VisualCAD/CAM at Lane Manufacturing

Lane Manufacturing moved into its current facility in Lebanon, Oregon in July 2007. Since then the company has added a full CNC mold shop and increased its manufacturing capacity with new injection molding machines. Another 8,000 square feet of warehouse space was added in 2015, as well as additional property to expand in the future.

Lane Manufacturing's goal is to provide quality products at an unbeatable price. The company has been in business for over 50 years and has an unbeatable sample inventory and reference library of irrigation gaskets. By designing and fabricating their own molds they are able to turn around production products in days rather than weeks or months.
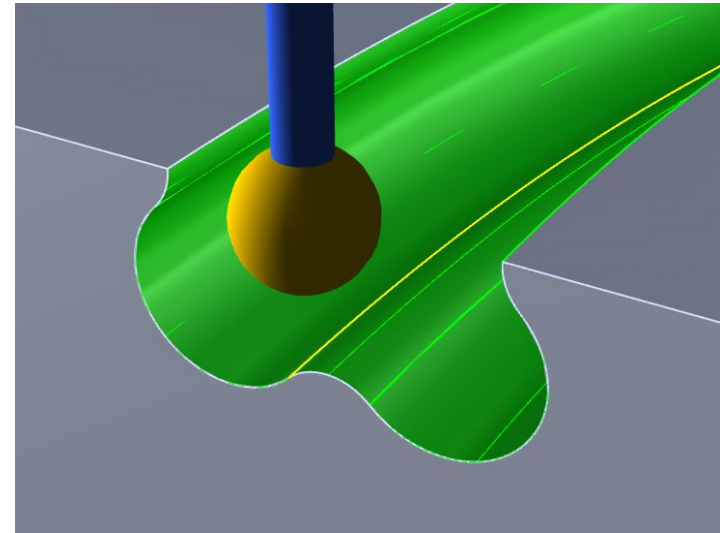
The VisualCAD/CAM Difference

Casey Simmons is Lead Machinist for Lane Manufacturing with 15+ years of CAM experience working with VisualCAM, Mastercam and GibbsCam. We recently sat down with Casey to ask him about his use of VisualCAM there at Lane Manufacturing. Here is some of what Casey had to say.

The primary reason we chose VisualCAM was cost versus performance. VisualCAM is our primary CAM application that runs our Milltronics VM5020 mill.

Casey Simmons, Lead Machinist, Lane Manufacturing
Lebanon, Oregon
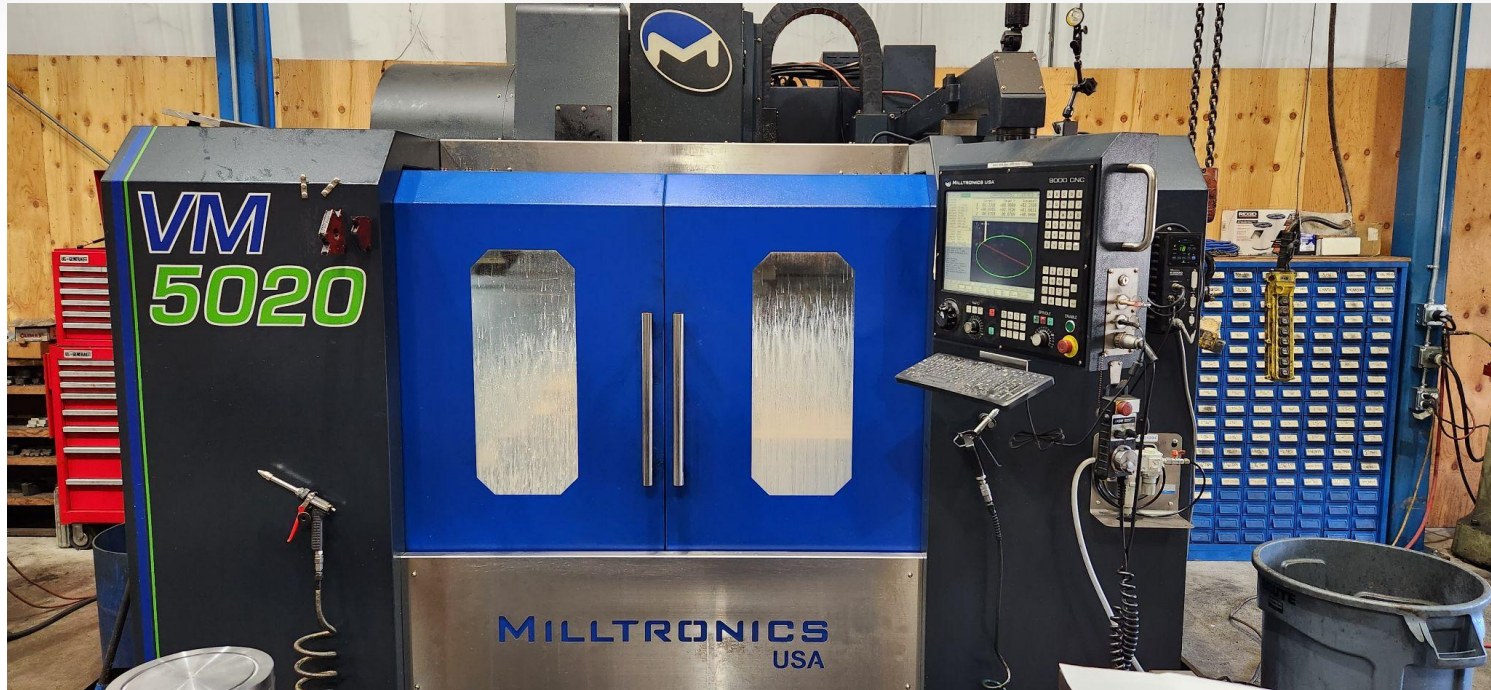
The Milltronics VM5020 mill at Lane Manufacturing

