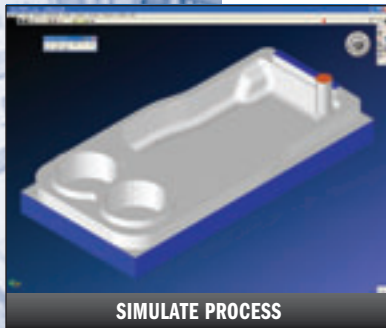


GibbsCAM Solids-Based Options

Solids Import, 2.5D Solids, SolidSurfacer[®]



Solid model-based CAD applications are becoming more and more widely used, resulting in part files in various solid model formats becoming more widely available. Compared to wireframe models, solid and surface models offer a more complete representation. Not only that, but they enable more intuitive modeling and advanced machining capabilities.

In order to fully take advantage of the benefits of solids technology, a cost-effective suite of solids-based options are available for GibbsCAM. Incrementally structured to add onto the base Milling or Turning modules, these options allow the user to start with basic solids-based functionality and gradually expand to more advanced capabilities while protecting their investment. Combined with GibbsCAM's intuitive graphical user interface, integrated cut-part rendering and associativity between part geometry, process parameters, and toolpath, these solids-based options provide powerful yet easy-to-use programming capabilities for today's solid and surface models. Using GibbsCAM's integrated advanced machining capabilities, ultra-efficient part programs with gouge-free toolpaths are created. At the same time, programming efficiency is significantly enhanced with GibbsCAM's highly automated multi-tool, multi-surface roughing and finishing, and "material only" machining methods.

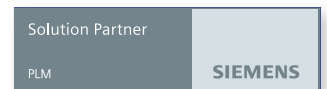
The GibbsCAM solids-based options include:

- ▶ **Solids Import Option:** Provides initial solids capability allowing solid and surface models to be read and manipulated. Geometry is extracted from the solid/surface for general machining.
- ▶ **2.5D Solids Option:** Provides a full range of functionality necessary to create and modify solids/surfaces, machine 2.5D solids/surfaces and generate optimized CNC programs. Specialized tools are provided for the import, repair and automatic solidification of surface data. Using the 2.5D Solids option, CNC programs are created faster, easier and more efficiently than from geometric shapes only. (Solids Import option is required.)
- ▶ **SolidSurfacer[®] Option:** Provides additional capability to handle complex surface modeling, plunge roughing, multi-surface capabilities and advanced 3D capabilities for 3-axis machining – Ideal for mold cavities, cores, dies and aerospace, medical and automotive components. (2.5D Solids option is required.)

The solids-based options are completely compatible with GibbsCAM Production Milling, Turning, Mill/Turn and MTM configurations as well as their post processors.

GibbsCAM is certified under the Autodesk Inventor Certified Application Program, is a Siemens Solution Partner Program-PLM for Solid Edge Product, and is a SolidWorks Certified CAM Product.

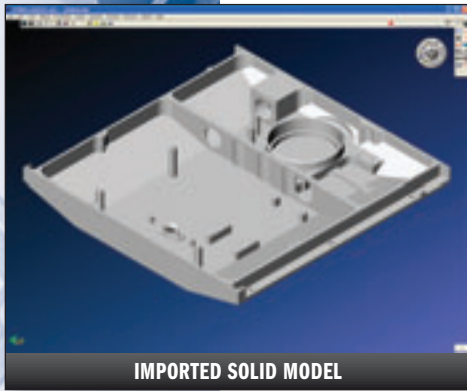
GibbsCAM is compatible with Windows[®] 7 and certified for Windows Vista[™].



Solids-Based Options Capabilities Overview

GibbsCAM's solids-based options provide a full range of capabilities to import, manipulate, create and machine surface and solid models.

Whether starting from an imported IGES surface file, a solid model, or blueprint, GibbsCAM provides powerful tools to prepare geometry and to generate toolpath.



CAD Import

(For a full description of GibbsCAM's data exchange capabilities, see the CAD Interoperability data sheet.)

