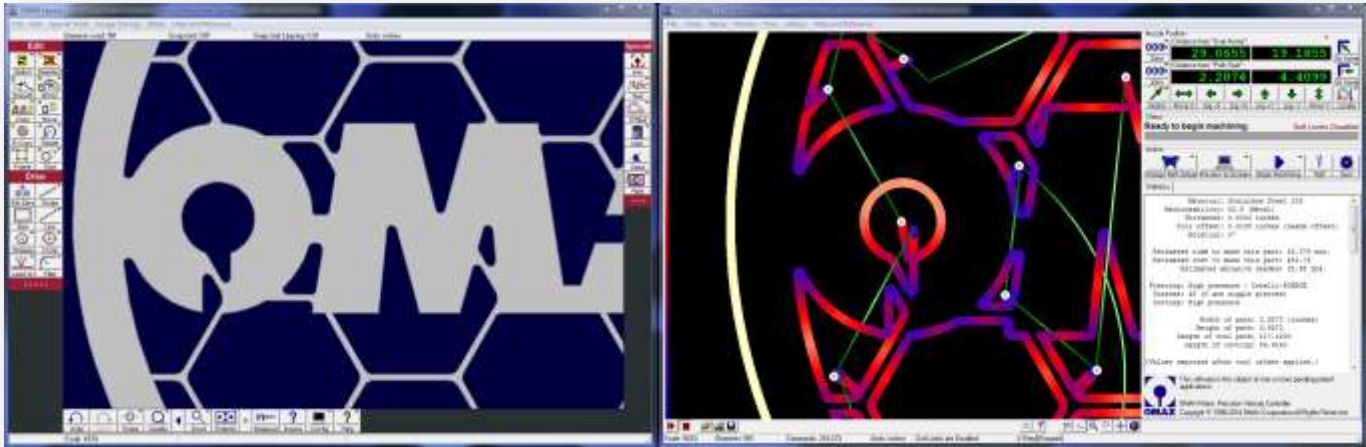


Introducing the OMAX Generation 4 cutting model

8/11/2014

It is strongly recommend that OMAX machine owners and operators read this document in its entirety in order to fully understand and best take advantage of this new cutting model.



Executive Summary:

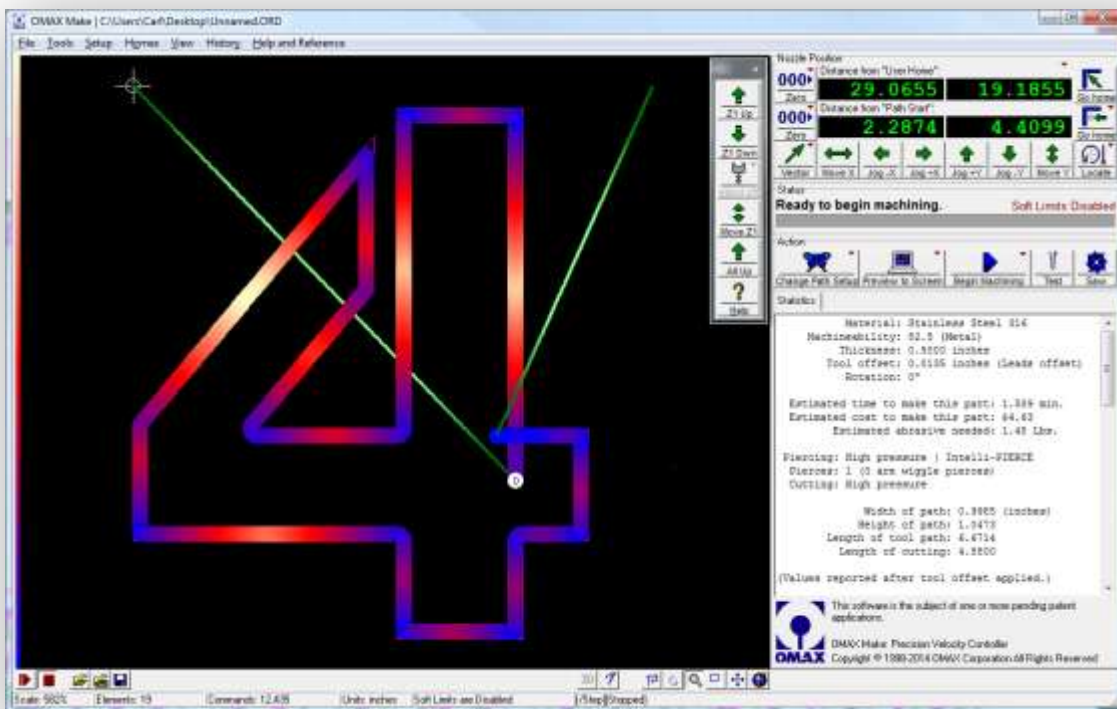
There is a new cutting model available in version 21 of the OMAX Intelli-MAX® Premium software. This 4th generation cutting model is significantly more capable than previous generations of cutting models.