The Milltronics VM5020 mill at Lane Manufacturing

The VisualCAM Part

The parts selected for this case study are a set of cavity inserts for a 3-plate mold for injection molding 8 quad-ring seals at a time. The seals are used in irrigation and hydraulic applications. The resulting seals are approximately 5" in diameter and ½" thick with one half of the seal being molded by each cavity. The cross-sections and dimensions below illustrate the complexity of these cavities.
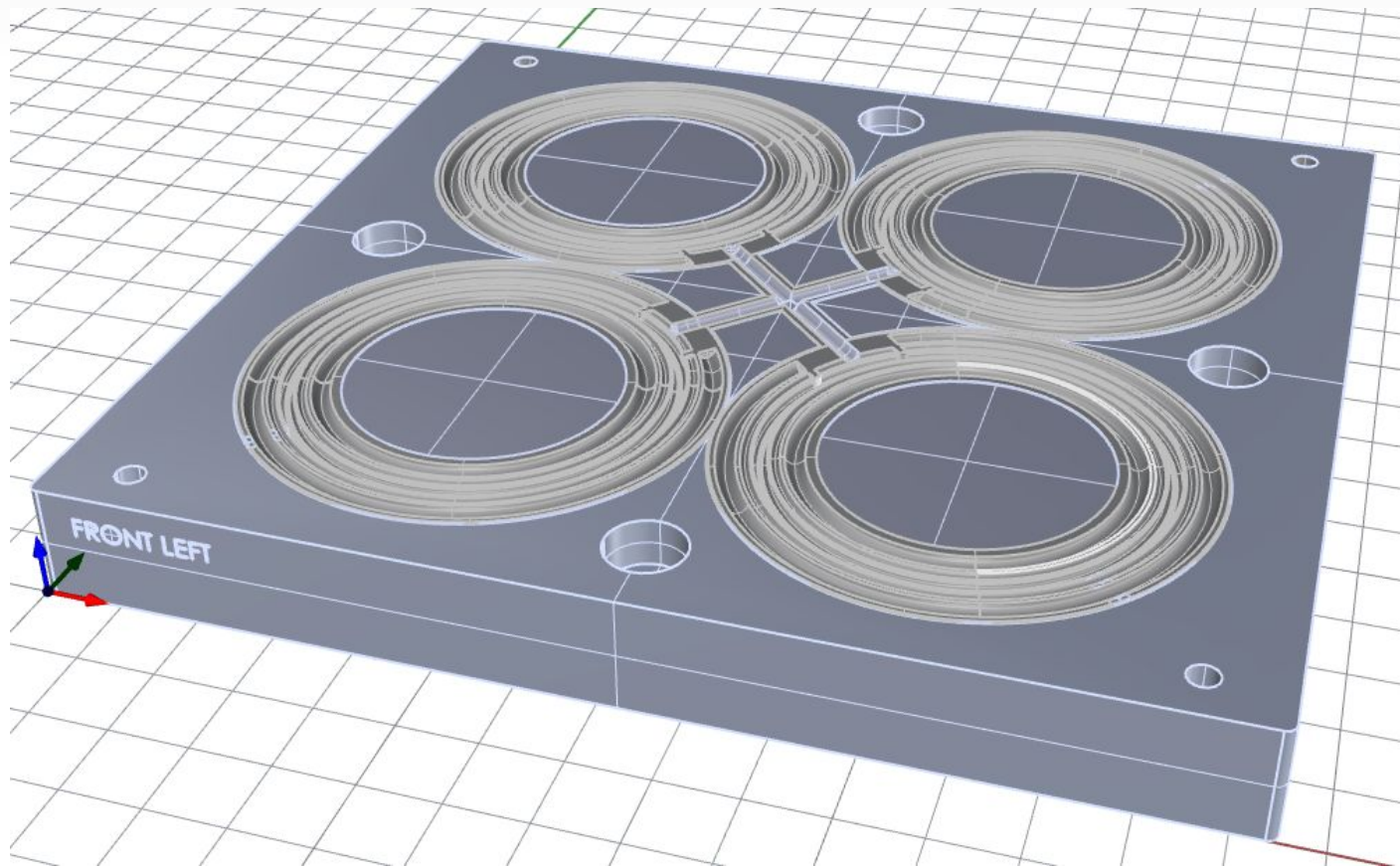
Here we see the 4-cavity mold block assembly with inserts
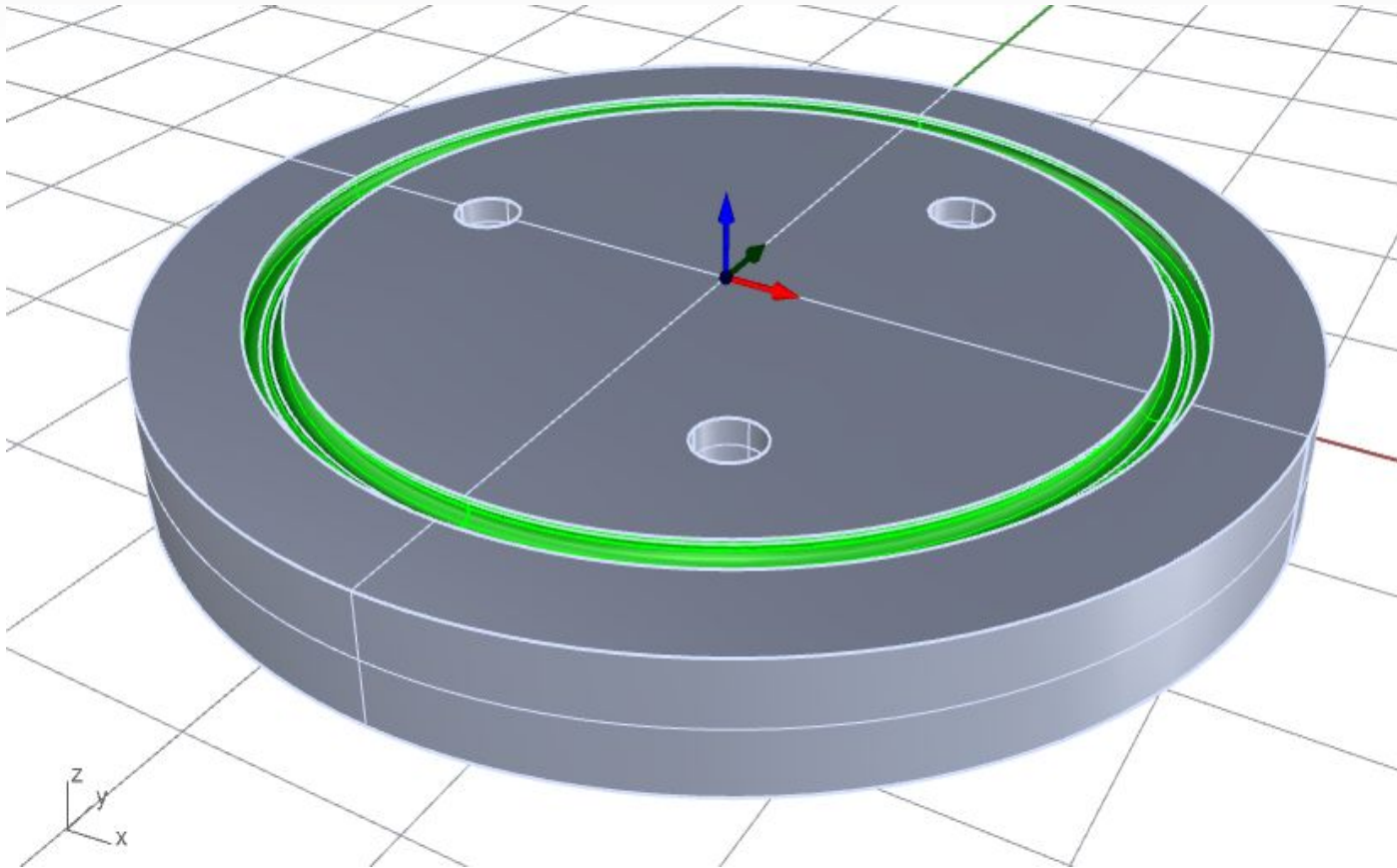
The cavity insert shown above molds one half of the quadring seal used in irrigation and hydraulic applications.
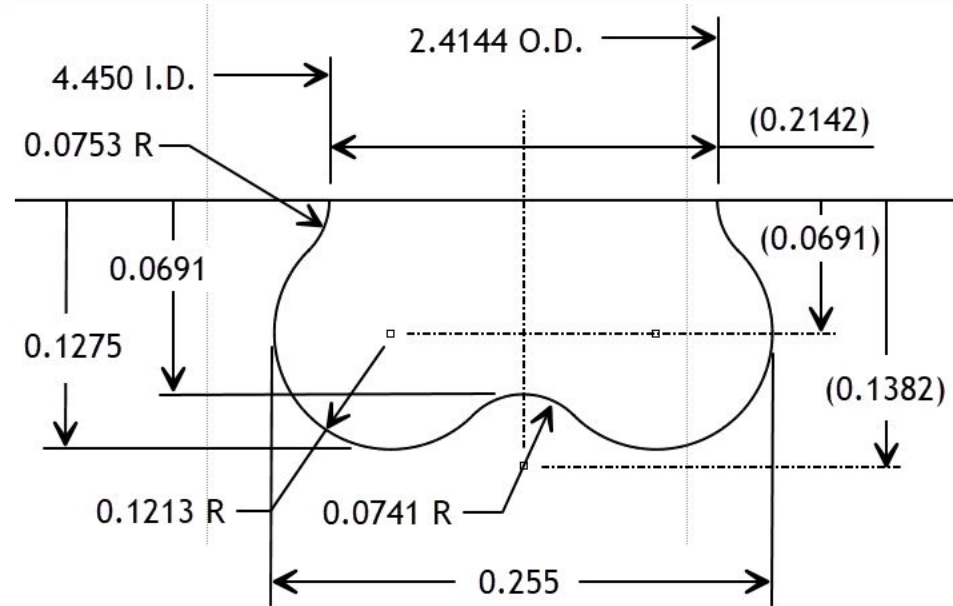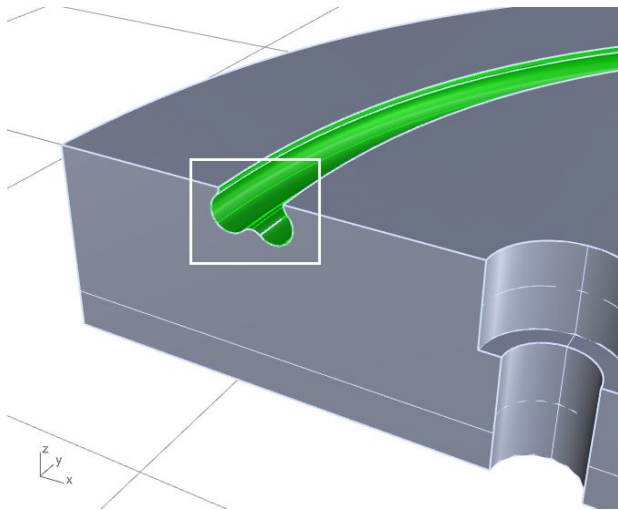
Here we see the cross-sections of the quad-ring seal cavity inserts. This machining job requires some very precise cutting paths to reproduce these undercut cavities as mentioned above.