CAD Model Formats Supported

- ▶ DXF and DWG
- ▶ IGES, importing all 2D and 3D wireframe geometry elements, surface entities and B-Rep solids
- ▶ Parasolid X_T solid model files generated by Unigraphics, Solid Edge, SolidWorks and others
- ▶ Solid Edge and SolidWorks native formats
- ▶ Optional support for ACIS SAT solid model files generated by Ashlar Vellum, Autodesk Mechanical Desktop, Autodesk Inventor, CoCreate Solid Designer and others
- ▶ Optional support for native formats including Autodesk Inventor, CATIA V4 and V5, and Pro/ENGINEER
- ▶ Optional support for STEP AP203 and AP214, and VDA-FS standard formats

Geometry Creation

Solid and Surface Modeling

- ▶ NURBS-based solid and surface models
- ▶ Interactive object-based interface
- ▶ Full associativity for quick and easy changes
- ▶ Solid model history to track and change part creation. Also, Swap, Replace and Clear History
- ▶ Fast rendering of surfaces and solid models
- ▶ Reorient solids with alignment utility
- ▶ Automatic corner rounding and chamfering
- ▶ Variable radius blending
- ▶ Solidify surfaces into solid bodies
- ▶ Slice and section a body

- ▶ Offset and shell a body
- ▶ Create parting line curve
- ▶ Apply Draft to a solid model
- ▶ Automatic core and cavity creation
- ▶ Primitive body creation, including:
 - Sphere
 - Cuboid (blocks, rectangular solids)
 - Extruded shape with taper
 - Revolved shape
 - Lofted NURBS solids through multiple shapes
 - Swept NURBS solids through multiple shapes/drive curves
- ▶ Local editing of solids
- ▶ Provision for shrinkage factors
- ▶ Designate solid as part, fixture or stock
- ▶ Integration of module properties, including surface area periphery and volume (mold shot size)
- ▶ Surface import, repair and automatic solidification
- ▶ Surface creation functions include:
 - Swept NURBS surfaces through multiple shapes/drive curves
 - Lofted NURBS surfaces through multiple shapes
 - Plane
 - Revolved shape
 - Coons patch
 - Trimmed planes
 - Stitch/Unstitch surfaces
 - Trim/Untrim surface
 - Intersect surfaces
 - Create surface from selected body face
 - Extend surface



Machining

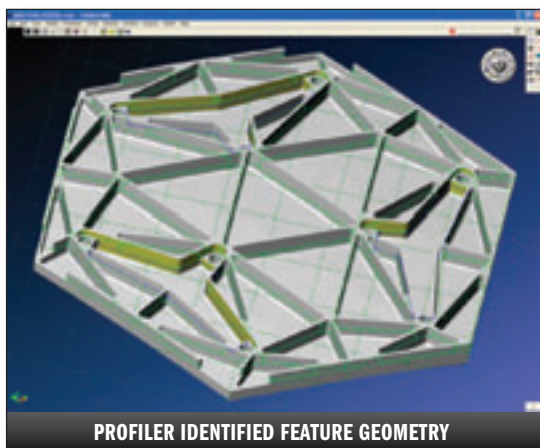
General

- ▶ Fast, gouge-free toolpaths over multiple surfaces and/or complex bodies
- ▶ Apply multiple tools to multiple surfaces in a single step
- ▶ Full associativity to update all changes throughout the entire part

Why Is Associativity Important?

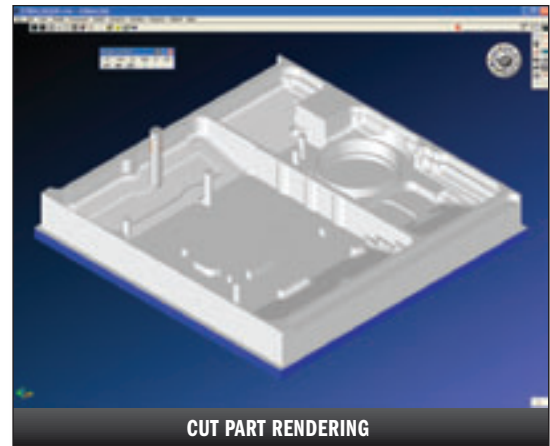
The entire GibbsCAM product line is built with one primary objective – ease of use. Associativity is an important part of that, as it allows you to make changes to your part file and all affected aspects of the part update automatically. All types of changes – tooling, geometry, machining parameters – are completely incorporated into the part with one simple mouse click. This gives you the freedom to experiment, build new parts from similar existing parts and create families-of-parts quickly and easily.

