

GibbsCAM 5-Axis Option 5-Axis Simultaneous Multi-Surface Milling

Today's manufacturers are under constant pressure to continually improve product quality and reduce production times. As part complexity and labor costs continue to increase, 5-axis CNC machine tools provide a key way to address these and other critical machining factors. Today, 5-axis CNC machine tools are being applied in a wide variety of applications and industries, from aircraft and aerospace components, such as spars and ribs, and turbine blades, to electrodes, to deep mold cavities.

The GibbsCAM® 5-Axis option was specifically developed to provide a powerful way to program 4- and 5-axis CNC machine tools while being consistent with GibbsCAM's commitment to ease-of-use. The new 5-axis functionality is seamlessly integrated into GibbsCAM allowing the user to access the entire GibbsCAM environment, providing unparalleled programming flexibility and support. When the 5-Axis option is integrated with the GibbsCAM MTM configuration the resulting combination is capable of supporting advanced multi-task machining systems with live tooling mounted in an articulated head. With its breadth of capability and its ease of use, the GibbsCAM 5-Axis option is ideal for your 5-axis programming needs.

Using a variety of different cutting styles, 5-axis toolpath can be created on any number of trimmed or untrimmed surfaces. The 5-Axis option's toolpath generation functionality works directly from the part model's surfaces resulting in a superior surface finish. The toolpath generation automatically handles model and geometric imperfections. For example, the surfaces' UV lines do not need to be oriented in any special direction prior to creating toolpath offering full flexibility with surfaces being machined. Full support for all standard 4- and 5-axis tool types (ball, flat, bull, conical, and lollipop) is provided with collision checking of the tool tip, tool shaft and holder.

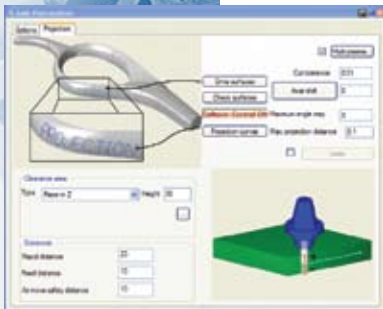
The user has complete control over all aspects of the tool axis. Powerful tilting options can be used to produce a better surface finish. For example, the tool can be set to a specific angle to the surface normal or the 4th or 5th axis can be locked to reduce tool moves. The user does not need to define a guide surface to control the tool axis.

Comprehensive collision checking is supported ensuring milling of sharp corners, avoidance of fixtures and clamps, while producing compact toolpath. Each position of the tool is automatically calculated to ensure that the tool and holder do not collide with the part. A variety of different avoidance strategies are available to address potential collision situations.

The types of geometry that are machined using 4- and 5-axis functionality also introduce specialized modeling requirements. GibbsCAM's geometry creation and editing tools have been expanded to include a new suite of spline modeling tools to address these needs. Splines can be manipulated or modified as desired to suit specific machining conditions.

To optimize the 5-Axis option's ease of use, task-oriented dialog panels are provided to only display the parameters specific to a particular function. Choices such as projection machining, swarf milling, mold cavity machining, cylinder head machining, electrode machining, and turbine blade shaft finishing are included. A set of dialog panels are also available specifically for machining impellers: floor machining, general roughing, and blade finishing.

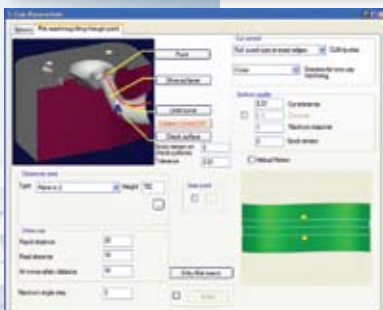
GibbsCAM 5-Axis users can create CNC Gcode a number of different ways. For new 5-Axis users, Gibbs posts provide what-you-see-is-what-you-machine posted output. For users with established posting solutions based on APT-CL, APT-CL output can be generated. ProXYZ 5 axis drivers are also fully compatible with the GibbsCAM 5-Axis option which allows ProXYZ 5as customers to use their existing post processors. In addition, 5-axis posting solutions from Complete can also be used.



