

VisualCAMc for Onshape at DeLaRue Authentication Solutions

Authentication Solutions, located in Logan, Utah, is a wholly owned subsidiary of DeLaRue, a UK based global company that provides governments and commercial organizations with products and services that underpin the integrity of trade, personal identity and the movement of goods. The facility in Logan, Utah manufactures anti-counterfeiting and authentication appliques to exact customer specifications.

What's an Authentication Solution?

An Authentication Solution is a physical pressure sensitive label that is applied to a company's product or packaging during manufacturing that alerts the consumer that the product they are looking at is authentic. The label applique can consist of holographic imaging, as well as serialization and bar coding that allows the customer to perform a track and trace of their product.

These holographic labels are not embossed! They are the result of extensive development of the DeLaRue proprietary laser imaging processes, all performed within a 0.001" inch thickness of photopolymer! The product packaging would include instructions on how the label should appear to the human eye. The DeLaRue image shown here is a simplified example of an authentication label.



John Humpherys is the Engineering Manager and has been with DeLaRue Authentication Solutions for 18 years. Because Authentication is a relatively niche market, there are no OEM manufactured systems that can produce these holographic authentication labels. The entire manufacturing apparatus is a unique and guarded proprietary process that is tailored to each customer's authentication solution needs. We recently sat down with John to discuss his use of [VisualCAMc for Onshape](#) as his Computer-Aided Manufacturing (CAM) solution of choice for DeLaRue's machine design and manufacturing.

The CAD/CAM Platforms

John, like all experienced engineers and designers today has been using desktop CAD design software tools since they were first introduced. His Computer Aided Design (CAD) system of choice for years has been SOLIDWORKS. His Computer-Aided Manufacturing (CAM) system of choice has always been [VisualCAM for SOLIDWORKS](#). I say *has been* because John has also been using the [Onshape cloud-based CAD system](#) since its launch in 2012 and has also been using [VisualCAMc, the full cloud production CAM solution for Onshape](#) during its beta release and then production release in 2018.

The CNC Machining Centers

John relies on four different CNC machines on a day-day basis. The MecSoft technical support staff worked with John to fine-tune VisualCAM post-processors for each of his machining centers using VisualCAM's built-in Post-Processor Generator. The machining hardware in service at DeLaRue Authentication Solutions is listed and shown below.

[The Roland MDX540 milling machine for plastics](#)

[The CNCMasters Supra knee type milling machine for aluminum](#)

[The XCarve CNC router for wood and plastics](#)

A custom built CNC router for woods and plastics





The CNC Masters
Supra knee mill



The XCarve CNC router

Why Cloud-based CAD/CAM?

We asked John what drew him to [Onshape's cloud-based CAD solution](#). Here is John's short list of reasons:

- **The future is in the Cloud:** *The software industry in general is going cloud based and we feel that Onshape is on the cutting edge of that migration for the CAD industry.*

- **The Onshape Development Team:** *We were comfortable in knowing that the same team that developed SOLIDWORKS is now developing the Onshape platform.*
- **Updates & Compatibility:** *We don't have to pay an IT group to come in and update our software. Onshape updates occur automatically every three weeks! We can also access our Onshape designs from any computer, anywhere in the world without worrying about hardware compatibility.*
- **Collaboration:** *We can collaborate and share design information with colleagues and contractors who do not need a paid Onshape account to view them!*

