

Project III: Making a Mold

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This Project will be to take the 3D scanned object, import it into a 3D modeling software, and use it to create a negative space in a block in order to create a mold.

What is mold making? What does it involve?

There are literally too many methods, techniques, and materials to mention in this report. Here are just a few examples.

http://www.youtube.com/watch?v=LSH19G_6Yeo

http://www.smooth-on.com/pdf/Smoothon_HTB_2008.pdf

<http://newsletters.hagerman.com/newsletters/ebul47-Tips.htm>

Making A Mold By Brushing Rubber Onto The Model

So far, we have described techniques for making molds using mold rubber that is mixed and poured. But, what if your model is 8' high by 8' long by 4' wide (2.4m x 2.4m x 1.2m) such as a horse figure or even larger. What if your model is multi-faceted with severe undercuts, such as an octopus. Demolding such a model would be very difficult, indeed.



The idea is to be able to use the 3D printers to actually print the mold out, and then try to create a replica of our objects using our choice of material (resin, concrete, etc.)

The Cavity Pour Technique

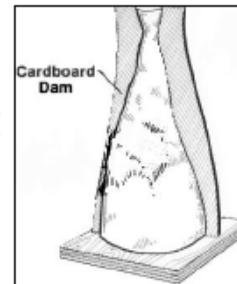
The split, one-piece shelled mold is another technique that minimizes the amount of rubber used. To illustrate, we select a three-dimensional figurine that has a relatively long vertical axis, is narrow at the top and larger in circumference at the base. The model is secured to the base with clay or a glue gun.

As was done with our one piece-mold (shelled) that was illustrated earlier, modeling clay is rolled into thin sections. A clay blanket is layered over the model, and a "pour plug" is formed at the top. (As you will see, once our support shell is formed and the clay blanket removed, the liquid rubber will be poured through this pour plug).



The next step is to identify or "map out" where the segments of the support shell will be applied. The number of shell segments depends on the complexity of the model (angles and undercuts). This model is relatively simple and therefore requires a two-piece support shell.

A vertical center line is lightly inscribed up one side and down the other. This line identifies the two halves of the shell. Cardboard templates, of width equal to the thickness of the support shell, are cut to conform to the contour of the center lines. The templates are gently affixed (pressed into the clay along the center lines).



1st Goal: Export 3D scan into a file type that can be imported into the particular 3D modeling software of choice - In this case, Inventor 2012.

1st Obstacle – 3D scanner software cannot export to file type that can be imported into Inventor

Possible solutions: Can .stl file be converted into any other file type that can be read by Inventor (.igs, .stp)?

Unfortunately, none of these websites, or several others, were able to successfully convert the file into any usable format for Inventor.

An attempt was also made to import the object file into Solidworks to see if it would be possible to convert it from there into a usable file. This did not work either.

[STL to IGES converter](#)

www.cadtutor.net/forum/showthread.php?42857-STL-to-IGES...

Jan 13, 2010 – Hi, I am currently working on exchanging models. There are some exchanges involved between machines and software. Most commonly, I ...

[Anyway to convert STL to IGES/STEP?](#)

www.rhino3dhelp.com › [Rhino 3D Help Forums](#) › [Help](#) › [Ask for help](#)

4 posts - 3 authors - Jun 16, 2009

Anyway to convert **STL to IGES/STEP?** ... I have been trying for some time to convert an STL file of a femur (thigh bone) to an IGES file.

[STL to IGES - Practical Machinist - Largest Manufacturing ...](#)

www.practicalmachinist.com › ... › [Manufacturing Today](#) › [CAD / CAM](#)

Jun 28, 2010 – I am searching for a software to convert **STL to IGES** format. I have some STL models. I need to use those models in SOLID EDGE for some ...

[How do I convert STL to IGES? | www.TransMagic.com](#)

www.transmagic.com/node/323

May 27, 2010 – TransMagic does not convert *.stl to geometric formats. The *.stl files are comprised of triangular polygons vs. true geometry such as ...

