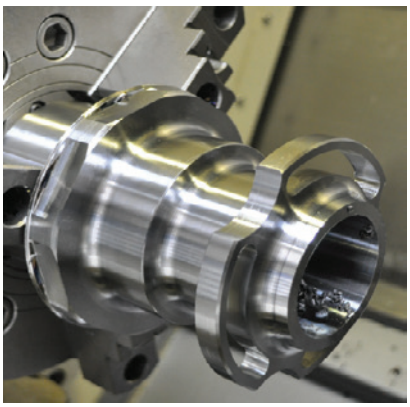
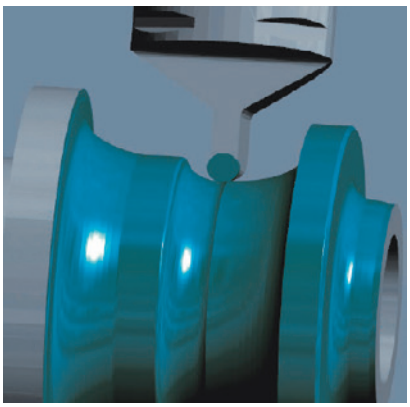
Waveform machining is standard with Edgecam, no additional purchase necessary







Adjusted Tool Engagement

To maintain the tool engagement and the chip load the tool path is automatically adjusted to compensate. When cutting into a concave area tool engagement is increased. The cycle adjusts the step over between the passes to compensate and maintain the desired engagement.

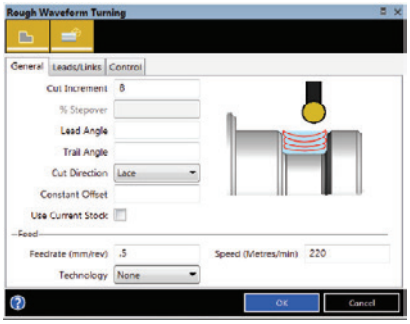
When cutting a convex area the opposite affect occurs. As the material falls away the tool path step over is increased to maintain the desired engagement.

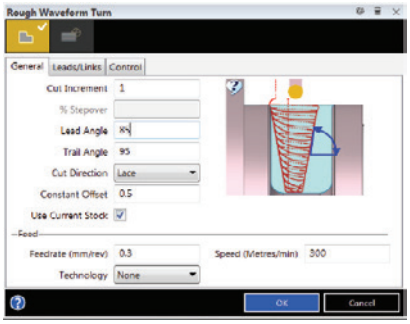
Constant Volume

Waveform Roughing greatly improves standard roughing by ensuring a constant volume of material is removed. In addition, this also opens up the way to use high speed machining, particularly for hard materials.

Cutting along as much of the insert as possible distributes wear evenly. Tool life is furtherer extended as most of the heat is removed in the chip.

An example of the feed rate and depth of cut that can be achieved in hard materials, is listed below:





MACHINING DATA

SPECIFICATION	TRADITIONAL	WAVEFORM
Material	EN8	EN8
Surface Speed Vc (m/min)	280	280
DOC Ap (mm)	4	2
Feed Fn (mm/rev)	0.12	0.8
Material Removal Rate (cm^3)	134.4	448.0

333 % Material Removal Rate increase
50 % Less Tooling Required
20 % Tool Life Increase

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MILL / TURN

MULTI TASK MACHINING

The uses of tail stocks, steadies, sub spindles, twin turrets along with C Axis, CY Axis and B Axis are regular features on today's Multi-Task machine tools. In this collision rich environment, the programming of these machines is made simple and safe utilising Edgecam's turning and milling combinations combinations in a single environment.

One single machining environment

Full machine tool and toolpath simulation

Reduce component cycle time

Full collision checking on component parts

Reduce machine tool prove out by graphically simulating the tool path

Support for Twin Spindle, Twin Turret, Pickoff spindle, C, Y & B axis machining

Mill/Turn Simulation

Edgecam offers a full kinematic Simulation package. All the cycles and movements are supported along with the full graphics of the machine, tails stocks and steadies meaning peace of mind as the part is fully tested before reaching the actual machine tool. The simulator being a very powerful tool in its own right offering full collision detection including many display options allowing the user full control over every aspect of the simulation. Feedback is given to the user show which commands are being simulated, this will also display which elements of the program may have caused issues. Comparison tools to show the part is machined as expected and correct before outputting to the machine tool.

4/5 Axis Simultaneous

Mill Turn machines have many uses and allow much more flexibility and capabilities not offered from other machine configurations. With this in mind many of these have multi axis, upper turrets, lower turret, CYB and Sub Spindles. Edgecam uses the latest cutting technologies and machine cycles and with this offers 4/5 Axis simultaneous milling options. For many industries this is becoming a must have option on a mill turn machine tool. Edgecam offers a wide range of 4 and 5 axis Operations and Maximum control in its cycles, with the Advanced 5 Axis options allowing even greater potential. With the addition of 4 and 5 axis simultaneous milling the simulation of these machine tools and fixtures is made easier, even for experienced manufacturing engineers.