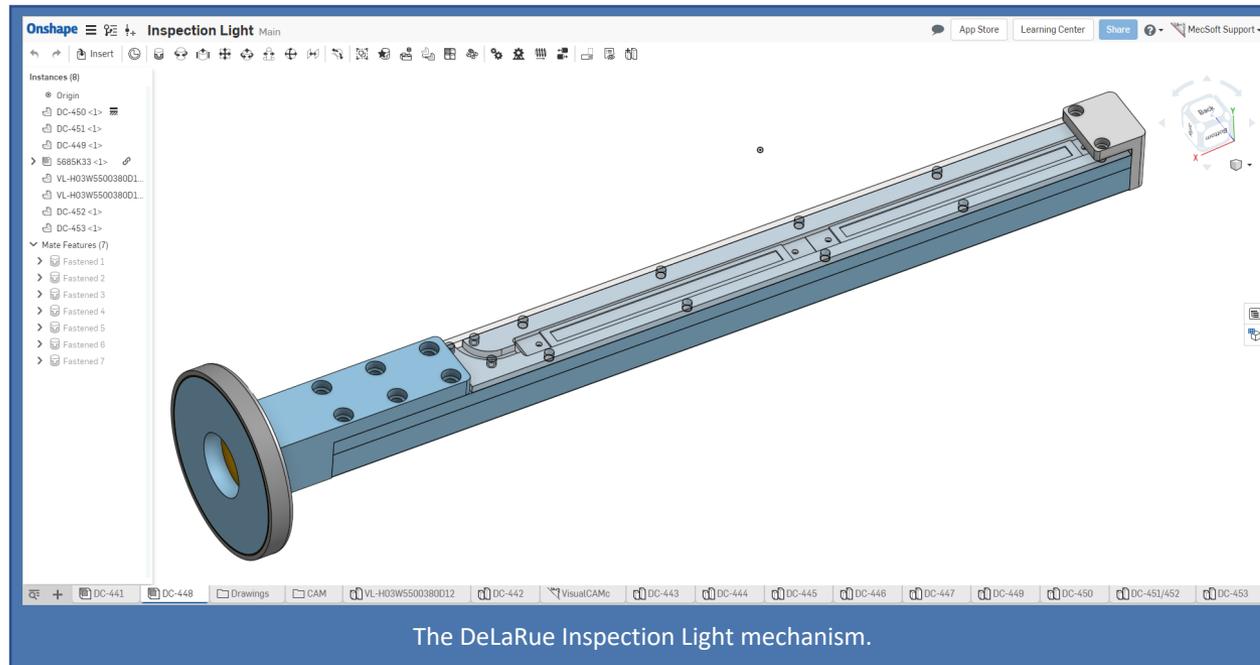
Why VisualCAMc?

An early concern John had when migrating to Onshape was his ability to generate the g-code he needs to run his multiple CNC machines (listed above). CAM was the very first Onshape add-on application that John started looking for. John also expressed these added benefits of using VisualCAMc for Onshape:

- **Onshape Compatibility:** *VisualCAMc is a fully integrated Onshape-partner plugin. Other CAM solutions require you to download and translate part models on your desktop computer breaking the link with the Onshape part. With VisualCAMc, our toolpaths are updated automatically when the Onshape part model changes.*
- **Accessibility:** *I can use the same Onshape account with VisualCAMc at work and at home. I have custom built a CNC machine at home that I use as a hobby. I can generate g-code for all of my CNC machines at any time and from anywhere.*
- **Minimum Learning Curve:** *I have been using the desktop version of VisualCAM inside of SOLIDWORKS for years. This made the transition to VisualCAMc much easier because many of the same features are available in VisualCAMc for Onshape.*

Example Project

John has agreed to share a small sample of how he uses VisualCAMc for Onshape. The Inspection Light mechanism shown below is a typical machine design sub-assembly that incorporates multiple components that require CAM g-code to machine. The DeLaRue production system incorporates multiple stages, each stage being a production process that can incorporate as many as 100 or more machined components. The Inspection Light mechanism is shown in Onshape in the image below.



The part and assemblies are displayed and worked on in the part studio tab of the Onshape document. Toolpaths are generated and displayed in a separate but associated VisualCAMc tab within the same Onshape document. When design changes are made in the part studio, the associated VisualCAMc toolpaths are updated automatically!