[3D Translate - Interoperability for 3D CAD : Iges, Step, STL, DXF](#)

www.3dtranslate.com/

3D Translate is a software which allows the translation of standard CAD file formats as well as the proprietary formats of leading CAD systems: **Iges**, **Step**, **STL**, ...



[SolidWorks Forum: .stl to .iges conversion](#)

www.mcadcentral.com/solidworks/forum/forum_posts.asp?TID...

3 posts - 3 authors - Sep 23, 2009

What is the procedure to convert .stl file to .iges. Satish Macharla ... Try to open in SW and then save in *.igs format. Rimma. Back to Top ...

[Catia Forum: Insert STL or IGES](#) - 1 post - Jan 31, 2008

[Pro/ENGINEER Forum: .stl to .iges or .stp help](#) - 4 posts - Feb 10, 2006

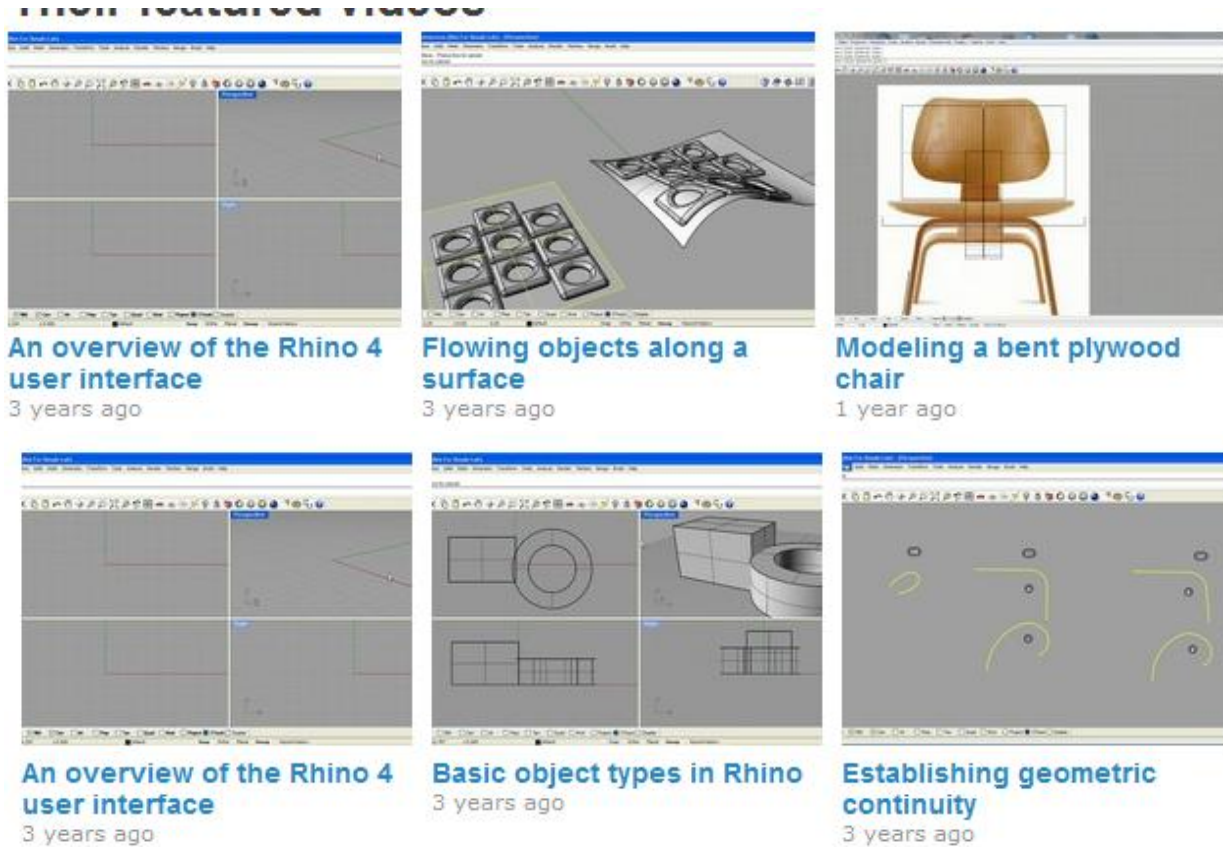
[More results from mcadcentral.com »](#)

Next Solution: Use Rhino to import the object file and create the mold.