Some key points:

- **Performance and features:** This model offers significantly better performance, features, and predictions compared with the previous generation of OMAX abrasivejet cutting models (that still dominate the industry, despite their age!)
- **For most parts, it will cut the same or similar to previous cutting models.** However, because this new model is more precise in its predictions, and broader in its coverage, some parts will cut differently than before. (Details are discussed below.)
- **It is up to you to make the switch:** If you are upgrading your software, whatever model you presently are using will remain the model in use, unless you purposely change over to the new model. (Instructions on how to do this below.) If installing the software on a new “virgin” computer that has never had the OMAX software on it before, then the Generation 4 cutting model will be enabled by default.
- **The old cutting models are still available.** They remain untouched, other than a few bug fixes.

Below is a summary of the 4 generations of OMAX cutting models:

- **Generation 1:** This was a first approach to modeling cutting speeds from jet parameters. This model was used on early DOS-based OMAX machines. It is now discontinued, though still making great parts on a few remaining old DOS based machines that have not been upgraded.
- **Generation 2:** This cutting model is based on a refined Generation 1 cutting model that includes a wider variety of materials and nozzle configurations. It provides very fast tool path calculations, but is limited in its prediction capabilities.
- **Generation 3:** This cutting model uses a statistical approach to support an even wider range of materials, pump, and nozzle configurations as well as additional predictive capabilities, in particular a deep understanding of taper and jetlag.
- **Generation 4:** The new model, available to OMAX customers only, is as described below...



What's new with Generation 4?

The Generation 4 cutting model offers a much wider range of predictions with much greater precision than previous generation cutting models. This results in improved cutting performance across the board, with particular benefits to those with unusual or extra-large pumping setups that previously were outside of the precision range of prediction.

This model, in a sense, combines the smooth predictive ability of equation based models (the best part of the G1 and G2 models) with the massive data set of the Generation 3 cutting model, for the best of both worlds. It very precisely predicts cutting speeds, taper, jet lag, and many other abrasivejet behaviors across a huge variety of materials, pump, nozzle, and machine configurations.

Who will see the most advantage of this model?

We expect that all OMAX customers will find this model superior in most every respect over the older generations. Customers with ultra-high horsepower pumps will see the most advantage, since the cutting model has been extended to support them with significantly more data points than before.

Will it cut faster, slower, different?

This cutting model is much more precise in its predictions than previous generations over a much wider range of conditions. As such, it may cut faster or slower in some instances. But it will cut more precisely to the "Quality" specified in the tool path. Our intention with this model was to extend the range of accuracy far beyond previous models, not necessarily to increase cutting speeds. That said, one should expect some parts to cut faster, sometimes significantly, much like a racecar driver can drive faster when able to more precisely gauge the traction of the road and the response of the vehicle. Likewise, some parts may cut slower than before, but the final part will come out closer to the specified "Quality" than before. The racecar driver is now able to stay on the road instead of skidding off, so to speak.

The end result here is that the cutting model will more precisely re-create the part as specified by the cutting qualities and other constraints in the tool path. In some cases, where in the past the surface finish would come out too rough because the machine was moving too quickly, the new model will slow the cutting down. In other cases, where previous cutting models may have slowed the machine down too much for the specified surface quality, the new model will go faster. In either case, with the new model, the final part will be closer to that specified in the program.

Changes in predicted cutting speed can also change the dynamic demands on the machine. When you are cutting thin material at high speeds an increase of cutting speed may result in dynamic artifacts (marks) on the part that are not present at slower speeds. To avoid such artifacts you can reduce the speed by specifying a higher quality or limiting the maximum cutting speed in the Advanced / Administrator Setup dialog in Make.

Is there a difference in the way things pierce?