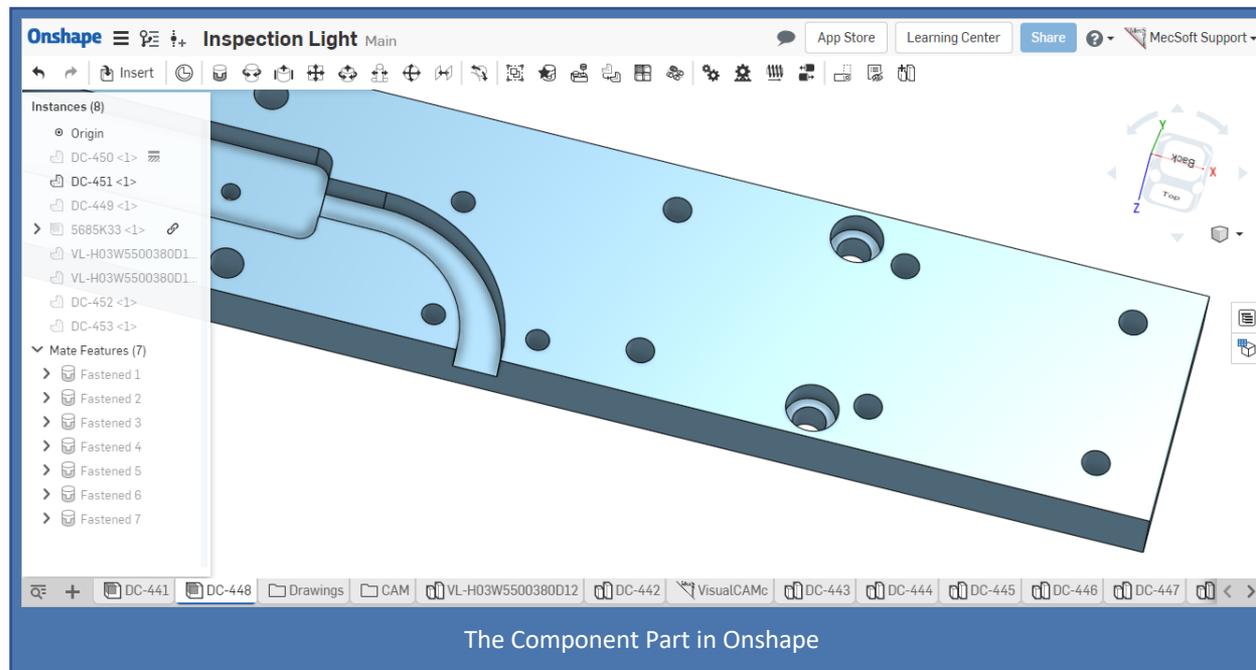
Here is more of what John had to say about the benefits to DeLaRue of using VisualCAM and VisualCAMc for Onshape for machine design:

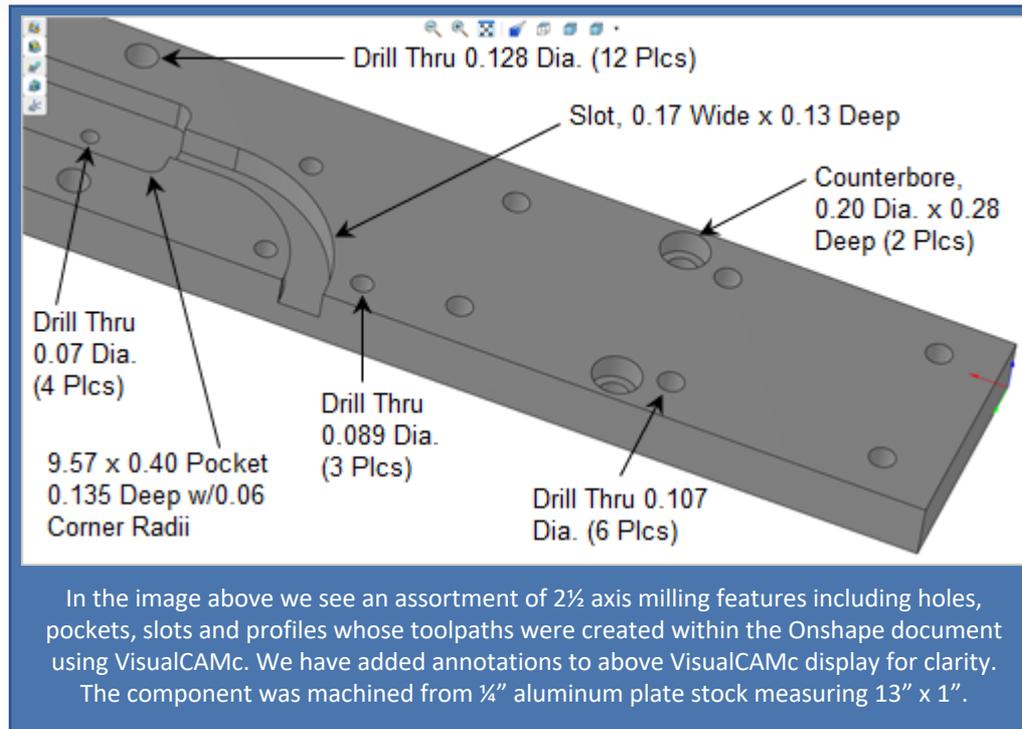
“VisualCAM and VisualCAMc have been real time-savers for us! Many of our initial parts now happily end up in the recycle bin. That’s because we can design, machine, evaluate, redesign and machine again all within the same day! We now machine all of our development and prototype components in-house where design issues can be resolved quickly and economically before going to mass production.”