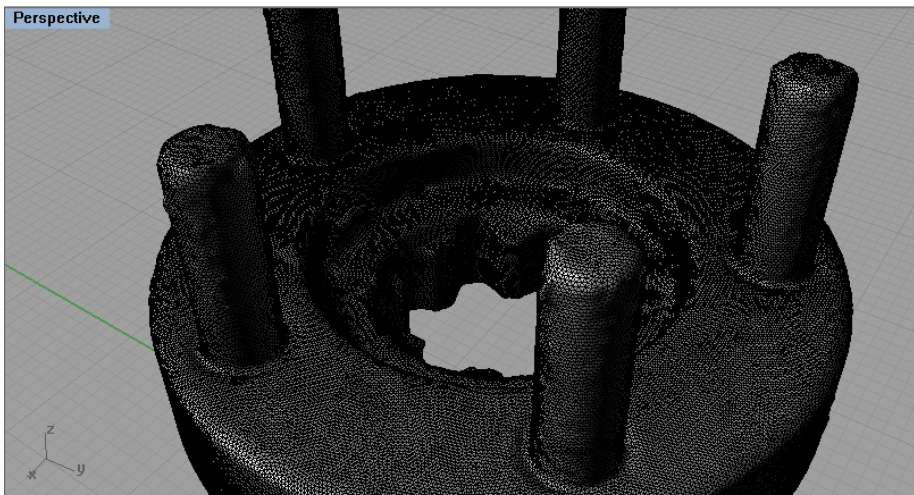
Next Obstacle: I don't know how to use Rhino!!

Next Obstacle: Can't get into the room with the Rhino software

Once able to get onto the computer with Rhino, I started off by Googling, and Youtubing several videos and tutorials on how to use Rhino. The interface is a bit tricky, but learnable. One of the best websites I found was <http://vimeo.com/rhino/videos>. By sorting their list by the oldest first, I was able to get a basic understanding of the software.



The first thing I did was to import the object file. It imports it as a mesh object, which is thousands of tiny triangles all connected together to form a solid. Very Cool!! Unfortunately, I do not have a lot of