Features include :

Axial Milling

This mode allows the user to perform milling operations using the C axis with Rotary options allowing programming along the Z Axis.

Radial Milling

Allows the user to machine features around the diameter giving flexibility to the user to turn the component, then create the mill features using driven tooling.

Y Axis Milling

The Y axis milling capabilities allows the engineer more control over the toolpath creation and CNC code output.

Edegcam supports plane switching where available on the machine tool and keeps the CNC code to a minimum by outputting arcs as required.

MILL / TURN

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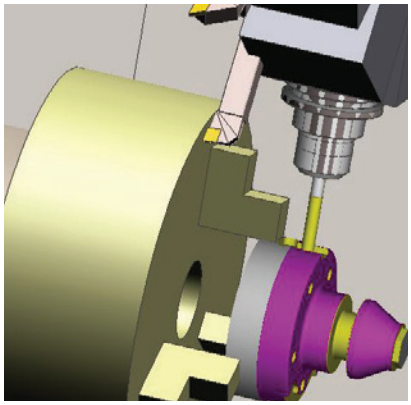

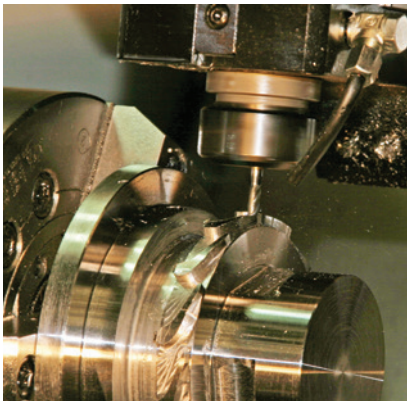

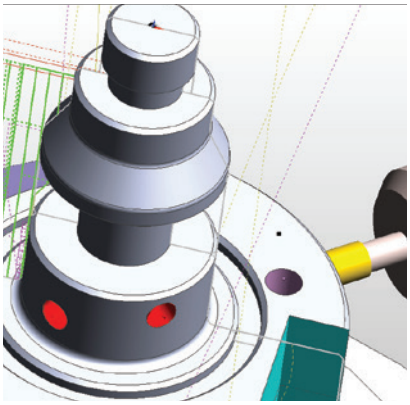

B Axis Head Support

In a Mill Turn environment Edgecam fully supports the use of B Axis head work whether working on single spindle or sub spindle machines. Edgecam for B Axis lathes offers the following main features: B Axis positioning on upper turret allowing more precise and varied approaches to Mill/Turn parts giving the engineer a more flexible approach to programming complex components. The B Axis can be programmed to tilt to any number of angles to allow the many milling options available to tackle any number of features such as Faces, Pockets and Holes.

B Axis machining on both the main and sub spindles maximises productivity allowing optimum machine performance. These features are also supported by our Full Kinematic Simulator with collision detection when using for 4/5 Axis Simultaneous work. This provides accurate feedback of the part being cut before release to the actual machine.

Upper/Lower Turret 4 Axis Turning

The Four Axis turning option in Edgecam allows major advantages and functionality which is not always easily achieve at the machine control. Edgecam programming techniques allow you to use more than one turret at the same time in the mill turn programming environment. This means you can use two fixed cutting tools in the same cycle by using a number of Four Axis commands from the Cycles menu. Edgecam supports the use of Upper and Lower Turret configurations and will support simulation of these including features such as:

Mirrored Turning

Edgecam functionality will program turret movements which are mirrored about a plane on the Z axis and shows the toolpaths lying on the opposite side of the Z plane. The mirror cycle is a very powerful command that will allow various mirrored operation to be performed, such as, a right and left handed turning tool to action a Rough Turn and also Back Turn simultaneously. Turret synchronisation will also be include where required.

Balanced Turning

Another of Edgecam's many features are balanced cycles. The Upper and Lower turrets work opposite each other about the Z axis. These cycles have an additional parameter called Z Lead. Using a value here instructs the currently active turret to cut in front of the other turret by the Z Lead distance allowing increased and improved metal removal. This cycle is automatically synchronised for optimum performance.

Synchronised Turrets

A feature often needed by engineers is Synchronisation between Upper and Lower Turrets. Edgecam performs this function with ease. Use of wait commands simplifies the synchronisation of the Upper and Lower turrets when wanting to use these independently. The synchronisation function is a major requirement in order to perform start and stop procedures with the upper and lower turrets and maximise efficiency in cycle. Edgecam tvisibly defines these operations in the manufacturing sequence and none productive time is clearly shown in the sequence time line.