*John Humpherys, Engineering Mgr,
DeLaRue Authentication Solutions, Logan, Utah*

Example VisualCAMc Toolpaths

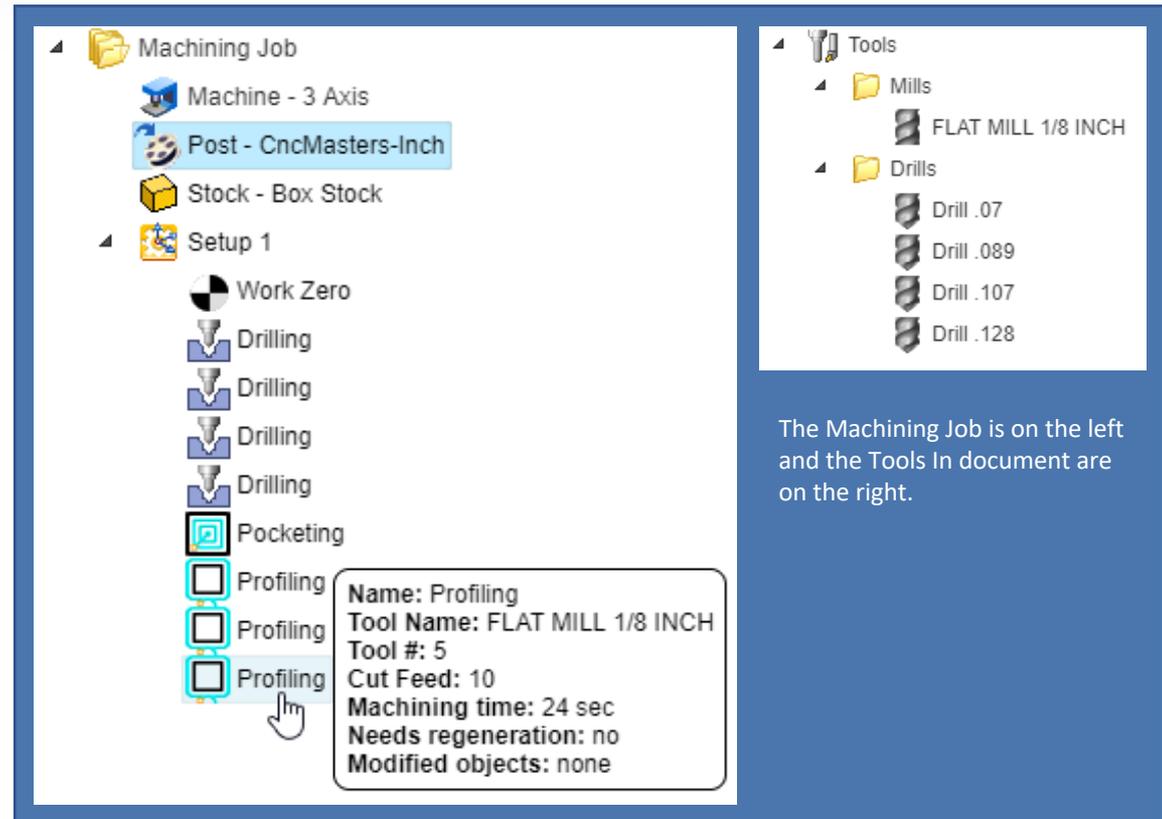
One of the components in the Inspection Light Sub-Assembly is shown below. It contains many prismatic features that were machined using 2½ axis toolpath strategies on DeLaRue's [CNCMasters Supra knee mill](#) machining center. These include drilled holes of various sizes and depths, blind pockets, open slots, etc. These features are shown in the part studio tab and in the corresponding VisualCAMc tab both within the Onshape document. The stock is ¼" aluminum plate measuring 13" by 1".