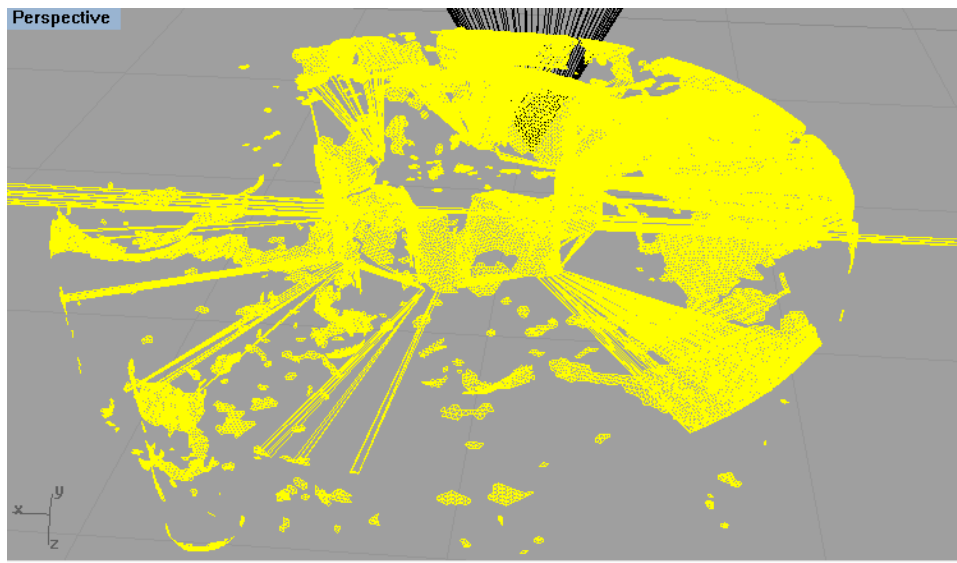


pictures of this, as I was needing to put all of my time and focus into learning a new software. The basic idea is that I should be able to draw a box around the object, split the box and the object into two pieces, do something called a "Boolean Difference", presto... a nice printable mold.

This is not what happened. I have spent several hours trying to Boolean the object, but the program does not seem to recognize my object as one solid piece. Every time I try to extract it from the block, either the block or the object just disappears. Yet another road block.

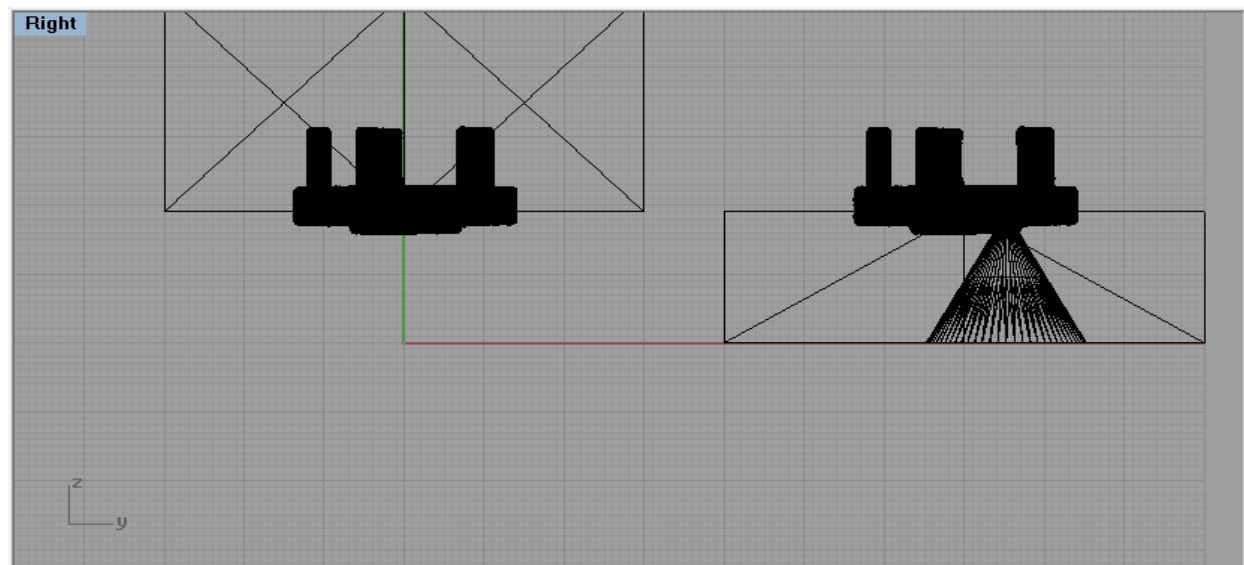
After speaking with Aaron, it appears there may have been a couple of reasons why I was having difficulty getting my object to Boolean. The biggest of which is that I was not converting the box that I had made from a NURB to a Mesh. Honestly, I did not know there was a such thing as NURB, or that it was any different from a mesh. At any rate, I should be able to get this finished up fairly quickly.