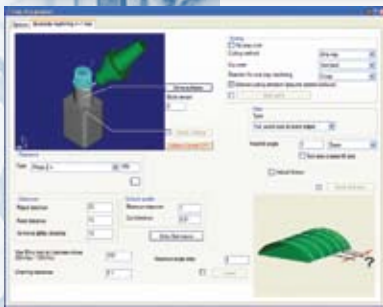
PROJECTION MACHINING



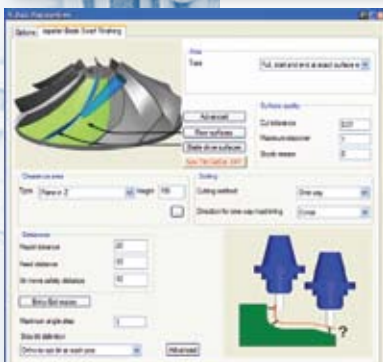
SWARF MACHINING



PORT MACHINING



ELECTRODE MACHINING



IMPELLER BLADE SWARF FINISHING

INTERFACE

- ▶ Easy to learn and use
- ▶ General 5-axis machining tabbed dialogue
- ▶ Specialized task-oriented interfaces
 - ◆ Projection
 - ◆ Swarf Milling
 - ◆ Cavity Tilt Curve
 - ◆ Cylinder Head
 - ◆ Electrode
 - ◆ Impeller Floor
 - ◆ Impeller Roughing
 - ◆ Impeller Blade
 - ◆ Turbine Blade Shaft Finishing

INPUT GEOMETRY

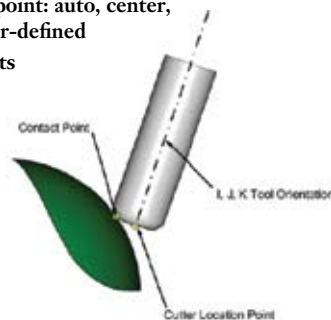
- ▶ Surfaces
 - ◆ Trimmed or untrimmed
 - ◆ Aligned/Non-aligned UV lines
- ▶ Solid models

TOOLPATH GENERATION

- ▶ Toolpath types
 - ◆ Parallel cuts
 - ◆ Cut along curve
 - ◆ Transition between two curves
 - ◆ Parallel to curve
 - ◆ Project curve
 - ◆ Parallel to surface
 - ◆ Transition between two surfaces
- ▶ Toolpath options
 - ◆ Machining Angle in XY
 - ◆ Machining Angle in Z
 - ◆ Drive Surface Selection
 - ◆ Curve/Edge Surface Selection
 - ◆ Drive Surface Offset
- ▶ Cutting area specification
 - ◆ Specify cutting area
 - ◆ Filter out small radii
 - ◆ Extend/Trim drive surface
 - ◆ Shallow/Steep
 - ◆ 2D Containment
- ▶ Surface quality controls
 - ◆ Cut tolerance
 - ◆ Toolpath segment length
 - ◆ Maximum step over

TOOL AXIS CONTROL

- ▶ Constrain to 3-, 4-, or 5-axis
- ▶ Maximum angle step
 - ◆ Support for various tilting modes
- ▶ Side tilt definition
- ▶ Set tool contact point: auto, center, radius, front, user-defined
- ▶ Specify axis limits



LINKS GENERATION

- ▶ Specify tool approach/exit
- ▶ Control gap handling along cut
- ▶ Tool movement between slices
- ▶ Tool movement between passes
- ▶ Specify feed and rapid distances
- ▶ Specify clearance area
 - ◆ Plane in X, Y or Z
 - ◆ Cylinder parallel to X, Y or Z
 - ◆ Sphere
- ▶ Define entry/exit macro
 - ◆ Tool axis orientation
 - ◆ Width/Length
 - ◆ Arc Sweep/Diameter

ROUGHING

- ▶ Stock definition
- ▶ Roughing strategies
 - ◆ Multiple pass material removal
 - ◆ Deeper finish cuts
- ▶ Plunge to drive surface
- ▶ Area Roughing

GEOEDIT

- ▶ Project spline onto surface
- ▶ Offset spline along surface
- ▶ Blend ends of two splines
- ▶ Extend end of spline
- ▶ Split spline into multiple pieces

COLLISION DETECTION/AVOIDANCE

- ▶ Supported tool types
 - ◆ Flat
 - ◆ Bull
 - ◆ Ball
 - ◆ Conical
 - ◆ Lollipop
- ▶ Collision checking conditions
 - ◆ Tool tip
 - ◆ Tool shaft
 - ◆ Tool holder
- ▶ Advanced gouge checking
 - ◆ Check gouge between positions
 - ◆ Extend tool to infinity
 - ◆ Check link motions
- ▶ Avoidance strategies
 - ◆ Moving tool away
 - ◆ Tilting tool away with max angle
 - ◆ Leaving out gouging points
 - ◆ Retracting tool along tool axis
 - ◆ Stop tool path calculation

POST PROCESSING

- ▶ Gibbs Post
 - ◆ Supports legacy solutions
- ▶ APT CL
 - ◆ Supports legacy solutions
- ▶ ProXYZ Driver
 - ◆ Compatible with ProXYZ 5as
- ▶ Complete 5-Axis Post
 - ◆ Machine-specific output
 - ◆ 5-Axis Simulation

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