On the right we see the contents of the VisualCAMc Machining Job tab. It defines the Machine Tool orientation in relation to the Onshape world coordinate system (WCS). This is followed by the Post and Stock definitions. The Setup defines the orientation of the machine tool coordinate system (MCS) for the machining operations contained within it. The Work Zero defines the machine zero location point from which all toolpath coordinates are measured from. This is then followed by the various Drilling, Pocketing and Profiling toolpath operations.

Moving the cursor over an operation in the Machining Job displays information about that operation such as its name, cutting tool, cut feed rate, estimated machining time, etc. On the right we see the Tools tab containing an assortment of Drill and Mill tools located within the document. Tools can also be saved and reused from a tool library.

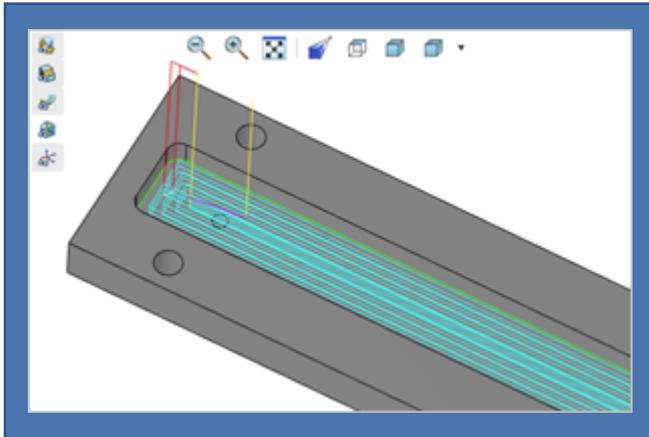
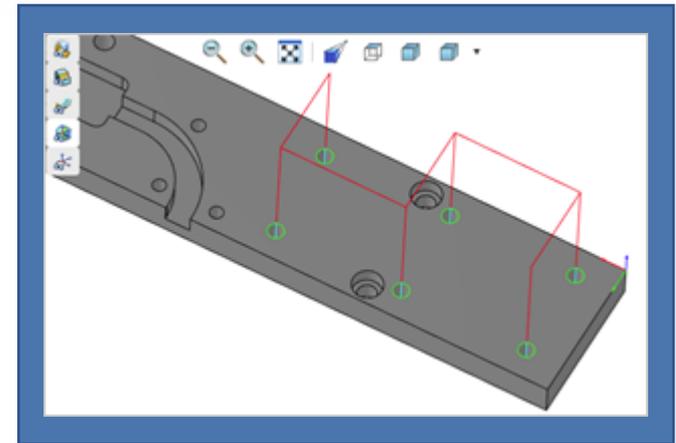