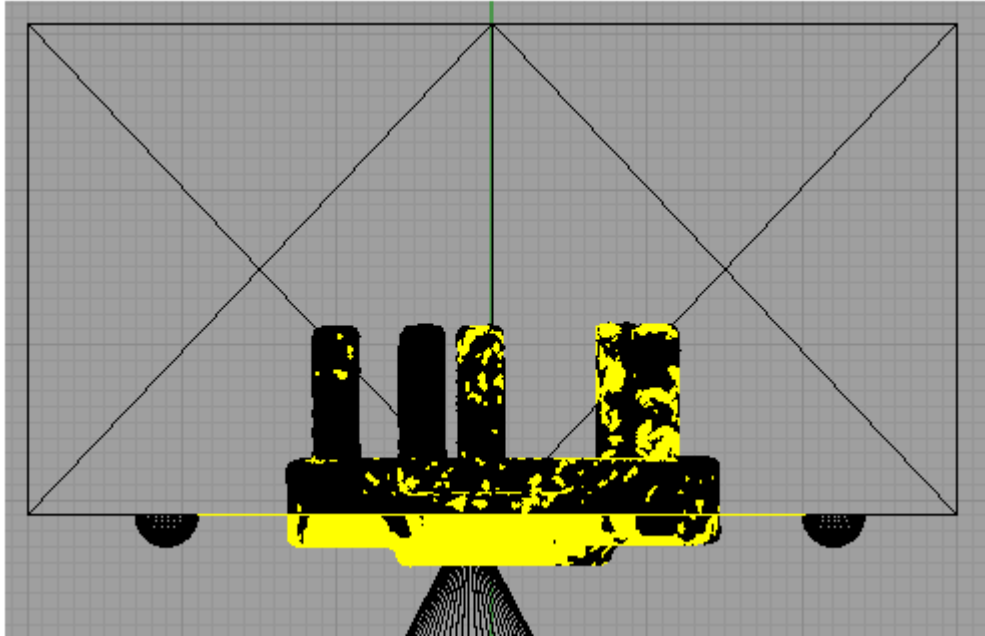
Guess again!!!!



This is basically the best result either myself, Micah, or Aaron could get when attempting the Boolean Difference. I will say though, that I think I was on the right track. Although, the box was a bit big, and would have used far too much material for what was needed. It was intentional. I

was wanting to leave plenty of room at first in order to be able to clearly tell the difference in objects.





After far too trial an

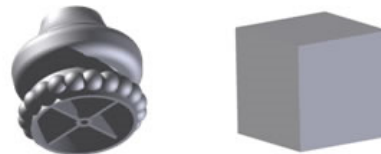
error, I am going to have to give up on the making of a mold from my 3D scan.

2nd Goal: “Manually” model the metal gear in Inventor, use it to create a mold using the mold making functionality of Inventor, save it to a printable file, and print a mold...

OR shoot the computer, and the makers of all 3D software.

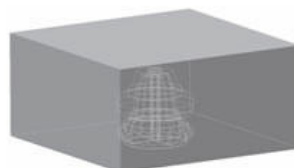
Using the Model to update the Patterns

When using your product model to associate with the mold and core impressions, any changes made to the model will affect the mold and core parts upon an update either from the individual part files or from the mold .idw or the core .idw. First, create your product model, per design intent and nominal tolerances (below, at left).



