

## Tombstone Management System

Tombstones are a very productive means for machining multiple parts, greatly extending the time a machining center can run without operator intervention. GibbsCAM TMS (Tombstone Management System) streamlines multi-part setups to move more material through a machine tool while dramatically reducing the overall time required to create error-free machining processes.

Is it more efficient to keep the tool in the spindle and index around the tombstone or would it be better to finish all operations on one face of the tombstone before indexing to the next? GibbsCAM TMS makes it easy to try a variety of strategies to find the optimal strategy for any group of parts.

Perfect for lean manufacturing environments, or for job shops that want to implement lean principles, tombstone machining automates the output of a continuous flow of parts. The simplest strategy is to arrange the same part across multiple locations and sides of a tombstone and machine them one after the other by simply repeating the CNC program. With each rotation of the tombstone, a fresh group of parts is presented for machining.

With only a few mouse clicks, parts and their associated fixtures are located on the tombstone. GibbsCAM TMS offers numerous options for automatically arranging parts on a tombstone face with the choice of duplicating the same configuration on all faces of the tombstone or creating custom configurations for each face.

For parts that require different operations using a variety of tools, a more complex strategy can be defined that optimizes tool changes and minimizes rotations of the tombstone. Different faces of the same part can be programmed, at different Z-levels, on each side of the tombstone or mix different types of parts. GibbsCAM TMS handles the simplest to the most complex tombstone configurations.

Operations can be added or cleared to modify the sequence of operations on each side of the tombstone to accommodate certain exceptions. For example, features can be selectively excluded on the sides of parts that face other workpieces instead of the open side of the tombstone where the spindle can reach. These operations can then be addressed later in another setup. Separate clearance values control the safe distance for the tool when moving from part to part on one face of the tombstone and the safe distance when indexing from face to face on the tombstone.

When GibbsCAM TMS is combined with GibbsCAM Machine Simulation, a dynamic rendering of the complete setup—tombstone, parts, fixtures, and machine tool components—shows all inter-operation and intra-operation moves. Different strategies and their cycle times can be compared and adjusted quickly and easily.

After various scenarios have been tested and the user is completely satisfied with tool movement, tool changes, sequence of operations and index moves, GibbsCAM TMS will generate a complete post processed set of G-code for the entire tombstone of parts. GibbsCAM TMS also provides support for the posted output of subroutines, canned cycles, and B-rotation positions.

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## Single Interface

The TMS dialog provides all the options needed to machine a tombstone full of parts—whether it's the same part duplicated in a number of locations, different faces of the same part, or different parts altogether

## Flexible Part Layout

Define the tombstone, the multiple parts on it and how tools should move from part to part.

- Set up a standard configuration of parts where the same configuration is used on all sides of the tombstone.
- Set up a custom configuration to support multiple types of parts or part conditions that can vary from one side to the next.

## Stock/Fixture Layout

Create only one instance of a stock body or fixture group and easily duplicate these items in a matrix on the tombstone for Machine Simulation rendering.

## Optimize Tool Changes;

## Minimize Rotations

Group similar operations to control which operations should be performed together to minimize tool changes and rotations of the tombstone.

- Group operations by tool to machine all features—in order and across all parts, including those accessible on adjacent sides of the tombstone—with the same tool before the next tool change.

- Group operations by tool and coordinate system to complete all operations on a workpiece with the same tool before moving to the next.
- Because some tools may be used for several operations, the user has the option to have one tool perform only one operation in one group at a time.

## Safe Retracts

Avoid collisions by defining the safe distance when moving from part to part on each face of the tombstone and when indexing from face to face of the tombstone.

## Visual Verification

The Machine Simulation module provides visual verification of the complete setup—the tombstone, fixtures, and workpieces as well as critical components of the machine tool such as the rotary table, base plates, machine columns and so on. Apparent problems can be corrected easily by simply returning to the TMS dialog and modifying the input. Simulation also keeps track of X, Y, Z positions relative to the machine's travel limits to prevent the tool from exceeding the machine's travel capacity.

## Error-free Code

Output a program for the entire tombstone of parts, including all index moves and tool retracts. Support is provided for how the posted output subroutines, canned cycles, and B rotation positions will be handled.

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GibbsCAM TMS is an optional module that requires the 2.5D Solids or SolidSurfacer modules and a customized processor to generate the appropriate G-code. While not required, the Machine Simulation module is highly recommended to properly visualize the TMS operations. Images on front page were generated by Machine Simulation module.

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