- ▶ Optimization of toolpaths into NURBS, smoothed line segments or arcs (G17, G18, G19)
- ▶ Machine from complex 3D stock bodies, with “material only” cutting
- ▶ Automatic fixture avoidance
- ▶ Support for ballnose, bullnose and flat endmills
- ▶ Constant and variable cut width



Roughing

- ▶ Plunge Roughing (Z-axis plunging with flat bottom tool)
- ▶ Trochoidal Z-level pocketing with plunge, ramp or helical entrance moves
- ▶ Spiral-Out Pocketing with constant Z steps or constant ridge height steps (water line machining)
- ▶ Spiral-In Pocketing with constant Z steps or constant ridge height steps (water line machining)



- ▶ ZigZag Pocketing with Cut Periphery First
- ▶ Contour Roughing with constant Z steps or constant ridge height steps (water line machining)
- ▶ Contour Roughing with ZigZag
- ▶ Lace Cut Roughing, including single direction, back and forth, user specified angle with constant Z steps, offset Z, variable offset Z, constant number of passes over the entire model and optional automatic periphery cleanup
- ▶ Smart drilling of entry holes in multi-level pockets
- ▶ Smart sharp-corner drilling of pockets
- ▶ Hit Z flats option for Pocketing
- ▶ Containment area machining
- ▶ Project 2D geometry onto solid for 3D machining

Finishing

- ▶ Constant Z depth or constant scallop/ridge height finishing passes
- ▶ Lace Cut Finishing, including single direction, back and forth and user specified angle
- ▶ Clean-up only large ridge areas left by previous lace cut at a different angle
- ▶ Contour Finishing with constant Z steps or constant ridge height steps (waterline machining)
- ▶ Clean-up only concave fillets left by a previous larger radius tool (corner clean-up/rest milling)
- ▶ Finish top surfaces and clean-up ridge areas left by previous constant Z roughing
- ▶ Cut entire selected areas
- ▶ Automatic intersection machining following clean-up from previous tools (pencil milling)
- ▶ Multi-Surface Flow Machining
- ▶ 2 Curve Flow Machining

Other Functions

- ▶ Projection of toolpaths on multi-surface parts
- ▶ User control of stock amounts and cutting tolerances
- ▶ User-definable constraint shapes, surfaces and solids

Solids-Based Options Details

Solids Import Option

The Solids Import option provides entry-level support for machining solids and surfaces. Solid and surface models can be read, viewed and manipulated. Geometry can be selected and extracted for machining. Using this option you can import a model, view it and extract geometry from selected edges, which can then be machined.

Solid and Surface Model Interaction

- ▶ Display of solids/surfaces can be toggled on/off
- ▶ Display style can be set to wireframe/hidden-line/rendered
- ▶ Edge display can be toggled on/off
- ▶ Indicators can be displayed showing surface normals
- ▶ Solids and surfaces can be managed offscreen in Body Bag
- ▶ Wide range of options available from right mouse menu on solid/surfaces
- ▶ Geometry can be extracted from solids/surfaces
- ▶ Hole geometry can be extracted from solids/surfaces
- ▶ Cross-section geometry can be created by slicing solids/surfaces



2.5D Solids Option

The 2.5D Solids option provides significant surface and solid modeling capabilities. Functionality to directly machine surfaces and solids is also included. With this option, you have the ability to create, import and modify surface and solid models and then generate toolpath and machine code.

Surface Modeling

- ▶ Create a planar surface
- ▶ Create a spun surface
- ▶ Create a variety of lofted surfaces: loft using two parallel plane curves, with multiple curves, or closed
- ▶ Create a Coons 2.5D Patch (using line and circles only)
- ▶ Create a variety of swept surfaces: drive curve plane alignment is a 2D normal, one drive curve, and sharp corners
- ▶ Extract a surface from a solid
- ▶ Trim, untrim and extend a surface
- ▶ Stitch/unstitch surfaces