The Cutting Tool

The cutting tool used for this machining job is a 2-flute CARBIDE ball undercutting end mill with a ball diameter of 0.0938", a shank diameter of 0.038" and a shoulder diameter of 0.125. The Cutting Tool and the Tool definition dialog are shown below.
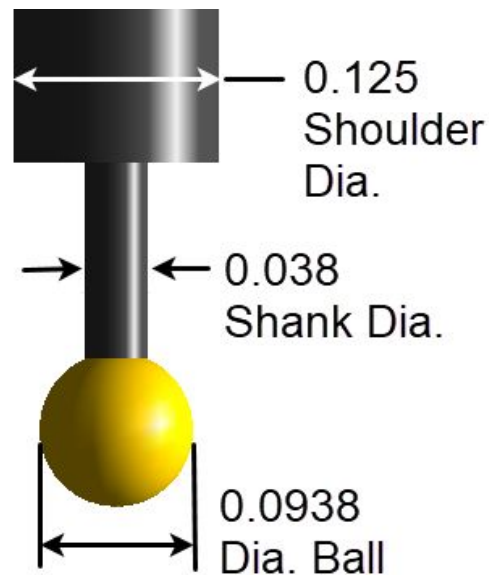
2-flute CARBIDE Ball Undercutting End Mill
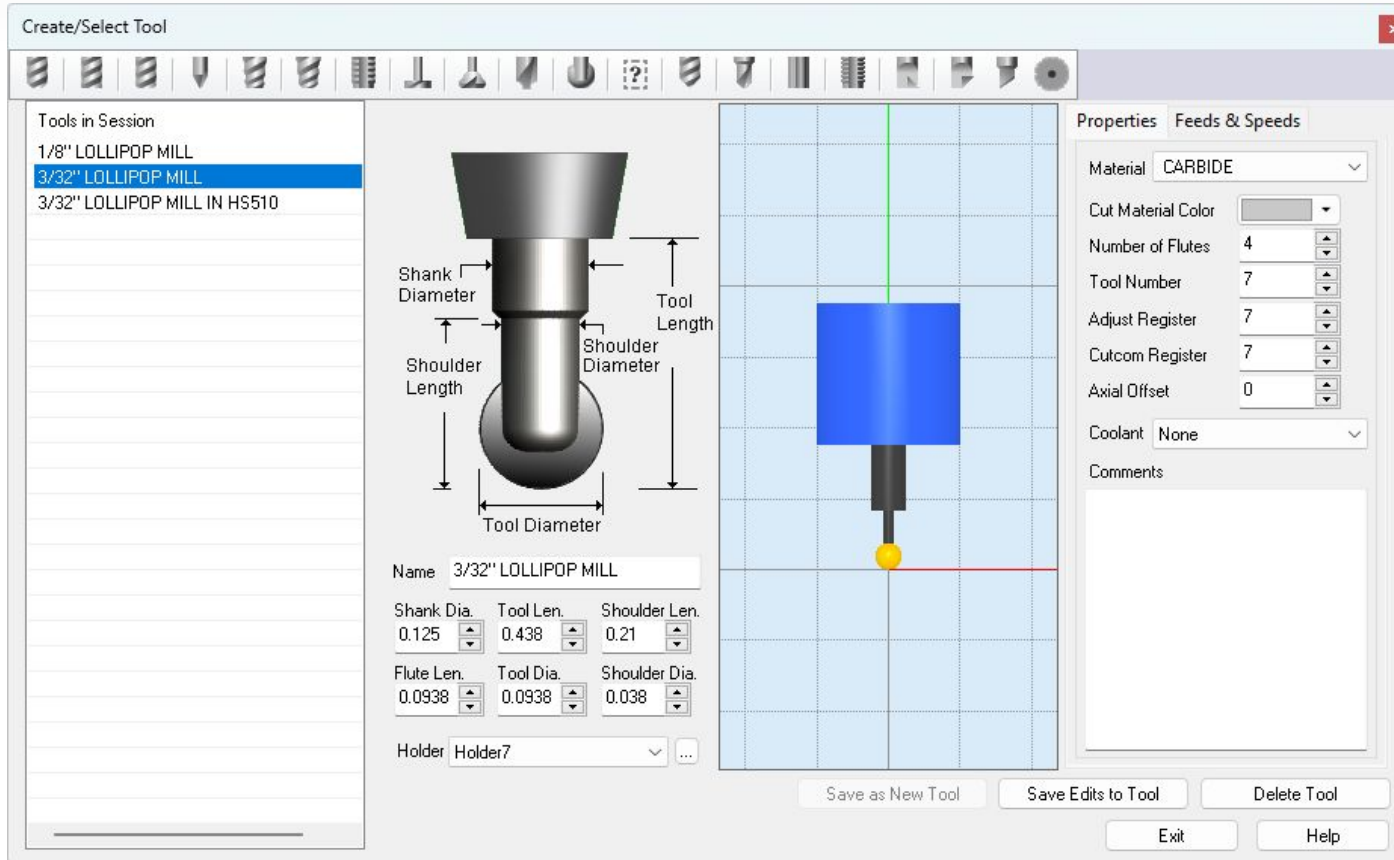
The Create/Select Tool dialog is used to define cutting tools as well as custom tool holders.

