RAKO STUDIOS

SolidWorks CAM-Quest 2020

I bought HSMWorks, trying SolidCAM, VisualMill, BobCAD CAM, SolidWorks CAM by CAMWorks, and MasterCAM.

Over the last six months I have tried six CAM (computer-aided manufacturing) programs that all work inside SolidWorks CAM (computer-aided design). Some of the programs were demos, others were fully-functional. I ended up buying a subscription to HSMWorks for $500 a year, with $200 off the first year. The program I felt was most capable was SolidCAM, though I found it harder to use.

Since an individual cannot transfer a license, I am better off paying $500 a year for HSMWorks rather than giving $5000 to SolidCAM or one of the other perpetual license CAM programs. If I was a business that could pass a SolidCAM license on, and I worked all day on CAM, I might buy it.

The worst program for me was MasterCAM, which is the most popular and the standard CAM used by machine shops in the USA. SolidCAM has more market share in Japan and Europe, , and they are working hard to gain share in the USA. MasterCAM has higher pricing, and I found it very hard to use.

All six programs have pluses and minuses. I wish I could graft VisualMill's setup and part-zero method onto HSMWorks. I would like it to have SolidCAM's 2D fixture-avoidance as well. I loved the way BobCAD CAM did holes, knowing to do a center-drill, drill, chamfer, and tap for a tapped hole called out in the SolidWorks model. The simulator in the free SolidWorks CAM by CAMWorks is good.

HSMWorks, the good:

- Price. For an individual who cannot pass on the software license via a corporation, paying $500 a year is better than paying $5000 up front. If I put the $4500 I save that first year into the stock market at 8% gain, that money would last 17 years before it was gone while paying out $500 a year.
- The simulator. While the HSMWorks simulator does not color-code excess and gouges, it uses shades of gray. It also lets you hover the mouse over any point and will tell you the gouge or excess at the point.
- Ease of use. The user interface most all works in the SolidWorks side-panel where the tree is. This means you are not swooping your mouse around giant dialog boxes getting carpal tunnel syndrome. There are only 5 tabs in the CAM tree. The tool tab is first, the way most machinists I know think when starting an operation. The other four tabs are all logical. It retains the last tool used.
- It is operation-based, not feature-based like SolidWorks CAM by CAMWorks or BobCAD CAM.
- Community and support. While I got no real help from four different support people when I could not get the program installed right, AutoDesk did have a post-processor for my Mach4 milling machine, free to download.
- No VAR (value-added reseller). It is ironic that Autodesk does not use a VAR distribution channel, since it was their old AutoCAD that got me hating the whole VAR relationship.The worst thing it does is shield the company from user problems and documentation shortcomings.

HSMWorks, the bad:

- Initial part setup. They don't distinguish between a "Job" where you are making a part, and a "Setup" where you have flipped the part around to machine a different face. Everything is a Job so you have to re-create the same stock for every setup. When you add a part-zero orientation, it will change the location of the stock. Design intent is to do a separate file for every setup, and then save the stock as an STI file at the end of the first setup, convert it to a SLDPRT with an external program, then import that stock as the starting stock for a second setup. Madness, sheer madness. Try the VisualMill for SolidWorks setup to see the right way. One job, one machine, and one stock. Multiple setups, with the part-zero and the fixtures defined in each.
- Dialogs close on toolpath generation.
- Stock condition. If you do a stock simulation on an operation halfway down the tree, it does not start with the stock in the proper state. You have to select all the operations before the one you are working on, then skip forward to see the simulation you want to see.
- No 2D fixture avoidance. The 2D toolpaths will not avoid clamps or fixtures. You can do it in a 3D toolpath, but it is kludge, where you set a stock allowance to keep the tool away from the clamp. There would be no way to do a pocket with clamps overhanging. They try to fool the ModuleWorks 3D toolpath module they buy to do 3D toolpaths, and it shows that this is a kludge. To their credit, HSMWorks does detect fixture collisions on a 2D toolpath, but my tool never turned red on a collision.

SolidCAM, the good:

- Great simulator. Color-coded compare function shows excess in shades of blue and gouges in shades of red. They even model the taper in the taps so you can be sure you are not going to bottom-out and break one.
- Dialogs stay open on toolpath generation.
- Fixture avoidance. They don't avoid in 2D facing, but they do avoid fixtures in 2D pockets. Brilliant implementation, they even honor SolidWorks configurations in each "Geometry" tab, so the simulator shows clamps moving or disappearing as you would in real life. It will do rest (remaining stock) machining of the material under the clamps in a subsequent operation.
- Point-to-point geometry. You can click on a point and then another point and SolidCAM will connect with geometry. This was useful in my chamfering show and in the T-slot and undercut show.
- Multi-level 2D. For 2D contours, you can set up multi-level toolpaths so one operation can do multiple levels. This was useful in my chamfering show and in the T-slot and undercut show.
- External mode. You can do the CAM files in a .PRZ zip file so your original SolidWorks file is not burdened with toolpaths. If you change the original file SolidCAM detects this and notes the changes in that might affect toolpaths. You can do the similar by creating a single-part assembly file for CAM, independent of any other assemblies the part is in.
- Free trial. Once you take a 1-hour demo, they give you a 60-day trial that is fully functional, it posts, and everything else.