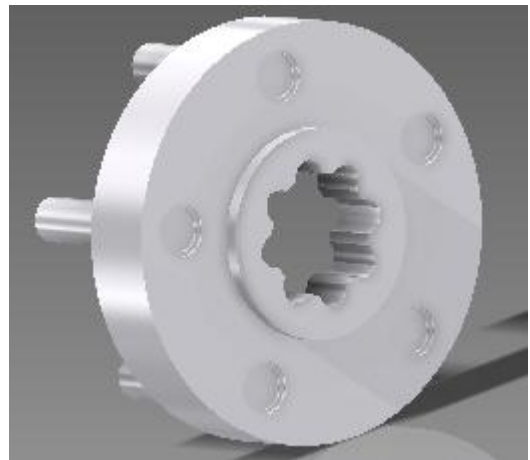
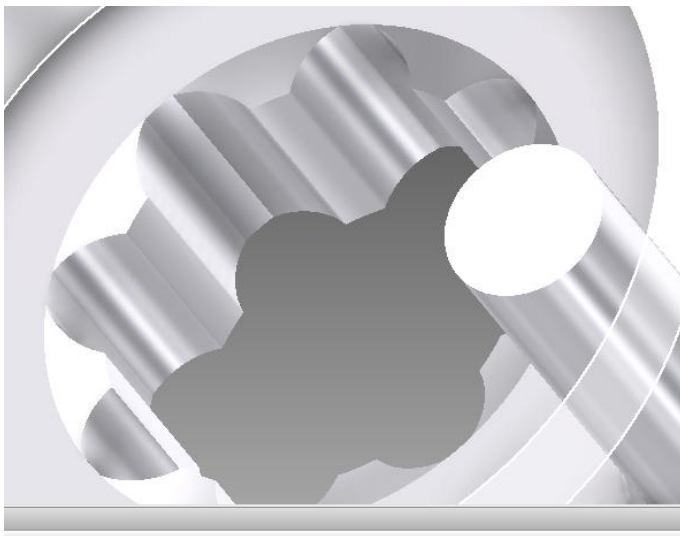
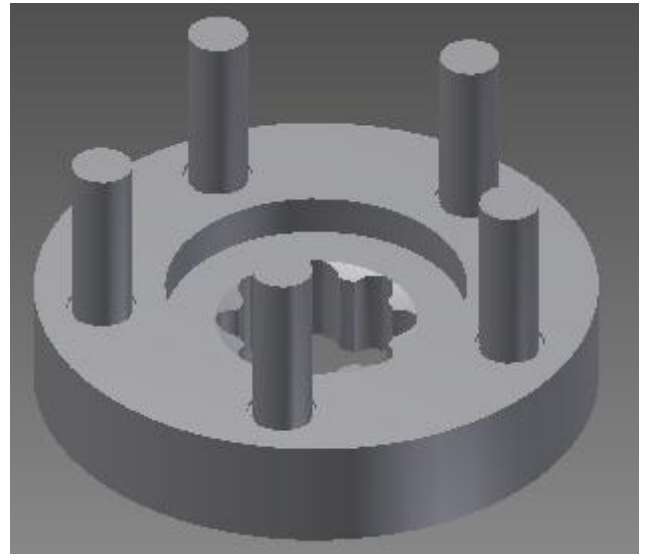
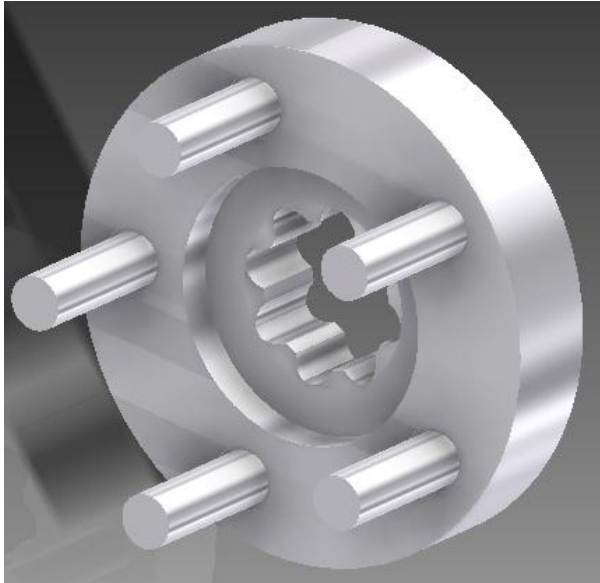
Once finished, create a solid block of material that will completely surround your product (above, right).

Now, start a new Standard Assembly (.iam) and insert one occurrence of your product part file. The product part should be grounded, as it will be the first part placed in the assembly. Next, insert one occurrence of the solid block object. (Note: If you do not wish to have multiple solid blocks for your various products, use one block that is big enough to engulf all sizes of your cast product models, since the solid block will never change). Constrain the solid block to be centered about your product part and to also have 1 face be flush-mated to a cored-open face on your product part; if no cored-open face exists, simply center the solid block about the product part.