The Machining Job

The undercut constraints of the quad-ring cavity requires a specific type of tool, This being a 2-flute CARBIDE ball undercutting end mill with a ball diameter of 0.0938" and a shank diameter of 0.038". You can refer to the tool images above for details. The Cutting Tool necessitates the use of multiple (over 50) 2-Axis Profiling operations each with a small amount of material removal. Samples of the Machining Job tree are shown below.

On the left you see the entire Machining Job starting with a 3 Axis Horizontal Roughing operation named "ROUGH O'RING GROOVE" that is followed by 6 Machining Operation Sets (referred to as MOpSets). Each MOpSet contains 10 or more 2½ Axis Profiling operations.
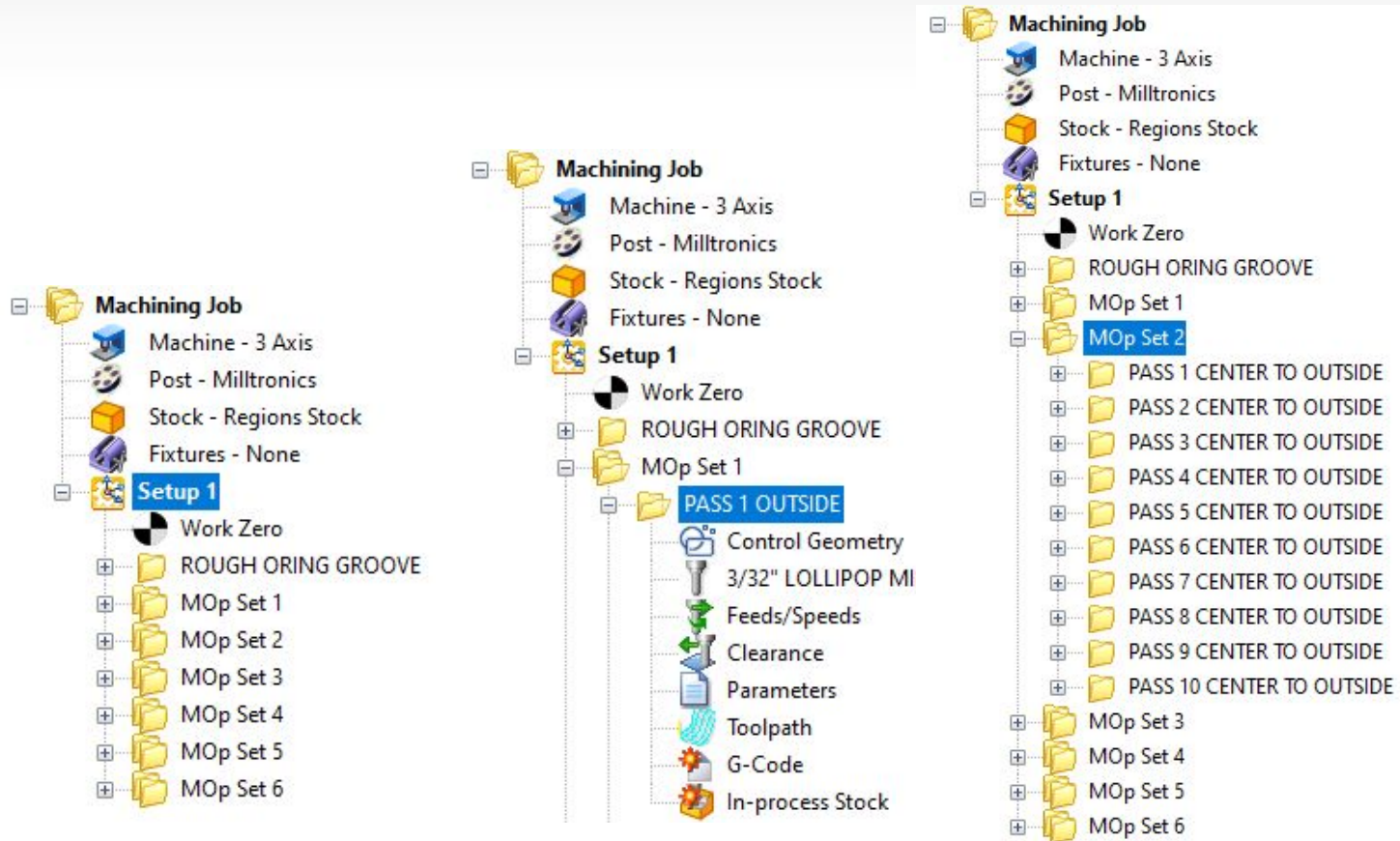
The Machining Job trees shown above show the depth of the machining operations required to cut these quad-ring seal grooves into each cavity. Each operation removes a small amount of material due to the size of the 0.0938" cutting diameter.

