

SURFCAM Multi-Axis Training

Objective

To provide a comprehensive understanding of the SURFCAM 4- and 5-Axis toolpath generators. To provide advanced training in geometry construction techniques to support 4- and 5-Axis machining. To provide an understanding of the relationship between model and machine coordinate systems, and to understand the role of a 4- or 5-Axis postprocessor.

Prerequisites

The prospective trainee should (a) have a good understanding of machining practices and shop floor terminology, (b) have been using SURFCAM for two weeks or longer, (c) attended the Basic SURFCAM class, (d) attended the Advanced 3-Axis SURFCAM class, and (e) be in possession of a 4- or 5-Axis CNC machine. Items a-e may be waived on an individual basis if the person is confident in his/her ability.

Scope and Disclaimer

While we endeavor to accomplish as much of this agenda as possible, classes do vary in scope and subject matter depending to a large degree on the make-up of the trainees in a particular session. Additional subjects may be covered and subjects deleted as the software is updated and changed. Any attendee is welcome to bring an actual file to class that may be of particular interest and an instructor may work one-on-one with that person if time and scheduling permits.

Class Duration & Classroom Hours

This class is intended to be taught in two 8-hour days. Classroom hours are from 8:30 AM to 12:00 noon, and from 1:00pm to 5:30pm, allowing one hour for lunch break.

Multi-Axis Machining

Surface Machining Terms

An in-depth explanation of the terminology used within SURFCAM that will be encountered in the creation of 4- and 5-Axis toolpaths, such as rotary pivot line, Swarf vs. Cut toolpath types, Entry/exit controls, lead in/out moves, Lead vs. Lag, vs. Side angles, functional planes, construction vs. machining views etc. Relationship between model and machine coordinates. Detailed discussion of SURFCAM's INC2APT utility, what it does, various options and their impact upon postprocessing.

5-Axis Trimming

Use of the various methods available for machining 3D Splines or groups of Line, Arc, and Spline elements. Understanding of various lead in-out moves, plunge clearance, and the role played by the active CView.

Machining of Multiple Surfaces

Use of the Swarf and Cut commands with detailed explanation of all cut control fields and 4- and 5-Axis option tab fields. Thorough understanding of ThruPoint and WithinCurve tool axis control types. Geometric requirements for and usage of the 5-Axis Multi-Surface Contour command. Use of the 5-Axis Multi-Surface Project command. Extending cutting on first & last vs. all machining passes.

Construction View Machining

Thorough review of the rotary pivot line for Vertical or Horizontal Machining Center programming, Model to machine coordinate system requirements. CView definitions for various rotary index positions. Clearance plane height setting vs. postprocessor Index sequence contents. NC Operations Manager toolpath transformation features that support index/copying of 2- and 3-Axis toolpaths for rotary indexing tables.

Advanced NC Verification

Use of the external NC Verify software, including multiple views, custom tool shapes, deep zoom, part-fixture-material component setup, standard animation vs. solid verification vs. turbo mode display types. Part feature inspection, cut-away section views, comparison of as-machined part to original surface model.

SURFCAM Surface Creation

Surface Terminology

Explanation of NURBS surfaces, terminology, axes, symbols, requirements, origins, directions. Basic surface modeling demonstration.

Surface Creation

Review of construction view creation and the geometry used in the generation of various types of surfaces, how to create surfaces using cross-section, drive curve, extrusion, primitive, extruded, trim-plane and revolution. Review of how to create constant radius simple or rolling ball fillets, or variable radius fillet surfaces between existing surfaces, how to create blended surfaces tangent to two, three, or four adjacent surfaces.

Advanced Spline Creation Techniques

Review of how to create Splines as Helixes, Ellipses, Projections of 2D geometry onto a surface, surface flow curves, surface edges, or cross sections. Review of how to edit Spline control points, curvature, and tangency to adjacent elements plus the associativity requirements for surface trimming.

Surface Editing

Review of how to manipulate surfaces to force tangency with neighboring surfaces, or join adjacent surfaces, to extend or trim surface edges using linear, bi-cubic, or combined extension control types. Review of how to edit surface corner, side, direction, arrow etc. to facilitate fillet surface creation and single-surface milling, how to edit surface display curves to show native surface mathematics or a fixed number of rendering curves, how to edit and break surfaces at node points or at wireframe elements, and how to trim surfaces via wireframe elements or where they intersect or become tangent to other surfaces.