The screenshot shows two panels from the VisualCAMc software. The left panel, titled 'Machining Job', contains a tree view with the following items: 'Machine - 3 Axis', 'Post - CncMasters-Inch', 'Stock - Box Stock', and 'Setup 1'. Under 'Setup 1', there is a 'Work Zero' icon, followed by four 'Drilling' icons, three 'Profiling' icons, and one 'Pocketing' icon. A tooltip is displayed over the bottom-most 'Profiling' icon, showing the following details: Name: Profiling, Tool Name: FLAT MILL 1/8 INCH, Tool #: 5, Cut Feed: 10, Machining time: 24 sec, Needs regeneration: no, Modified objects: none. The right panel, titled 'Tools', contains a tree view with 'Mills' (including 'FLAT MILL 1/8 INCH') and 'Drills' (including 'Drill .07', 'Drill .089', 'Drill .107', and 'Drill .128').

The Machining Job is on the left and the Tools In document are on the right.

Drilling

The component requires thru holes of four different diameters (0.07, 0.089, 0.107 and 0.128). Each are defined as Deep Drill operations with a specified step increment. This means that the drill will cut to each increment depth, retract, and re-engage until the full depth is obtained, similar to peck drilling. A minimum distance sorting rule is also applied to minimize machining time. The 0.107 dia. Holes are shown.

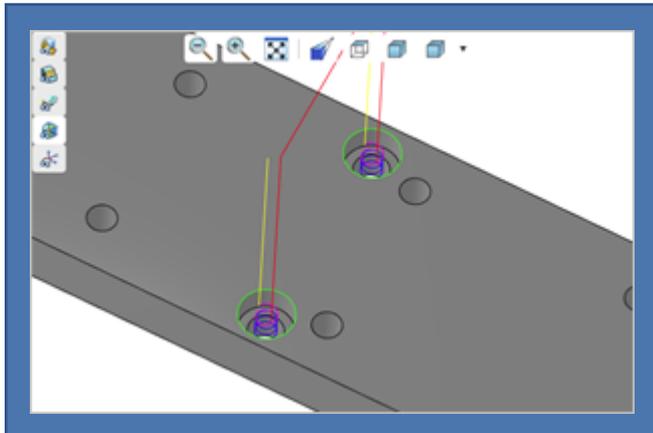
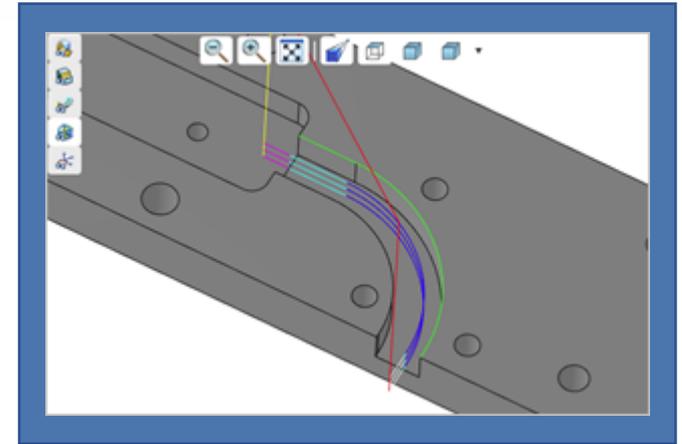


Pocketing

A 9.57 x 0.4 pocket runs nearly the full length of the component at a depth of 0.135. The pocket is cut in three levels using a 1/8" flat end mill and a 35% stepover. A 10 degree ramp entry motion is used along with a 45 degree linear exit retract motion. The side walls are cut with zero stock remaining leaving 0.063 radii in the four corners.

Slot Profiling

To cut the 0.7 wide by 0.13 deep open slot, two Profiling operations are used that follow each side of the slot. Notice that the engage and retract motions (shown in magenta and white) are linear and set to zero degrees. This extends the toolpath out past the open slot at each end and for each of the three cut levels. The cyan paths are linear motions while the dark blue paths are arc motions. The entry motion is yellow while the approach and transfer motions are red.