2½ Axis Profiling (64 Operations)

Because of the size of the cutting tool and the shape of the quad-ring seal cavity, only a small amount of material can be removed at a time. Because of this, a total of (64) 2½ Axis Profiling operations are required, each one precisely positioned to remove one level of stock material resulting in the undercut cavity. Below is the first 2½ Axis Profiling operation in the Machining Job. The remaining 63 operations are very similar except for the location of the control geometry and the depth of cut.
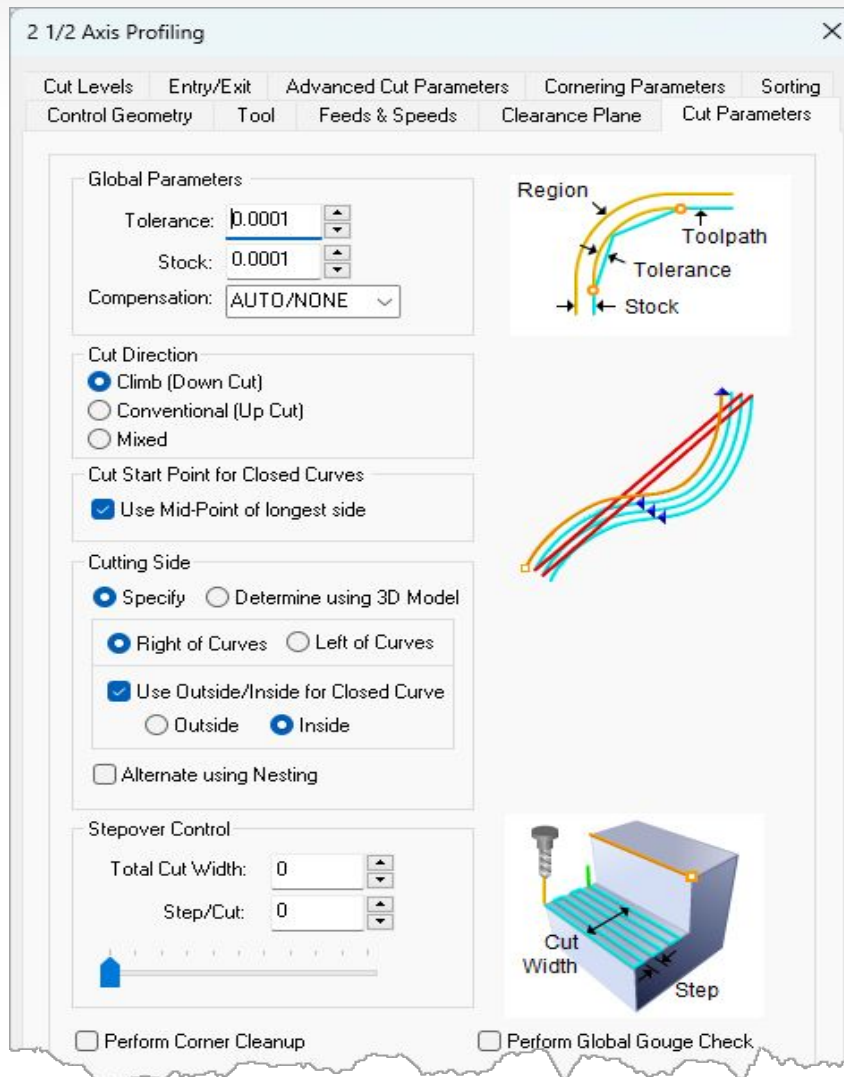
The Cut Parameters tab of the first of (64) 2½ Axis Profiling operations.

The Cut Parameters tab of the first of (64) 2½ Axis Profiling toolpath operations is shown above. Note that the Global Tolerance is set to 0.0001" and the Cut Direction is set to Climb (down cut).
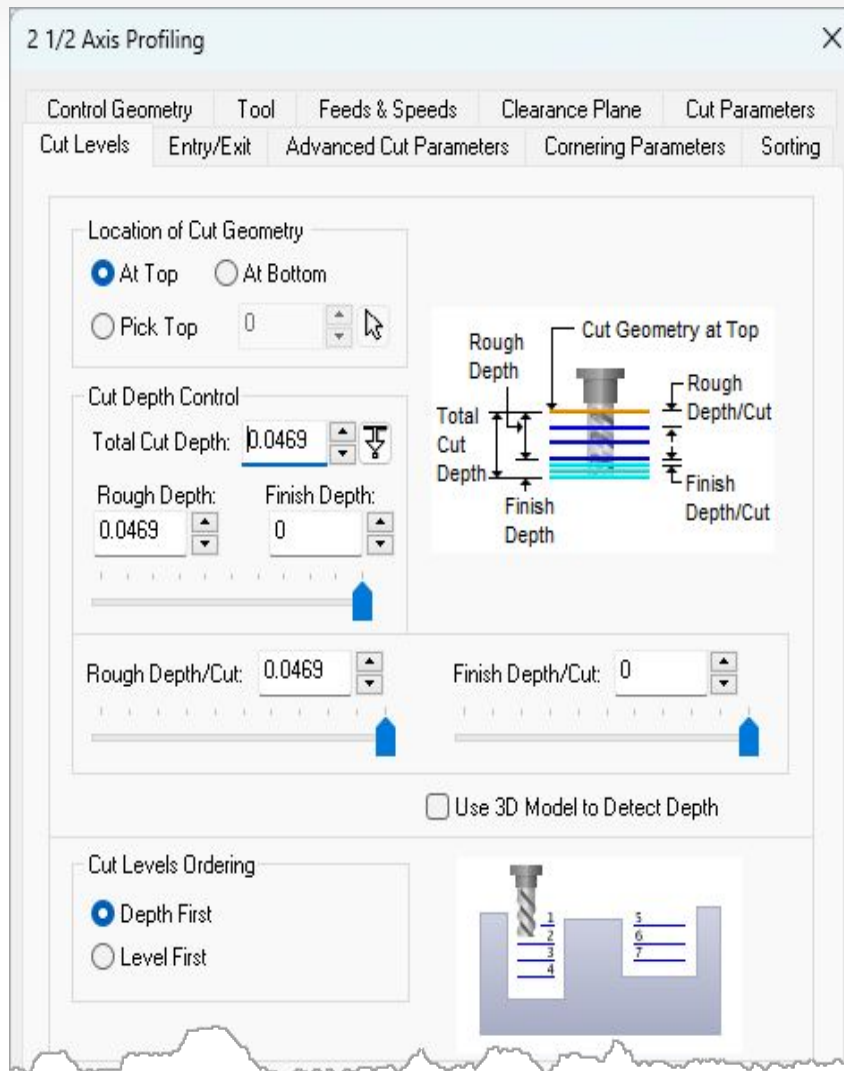
The Cut Levels tab of the first of (64) 2½ Axis Profiling operation