In general, the Generation 4 cutting model pierces in a manner very similar to that of the Generation 2 and 3 models though the actual pierce speeds, delays, and lengths may be slightly different, in the same way that cutting speeds are now more precisely calculated. On top of that we are newly introducing the "Pierceability Factor" for Intelli-PIERCE dynamic piercing. As you have known (and appreciated) this in previous version for stationary piercing you can now fine tune the dynamic pierce speed for materials that show differing cutting and piercing behavior.

Can I use the old cutting models so that the parts I have always cut in the past continue to cut in the same manner?

Absolutely! If one wishes to have the “old” results for whatever reason, it is certainly reasonable to cut the part using the older cutting models. They are still available – switch your models quickly from the Advanced / Administrator Setup. Another solution is to use the new model, but adjust the cutting quality in the path to tweak in the speed of the older method. In the long run, this is perhaps the “best practice”. Either way is reasonable, though, and both options are available.

Is there a difference between the cutting models used for MAXIEM and OMAX?

The OMAX Software is considerably more capable than the MAXIEM software when it comes to cutting models and cutting strategies. For example, the MAXIEM “Standard” software only supports the Generation 3 cutting model, and does not support some critical features such as Intelli-PIERCE and corner passing, and some of the other enhancements that make the OMAX software both cut faster and to higher precision.

I notice that when I enable the G4 model, it predicts that it will cut way faster on thin materials. Is something wrong?

No. Prior generation cutting models not have been very precise in predicting speeds for thin materials (materials less than 3 mm or 0.1 inches thick), and predicted cutting speeds on the slow side in order to ensure a good part, just like a person might drive slower in the fog. The Generation 4 cutting model greatly expands thin material support, and lifts the fog so that such materials can be cut significantly faster.

How much experience does OMAX have with the Generation 4 cutting model?"

We believe release 21 of the software to be a very stable release. The Generation 4 cutting model has been in the software for in-house testing for several years now, just not officially released or exposed to customers until now. What is new to version 21 is that we have simply exposed what has been tucked away, and while we were at it we fixed a few general bugs that were found since version 20 was released.

In addition, OMAX has done over 2 years of extensive testing of the Generation 4 cutting model on multiple OMAX machines, backed up with thousands of automated tests.

What else should I be aware of?

The cutting model and cutting strategy engine is constantly looking for the best way to make the part in terms of both time and precision, given the constraints of the pump, nozzle, material, Quality, and other constraints. At times, there may be threshold conditions where a decision may need to be made by the cutting engine to choose one strategy or another. When at such thresholds, if the conditions are changed ever so slightly, it may push the engine to make one choice over another. This may be observed at times as slight variations in cutting time estimates, such as a slightly thicker material being cut faster than a slightly thinner material, due to a different strategy kicking in. One obvious spot where such conditions can occur is when a slight change in tool offset causes a corner pass to disappear. These same phenomena may be observed in many similar, but less obvious scenarios, and is to be expected.

Another example might be the strategies employed at corners to avoid wash out. To maintain the specified quality in corners and radii, three different tolerance modes are applied as necessary, depending on the situation. Switching between the modes at slightly different operating conditions may result in noticeable differences of cutting speed. Expanding the allowed tolerance field (e.g. by selecting a different quality or increasing the advanced “QualityErrorLimit” factor setting) or enabling corner passing typically provides for faster cutting speed in corners and radii.

Does this new model support all pump and nozzle combinations?