SolidCAM, the bad:

- Part setup. They make you define the part-zero coordinate system first. Then you make the stock. Then when you move the part-zero to the edge of the stock, it moves the stock too. Just open and check the stock again to fix, but exasperating. Creating the coordinate system seems like a rocket launch. Dozens of parameters come up, and these generated warnings in the toolpath despite being essentially true. Please use VisualMill for SolidWorks to see the right way. Define the machine, define the stock, then define a setup with any fixtures and give it a part-zero.
- Ease of use. They assume you are a CAM programmer at a machine shop that uses the program all day everyday. They have unlabeled icons at the bottom of dialog boxes. You can hover to see what they do, but it is a major announce for an intermittent user.
- Dialog constancy. The 2D contour sets a chamfer operation with a drop-down menu on the left of a giant dialog box. The 3D profile sets a chamfer with a check-box on the right side of a giant dialog box. The designers have fallen for the fallacy that spreading things out makes them simpler, when it just makes your wrist sore navigating the dialogs.
- Tool default. SolidCAM does not remember the last tool used and use that for a new operation. While that might be wrong, it is quite often that you are doing multiple operations with the same tool. VisualMill and HSMWorks all pick up the last tool used and it is just seems much more streamlined to use. It's only two clicks to select the last tool, but if you have a lot of tools, that is a bigger pain.

VisualMill, the good:

- Honest pricing. The pricing is on the web, with a big chart that shows what each package does.
- Good pricing. In order to get the "compare" function in the simulator, you need the 2500-dollar "Expert" package, but that will do a lot of 3D at half the price of other programs. If you don;t need color-coded display of excess and gouged stock, then there is a base program for well under 1000 dollars that even does some 3D.
- Best user interface. This would be a good program to start with since it is so intuitive. They do part-zero after the stock, not before it like SolidCAM. All the operations are available as an icon in the tree tab header. A real pleasure to use.
- Great simulator. Color-coded compare function shows excess in shades of blue and gouges in shades of red. They did have some rounding errors that showed minor deviation, but still a good simulator. I did have to use "Advanced Parameters" tab to get the toolpath do do the most accurate arcs. It was the great simulator that tipped me off to this.
- Fixture avoidance. They avoid fixtures in a 2D facing operation, which is nice. SolidCAM only does it in pockets. It's a new feature so no support for SolidWorks configurations that I can see.
- Retains the last tool. It seems like simple or trivial thing, but for the test part I was doing, it was a real joy that VisualMill would keep the same tool from the last operation. Many many times you are doing a bunch of ops with the same tool and it is nice to not have to worry about re-selecting the tool.

VisualMill, the bad:

- Stability. When I had my zBook15 laptop BIOS set to have "hybrid graphics," it would make VisualMill dialog box values change, and create toolpaths that would drive the tool 3 feet into the table. Running Windows 7 also may have been a factor. Hybrid graphics means the laptop is using both an Intel HD 4600 graphics system and the nVidia Quadro K4400 graphics card. This is so the boot screen will appear on an external monitor when the laptop is docked. Once I disabled hybrid graphics in the laptop BIOS, and upgraded to Windows 10, most of the problems went away. I do have a complex setup with the zBook15 driving three 1920x1200 monitors with a 1920x1080 monitor as a fourth on the Thunderbolt port. Unfortunately, I would still get the "SolidWorks Resource Monitor" warning at the end of a part, and occasionally SolidWorks would crash. Since the demo program does not let you save, I do not know if re-starting the program would let me continue on, the way most memory leaks seem to work.
- Can't save in Demo. Not being able to save in the demo program was a big hassle. BobCAD lets you save, it just will not show those toolpaths in a paid-for BobCAD, you will only see them in another demo program. Better yet, SolidCAM just gives you a two-month trial with fully-functioning software.
- Dialogs close on toolpath generation. There are dozens if not hundreds of things to adjust and change and remember in each operation dialog set, so it is much better if the dialog stays open after it generates a toolpath.

BobCAD CAM, the good:

- Holes. Since it is feature-based, BobCAD was great when doing tapped holes. The automatic wizard does not work for my part, like all the other programs, but once you select the holes by hand, then it will do four operations, a center-drill, drill, chamfer, and tap. Unlike SolidWorks CAM by CAMWorks, it does not split the features and operations into two different trees so you know what operations belong to what feature.