The Cut Levels tab of the first of (64) 2½ Axis Profiling toolpath operations is shown above. Note that the Total Cut Depth is set to 0.0469" inches. This operation is shown in the cross-section illustration below.
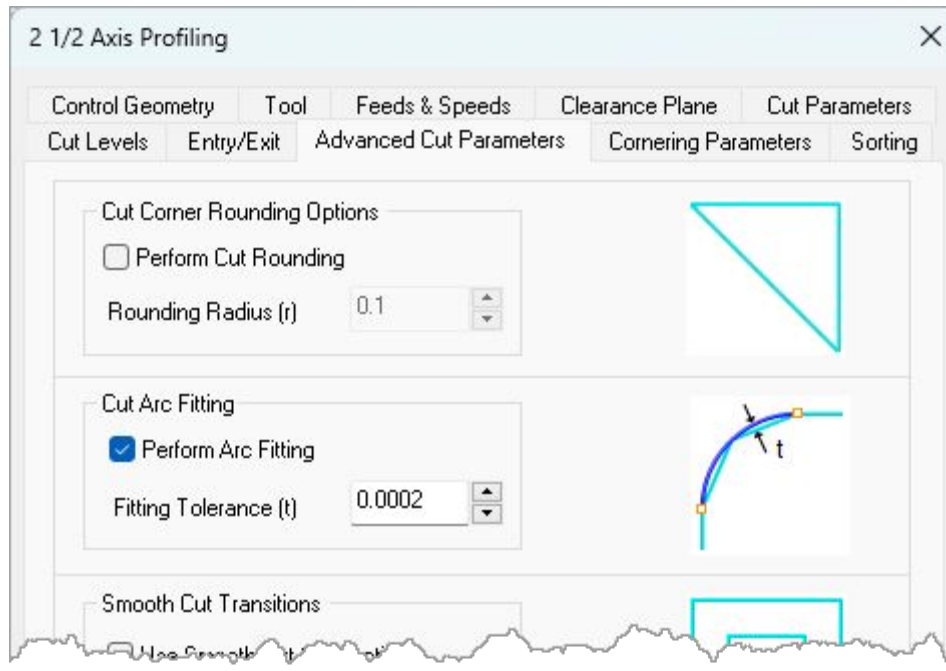
From the Advanced Cut Parameters tab, Cut Arc Fitting is enabled and the Fitting Tolerance is set to 0.0002 (2 times the Global Tolerance set on the Cut Parameters tab.

A Note About the Arc Fitting Tolerance

When Perform Arc Fitting is enabled, consecutive linear motions (G01s) are converted to circular arc motions (G02s and/or G03s). The Fitting Tolerance should be 2 times the Global Tolerance set on the Cut Parameters tab. This allows the CAM program to locate the next G01 coordinate in the fitted arc. If you feel the Fitting Tolerance is too high for your needs, then set the Fitting Tolerance to your final required tolerance and then set the Global Tolerance to 0.5 times your Fitting Tolerance.

Accuracy & Precision

MecSoft's CAM solutions like VisualCAD/CAM and RhinoCAM allow users to "dial-in" the exact amount of precision needed for each job. Whether engraving signs or machining production mold cavities, our CAM software by default operates with an internal precision of 14 decimal places. Users can then, using controls offered in the software, calibrate the exact precision required for a specific machine tool or a job, during the creation of toolpaths as well as during post-processing.
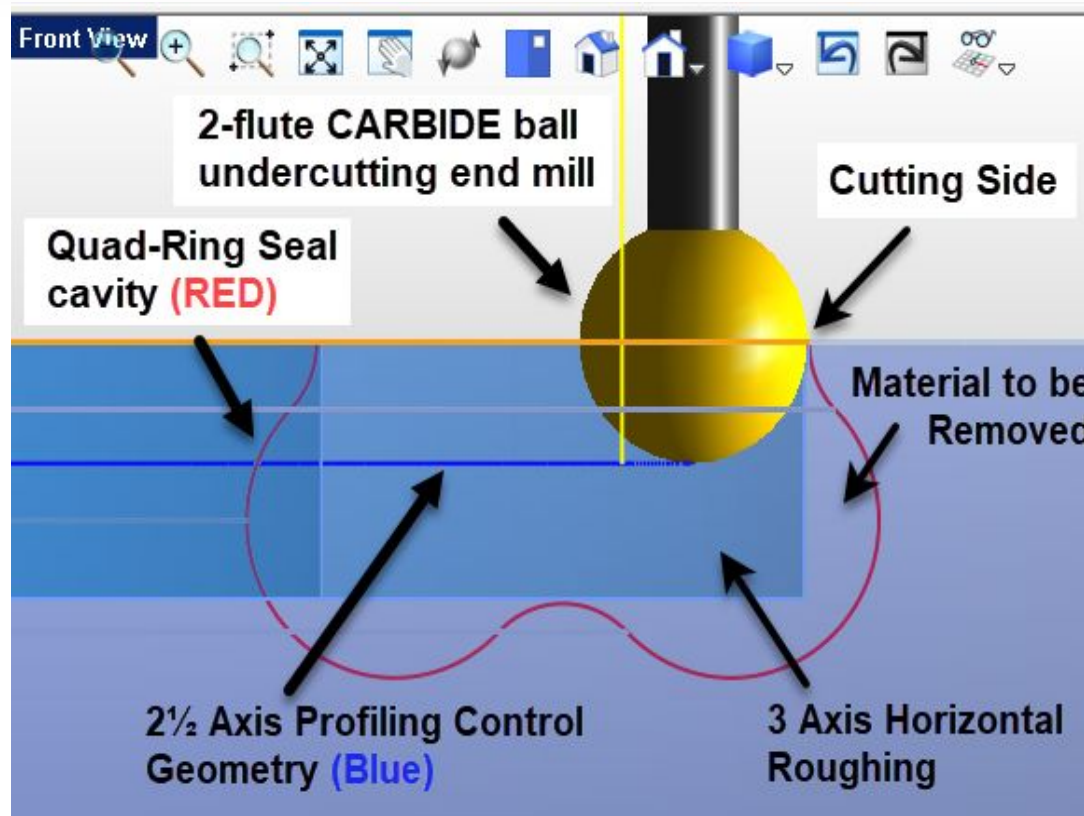
Here we see a cross-section of the Quad-Ring seal cavity during the first of (64) 2½ Axis Profiling operations

Above we see the cross-section of the Quad-Ring seal cavity during the first of (64) 2½ Axis Profiling operations. The cavity profile is shown in **red** and the control geometry for the Profiling operation is shown in **blue**. Note that cutting is being performed on the right side of the 2-flute CARBIDE ball undercutting end mill. Also note that a 3 Axis Horizontal Roughing operation is first performed to remove material from the cavity.