Solid Modeling

- ▶ Create simple sphere and cuboid solids using parametric constructors
- ▶ Create solid by extruding or revolving a cross-section
- ▶ Create solid using a variety of sweeping methods: drive curve plane is aligned to 2D, one drive curve, or a drive curve with sharp corners
- ▶ Create solid by lofting between two curves
- ▶ Create a solid by automatically solidifying multiple surfaces together to a tolerance
- ▶ Create a solid by offset or shelling a surface
- ▶ Apply a simple round or a chamfer to an edge

- ▶ Unstitch a body (useful for removing features, especially to create electrodes)
- ▶ Perform Boolean operations between two solids: union (add), difference (subtract), intersect (creates a shape at the intersection of the two solids) and separate (useful for separating an assembly)
- ▶ Maintain modeling history allowing modification and rebuild of solids

Solid Geometry Interaction

- ▶ Solid used for initial stock body for turning, mill/turn and MTM options
- ▶ Interactively select machining regions using Profiler
- ▶ Automatic Feature Recognition of hole features automatically identifies diameter, extents, location and orientation



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2.5D Solids, Solid Modeling
continued...

Machining

- ▶ Pocket machining with support for projected 2D geometry
- ▶ Contour machining with support for projected 2D geometry
- ▶ Generate precise (analytic) contouring toolpath with offset arcs at corners

SolidSurfacer® Option

The SolidSurfacer option provides higher-level surface and solid modeling capabilities. Advanced functionality to machine surfaces and solids is also included. Using SolidSurfacer, you can address the most demanding surface and solid modeling and machining requirements for complex mold, tool and die work.

Surface Modeling

- ▶ Create Coons patch surfaces
- ▶ Create a swept surface using a variety of methods: no drive curve plane alignment, 3D normal drive curve plane, generating curve function (with optional marker), multiple drive curves, blended drive curves

Solid Modeling

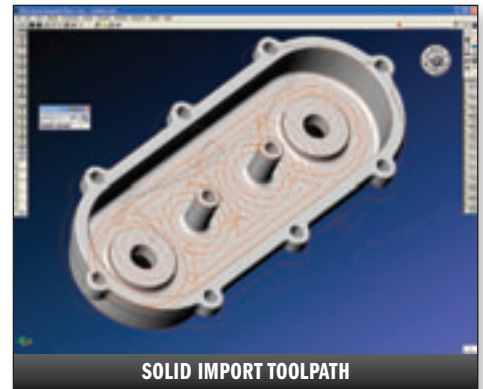
- ▶ Create body by lofting across multiple curves
- ▶ Create body through a closed loft
- ▶ Create a body using a variety of methods: no drive curve plane alignment, 3D normal drive curve plane, generating curve function (with optional marker), multiple drive curves, blended drive curves
- ▶ Create parting line from solid
- ▶ Apply positive/negative draft to solid

Why Include Modeling Functionality?

GibbsCAM provides the user with a complete suite of the tools necessary to get their job done. This includes modeling capability that supports creating solids from part prints, cleaning up imported solids so they can be machined, to creating models of fixturing. Because this functionality was specifically designed for manufacturing professionals, it is easy to use and appropriate for their specific tasks.

Machining

- ▶ Lace Cut Roughing, including single direction, back and forth, user specified angle with constant Z steps, offset Z, variable offset Z, constant number of passes over the entire model and optional automatic periphery cleanup
- ▶ Lace Cut Finishing, including single direction, back and forth and user specified angle
- ▶ Clean-up only large ridge areas left by previous lace cut at a different angle
- ▶ Contour Finishing with constant Z steps or constant ridge height steps (water line machining)
- ▶ Clean-up only concave fillets left by a previous larger radius tool (corner clean-up/rest milling)



SOLID IMPORT TOOLPATH

- ▶ Cut entire selected areas
- ▶ Finish top surfaces and clean-up ridge areas left by previous constant Z roughing
- ▶ Automatic intersection machining following clean-up from previous tools (pencil milling)
- ▶ Multi-Surface Flow Machining
- ▶ 2 Curve Flow Machining

Post Processing

- ▶ PosteHASTE for GibbsCAM, a template-based post processor development tool delivered with over 229 example post processor templates
- ▶ GibbsCAM's library of over 10,000 proven post processors, ensuring what-you-see-is-what-you-machine G-code output
- ▶ APT CL output for use with legacy post processing systems