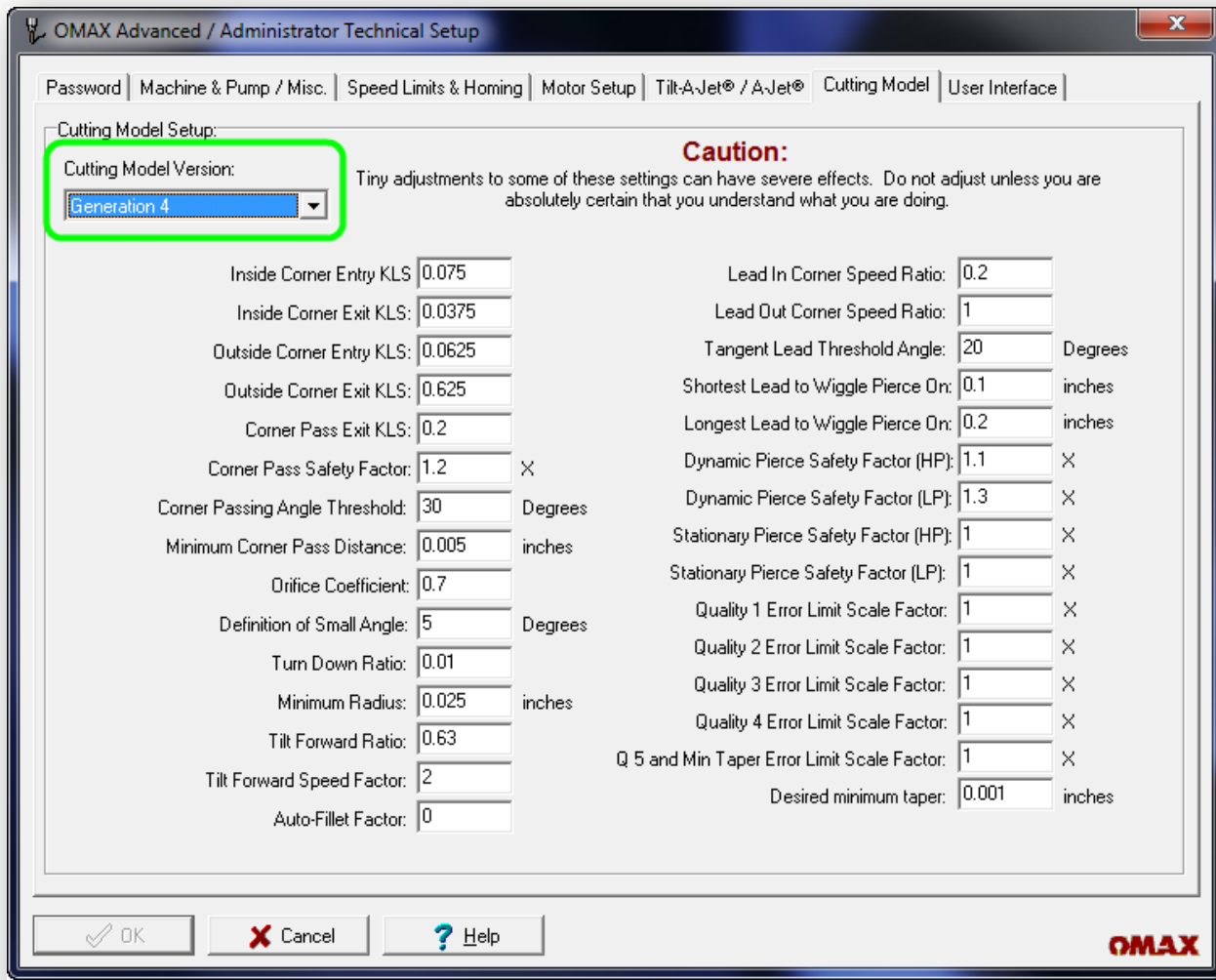
The Generation 4 cutting model supports all pump and nozzle combinations that OMAX sells in both OMAX and MAXIEM lines.

Are the old Generation 2 and Generation 3 cutting models left completely untouched?

For the most part, the Generation 2 and 3 cutting models have remained untouched, though some bugs have been identified and fixed. In most cases, you will not notice any significant change when using the older cutting models. An exception is that a bug was found in the calculation of Quality of Minimum Taper's speeds, where the speed could be off by as much as 50% in some rare cases. Since this bug has been fixed for both the Generation 3 and Generation 4 cutting models, you may notice a speed difference accordingly under some conditions when using Quality of Minimum Taper.

How do I change cutting models?

The cutting model to be used is specified in the “Cutting Model” tab in the “Advanced / Administrator” setup dialog in Make:



(To get there, from the pull down menu at the top of Make, click on “Setup”, and then “Advanced”, then “Advanced / Administrator Setup”.)

- **When upgrading your software**, whatever cutting model you had previously enabled, will be kept active. It is up to you to manually switch to the new method, should you want to use it.
- **For new software installations**, installed on computers that have never had the OMAX software on it before, the Generation 4 cutting model will be selected by default, since this is the recommended cutting model to use from this day forward. New OMAX machines will also ship with the Generation 4 cutting model enabled.

For additional help and information, or to download the latest software updates, visit:

<http://www.omax.com/support> or email techsupport@omax.com