The Cut Material Simulation

The cut material simulation video for the above Machining Job can be watched below. It is accelerated so you can see the entire cavity being cut.
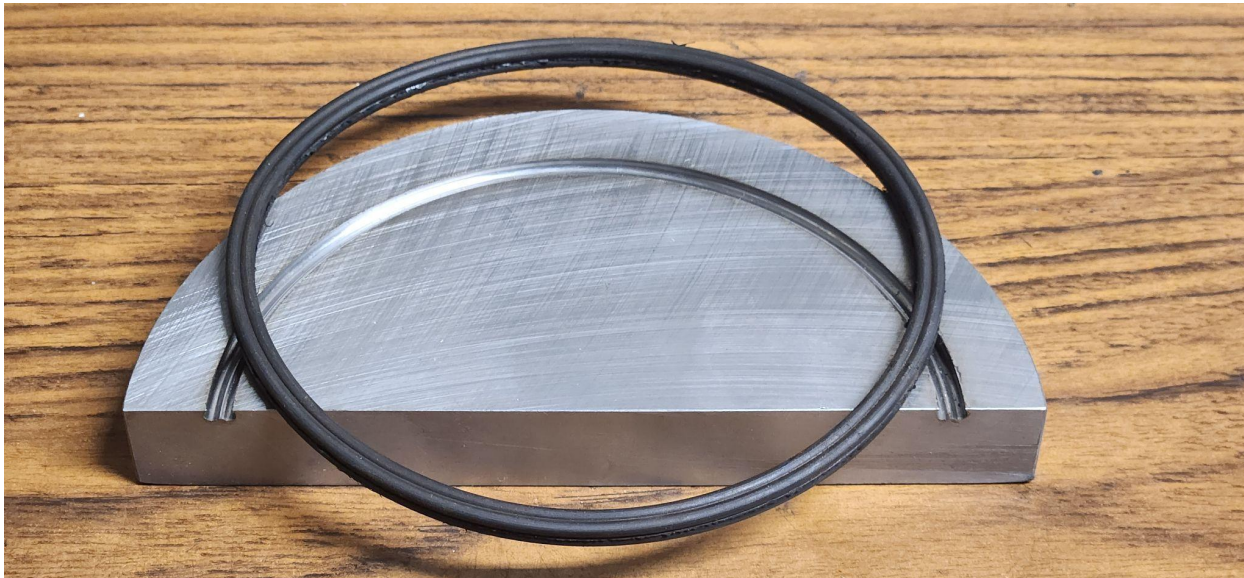

https://youtu.be/BAWmEDYMZo8
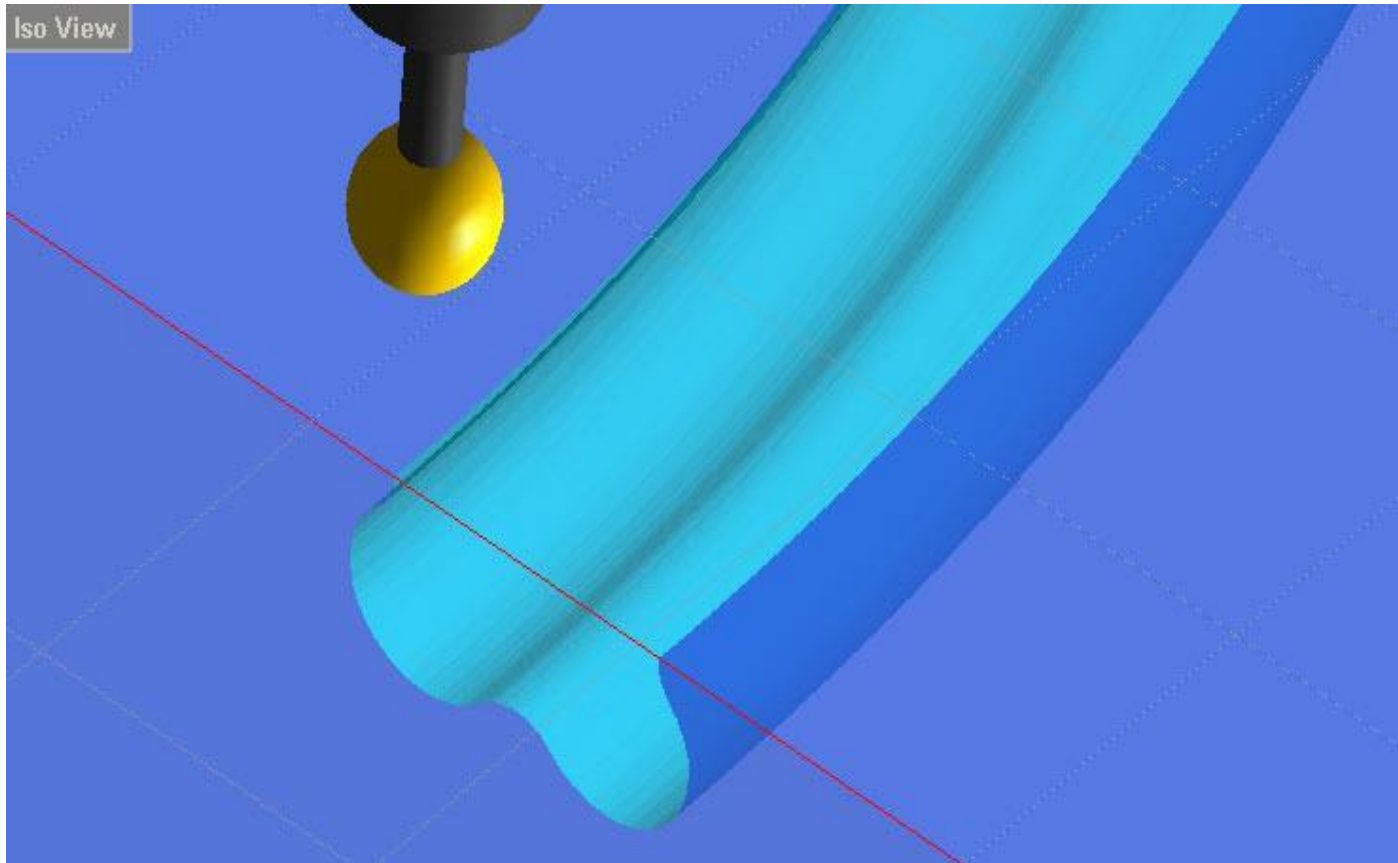
**Above we see a section view of the completed cut material simulation model after all CAM operations are complete.**

Project Wrap

The image below shows a proof-of-concept cavity plate and a prototype quad-ring seal. We want to extend a special thanks to Casey Simmons and Lane Manufacturing for allowing us to showcase their work.