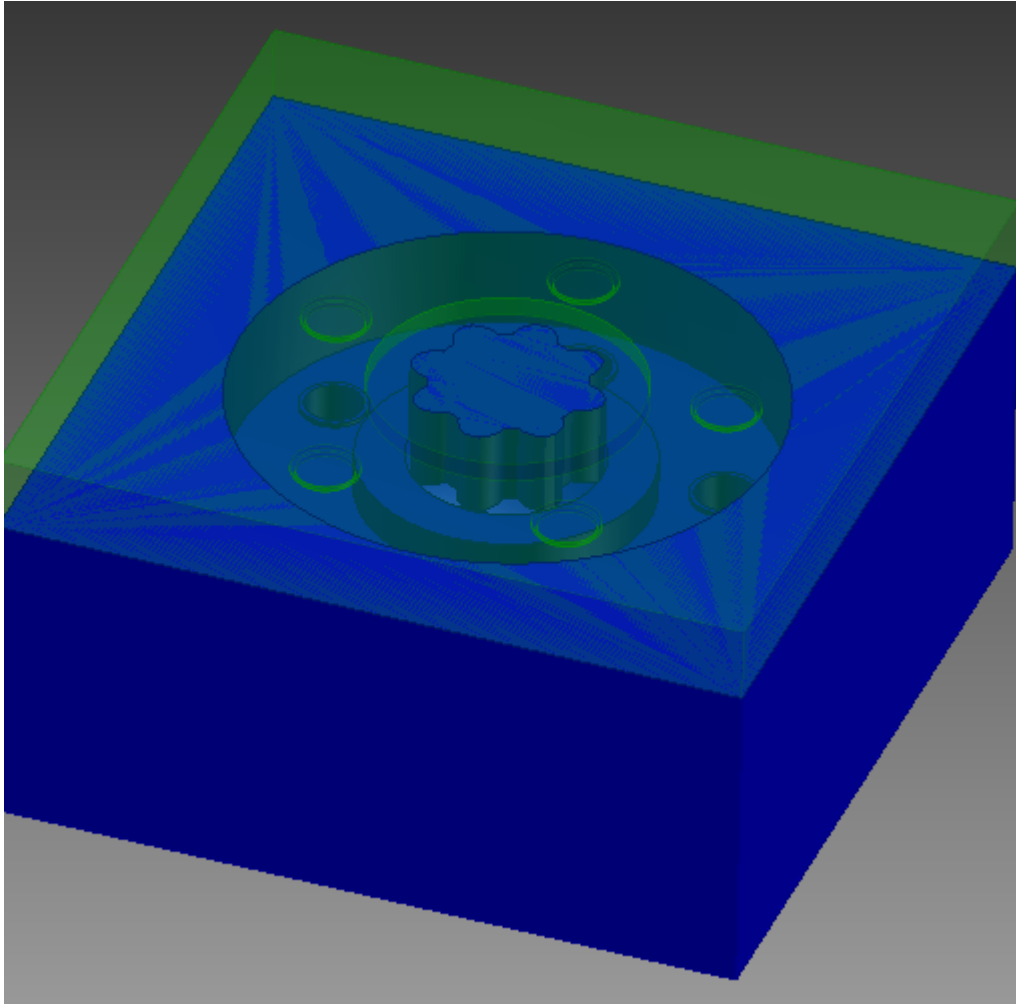
Save this assembly with some designation that makes sense, as you will have to keep this assembly for associative changes to be reflected in the finished models and drawings when performed.

Modeling the gear was easy. Infact, I was fairly impressed with myself on how well it turned out. Aside from intentionally leaving the tiny lips around the outer radius off because the printer would never print that fine, I think that the gear came out looking quite good.