BobCAD CAM, the bad:

- Simulator. It uses the ModuleWorks simulator. It opens in a different window, and the zoom and rotate mouse buttons are different than SolidWorks. It does not color-code gouges and excess, instead requiring to run a report, and then sprinkling little text boxes over the part with numeric values. You do the gouges and excess separately.
- Feature-based. I did not like that I don't decide on the operation, instead you select geometry and BobCAD figures out if it is a pocket or contour or whatever.
- Pricing. At first it was under $5k for 3D. Then it became around $2k for "full 3D". When I asked for a quote for "Premium 3D," as well as the upgraded simulator and G-code editor, the cost was something like like $12k spread over multiple years, like a contracted future maintenance.
- Fixture avoidance. It is kluged into 3D toolpaths, but it just doesn't work right.
- No help system. There is no built-in help system, or hover help. You do get training with the maintenance.

SolidWorks CAM, the good:

- Price. 2D CAM is free with SolidWorks after 2018. The problem is it only works while you pay your SolidWorks maintenance. You can get a perpetual license and adaptive toolpaths for around $2400 bucks, maybe even $1000 on a deal. Full 3D is well over $5000. The free version does have a couple 3D toolpaths like constant-Z and parallel.
- Ease of use. It is fairly intuitive to learn on and a good place to start, though VisualMill is even better.
- Simulation. It has the color-coded gouge and excess "compare" function in the simulator.

SolidWorks CAM, the bad:

- Feature-based. The program tries to automatically recognize features on you part and then automatically generate operations to machine the features. I did three parts and the program never did the recognition right once. Worse yet, if you change the part in any way, SolidWorks CAM by CAMWorks wants to re-recognize the part and adds in the same bad operations you just took out. They have a tech database you can program to train it to make fewer mistakes, l but I don't want a computer science degree to be a database administrator. I actually prefer to think of, and apply the operations one-by-one in the order I want.
- Ease of use. To deal with the feature recognition, they have two trees, a feature tree and an operation tree. Then to deal with the order that the operations are done, they have a tool tree tab as well.
- Can't create stock by over-all size.

MasterCAM, the good:

- Popular. MasterCAM is the most used CAM in the USA for the average machine shop. It would look great on your resume if you are a CAM programmer and that is all you do.
- Probably very capable, but so hard to use and a bad simulator so I stopped looking.

MasterCAM, the bad:

- Simulator. It uses the ModuleWorks simulator. It opens in a different window. It does not color-code gouges and excess, instead requiring to run a report, and then sprinkling little text boxes over the part with numeric values. You do the gouges and excess separately.
- Ease of use. The most difficult to learn and use of all six programs. I had to watch videos to even get started. They want you to define a bunch of planes before you can do anything, and older tutorials show the planes tab in the wrong place.
- Price. It is the most expensive, and they charge for every little additional module. It is easy to get to over $10,000 with full 3D and feature recognition, which probably doesn't work any better than these other programs feature recognition.
- Maintenance. If you lapse your yearly maintenance, MasterCAM requires that you pay all the back maintenance to become current.
- VAR (value-added reseller). You don't deal directly with MasterCAM, they sell and service thought value-added resellers. That is a bit of an anachronism in this day and age, with the internet and user forums and YouTube to help you.

Conclusion:

For an individual user that does prototype work, I feel HSMWorks is the best trade-off with price, ease-of-use, and capability. I do want full 3D. My machinist buddy Dave Ruigh told me: "Getting nice looking 3D is an art. You need lotsa brushes. Flowline, waterline, parallel, Z level, and one of my favorites, projected surface, where you create a 2d profile on a plane and project it on the part surfaces. I'm not sure I'd be happy with just two multi-surface toolpaths, even if they claim they can do everything. Of course it was 20 years ago, but I had Pro/Mfg and Mastercam, and the Palm Pilot cases took a combination of many toolpaths and manual editing to make them halfway nice. Those were production parts, so it didn't matter how long it took to program, once I had good code, I was set. Dealing with that level of hassle for prototypes and one-offs can be maddening."

Both MasterCAM and SolidCAM get a little pricey for full 3D. Since most all the CAM programs use the ModuleWorks 3D module, there is not a lot of difference. I hate the simulator in MasterCAM and BobCAD. HSMWorks is a little goofy to set up, but I love how everything is done in the tree side-panel, instead of giant dialogs that just make your wrist hurt as you navigate. I wish VisualMill was more stable, I am sure it works fine in most desktops with any sane video setup, unlike my 4-monitor laptop. That $2500 Expert VisualMill for SolidWorks package would be tempting.

Now that I bought HSMWorks, my biggest fear is that AutoDesk will drop it, since they are mortal enemies of SolidWorks. Still, being able to do CAM inside SolidWorks gives AutoDesk considerable bragging rights. Let's hope they want to keep bragging for a decade or two.