Here we see a proof-of-concept cavity plate and a prototype quad-ring seal.
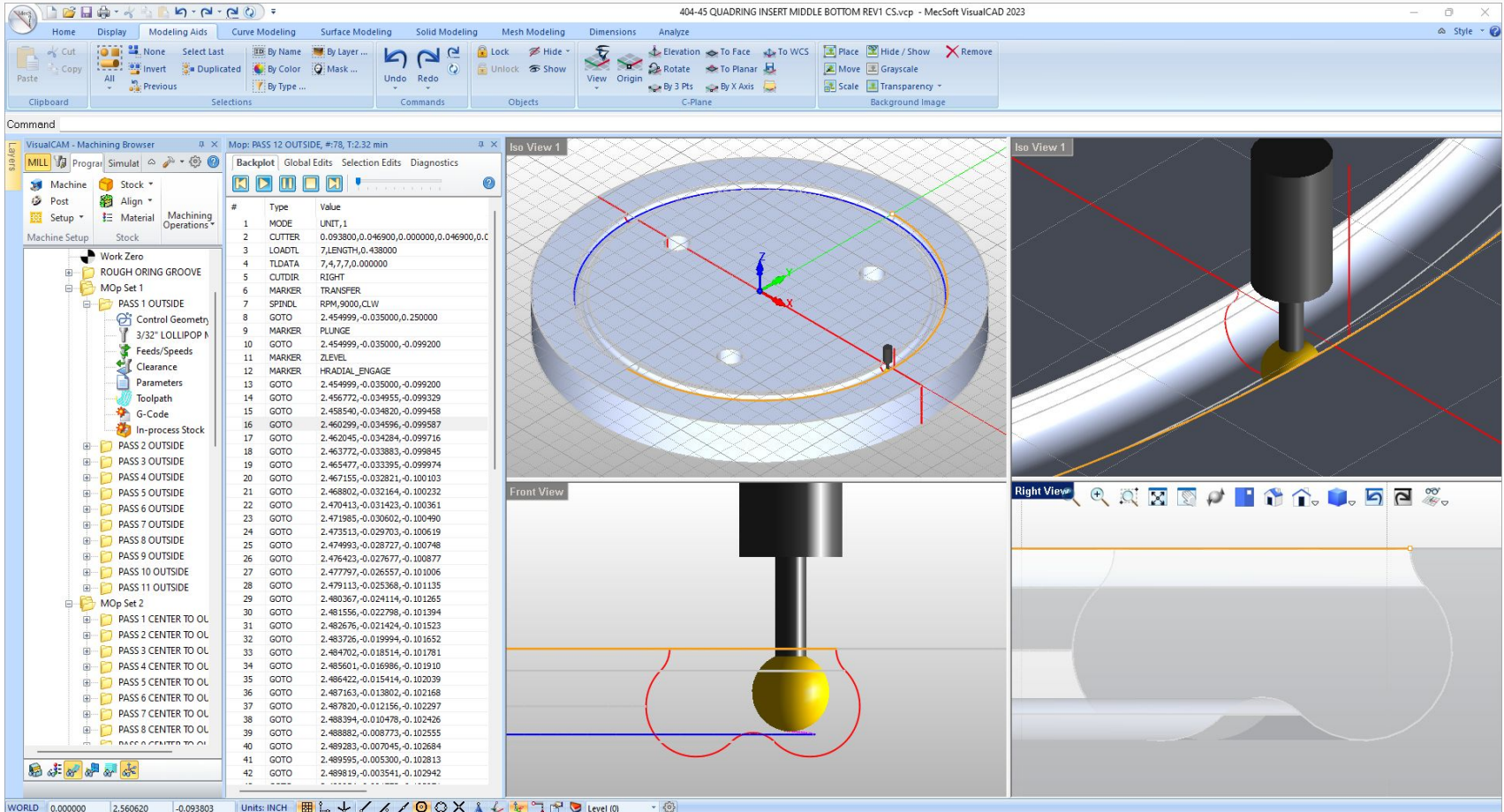
Here we see VisualCAD/CAM and the completed Machining Job, 2½ Axis Profiling operation and tool motion paths.
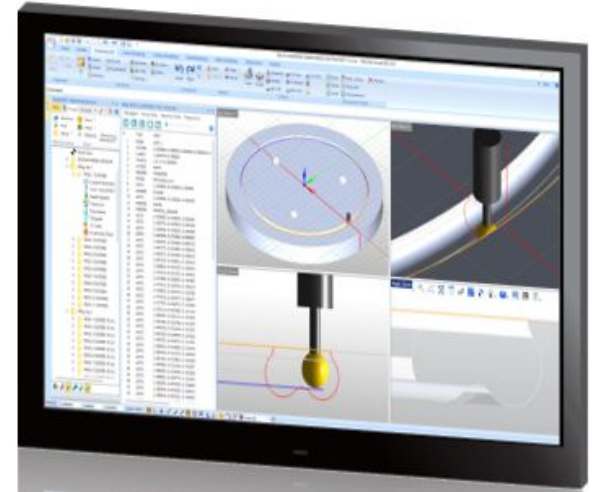
Cool project Casey!
Thank you for allowing us to showcase your work!

More about Lane Manufacturing

Lane Manufacturing strives to provide the best quality product and unmatched customer service. With over 50 years in the industry they have an unmatched sample inventory and reference library of irrigation gaskets. With in-house design and mold fabrication they have turned around production products in days instead of the weeks or months it can take others.

You can reach out to Lane Manufacturing via the channels below:

800.410.5263

sales@lanemfg.net

https://www.lanemfg.net/contact-us.html

Want to see how VisualCAD/CAM can help you? Click Here to download a demo!

More about VisualCAD/CAM

VisualCAD/CAM is available in five different configurations (Express, Standard, Expert, Professional and Premium). The part shown here was programmed using the Standard configuration. Here are some additional details about each of the available configurations. For the complete features list, visit the VisualCAD/CAM Product Page.

- **VisualCAD/CAM MILL Express**: This is a general-purpose program tailored for hobbyists, makers and students. Ideal for getting started with CAM programming. Includes 2 & 3 axis machining methods. Includes ART & NEST modules as well!
- **VisualCAD/CAM MILL Standard**: This configuration includes everything that is in the Express configuration plus additional 2-1/2 Axis, 3 Axis & Drilling machining methods. Also now includes 2½ Axis Turning!

- **VisualCAD/CAM MILL Expert**: Suitable for 4 Axis rotary machining. Includes the Standard configuration, plus 4 Axis machining strategies, advanced cut material simulation and tool holder collision detection.
- **VisualCAD/CAM MILL Professional**: Ideal for complex 3D machining. Includes the Standard and Expert configuration, plus advanced 3 Axis machining strategies, 5 Axis indexed machining, machine tool simulation, graphical toolpath editing and a host of other features.
- **VisualCAD/CAM MILL Premium**: Tailored for complex 3D machining with both 3 Axis and full 5 Axis methods. Includes the Standard, Expert and Professional configurations, plus 5 Axis simultaneous machining strategies.

Try VisualCAD/CAM Today!

Powerful 2½ - 5 Axis machining capability on your desktop!

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