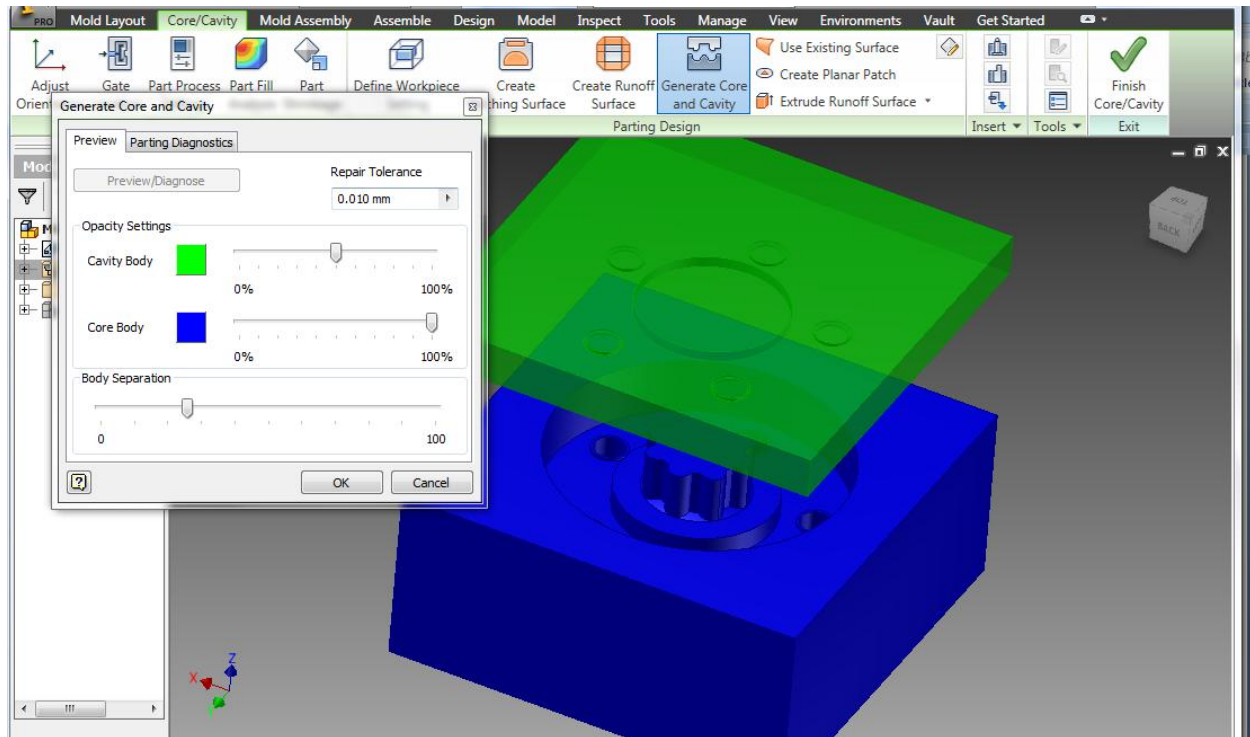


Making the mold was a completely different story. I have been messing around with this thing for six hours now, and I still have several things left to figure out.

- 1) How to put the keys into either side of the mold to line it up once it is printed. The program does have several types of grooves, and locks, and slides that you could put into the mold assembly, they are not what I am looking for.
- 2) How to separate the two pieces (top & bottom) so that I could save them to an .stl file in order to print them.
- 3) After creating the gate in the top to pour the material into, I can't seem to extract it from the top of the mold. It appears as if it is a solid piece itself.



Although it appears the two pieces are separated in the picture below, they do not stay that way once out of this simulation.



Update 1: I figured out how to get the solid out of the top piece in order to create the pour spout!!! I simply deleted the gate feature. However, once this was done, it could not be undone, and then I could no longer do the "Fill Analysis" That showed what the final product would be, along with a sort of flow analysis that showed what part would be filled first, and what would be the last parts to fill.