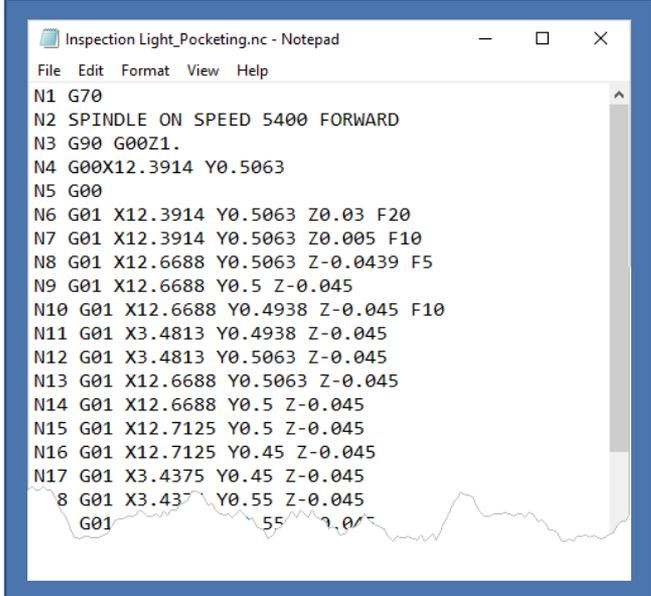
Hole Profiling

To cut the counterbore holes, a Profiling operation is used, again with the same $\frac{1}{8}$ " end mill. A 10 degree ramp entry creates a helical motion (shown in magenta) to the first of three cut levels. Depth First cut levels ordering ensures that one complete counterbore is cut before moving on to the next.

G-Code Sample

Shown here is sample g-code generated for the 2½ axis pocketing toolpath strategy shown above. The g-code was generated within the Onshape document for the [CNCMasters Supra knee mill](#) using the VisualCAMc CNCMasters-Inch post processor.

This is one of over 300 post processors included free of charge within VisualCAMc. They are the same posts that have undergone years of user-tested reliability in MecSoft's desktop VisualCAM application. [Here is the complete list of the available post processors.](#)



```
Inspection Light_Pocketing.nc - Notepad
File Edit Format View Help
N1 G70
N2 SPINDLE ON SPEED 5400 FORWARD
N3 G90 G00Z1.
N4 G00X12.3914 Y0.5063
N5 G00
N6 G01 X12.3914 Y0.5063 Z0.03 F20
N7 G01 X12.3914 Y0.5063 Z0.005 F10
N8 G01 X12.6688 Y0.5063 Z-0.0439 F5
N9 G01 X12.6688 Y0.5 Z-0.045
N10 G01 X12.6688 Y0.4938 Z-0.045 F10
N11 G01 X3.4813 Y0.4938 Z-0.045
N12 G01 X3.4813 Y0.5063 Z-0.045
N13 G01 X12.6688 Y0.5063 Z-0.045
N14 G01 X12.6688 Y0.5 Z-0.045
N15 G01 X12.7125 Y0.5 Z-0.045
N16 G01 X12.7125 Y0.45 Z-0.045
N17 G01 X3.4375 Y0.45 Z-0.045
N18 G01 X3.4375 Y0.55 Z-0.045
N19 G01 X3.4375 Y0.55 Z-0.045
```

Moving Forward

John estimates that they have approximately 10,000 components that have been designed and machined using VisualCAM for SOLIDWORKS. Today, about 25% of their new CAD design and CAM programming is performed in Onshape and VisualCAMc. John expects that will increase to nearly 100% in 2019 as they migrate over to Onshape.

For More Information

We would like to extend a special thanks to John Humpherys and DeLaRue Authentication Solutions for allowing us to showcase their work! To learn more about [DeLaRue Authentication Solutions](#), we invite you to visit them [online](#), at [Twitter](#) or on [LinkedIn](#). To learn more about Onshape we invite you to visit them at www.onshape.com or read more in the [Onshape CAD blog](#). For more information about VisualCAMc we invite you to visit the [VisualCAMc product page](#) and learn more in the [MecSoft Tech Blog](#).

Try VisualCAMc Today!