

INCREASING INNOVATION  
WITH DIGITAL CLAY

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# Increasing Innovation with Digital Clay

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## Contents

Objective: .....	1
What is Digital Clay? .....	2
Retopology and Detail Design .....	4
3D Printing & Rendering .....	5
What about Manufacturing? .....	6
Surfacing .....	7
CAD.....	8
Conclusion.....	9

### Objective:

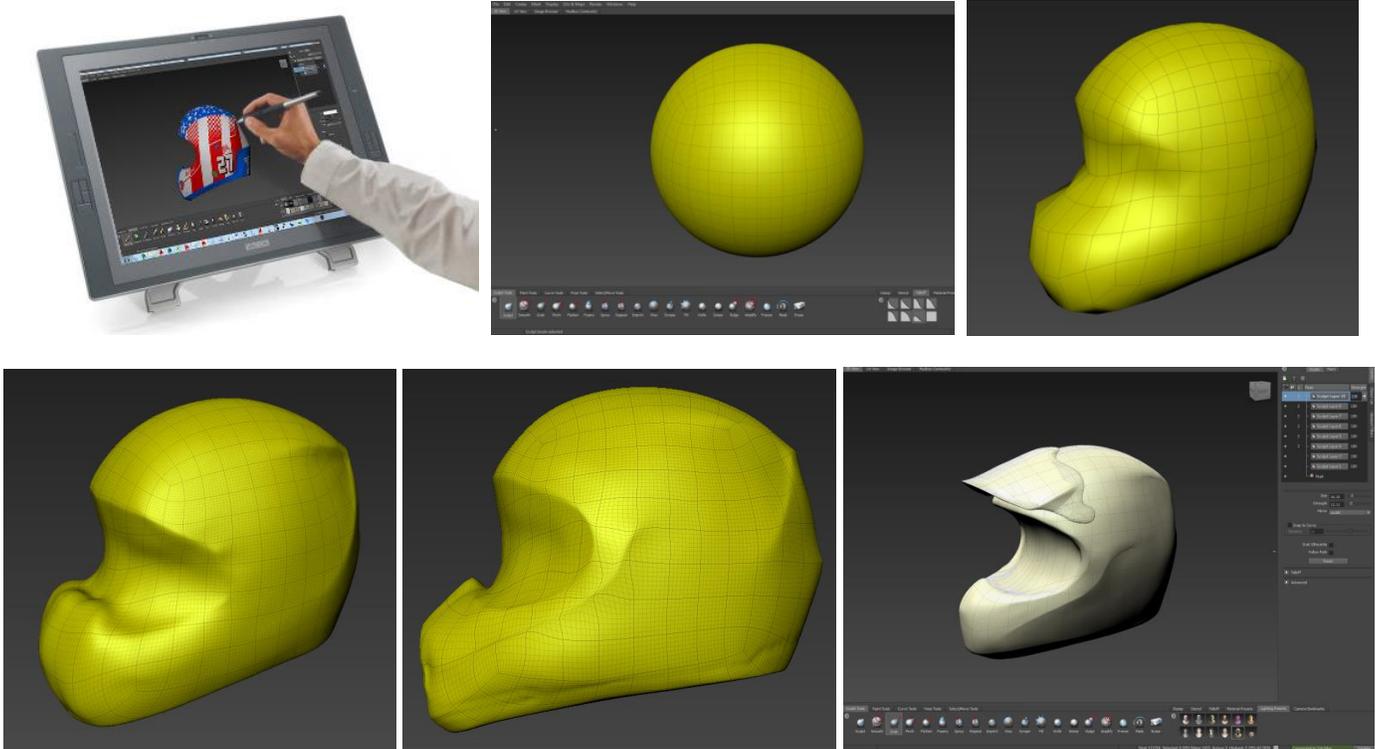
In this short paper I show the digital sculpting workflow I use to move from an idea to high quality surfaces ready for manufacturing.

Sculpting with digital clay is a great way of developing unique designs for new products that you are bringing to market and has a potential that is only limited by imagination.

## What is Digital Clay?

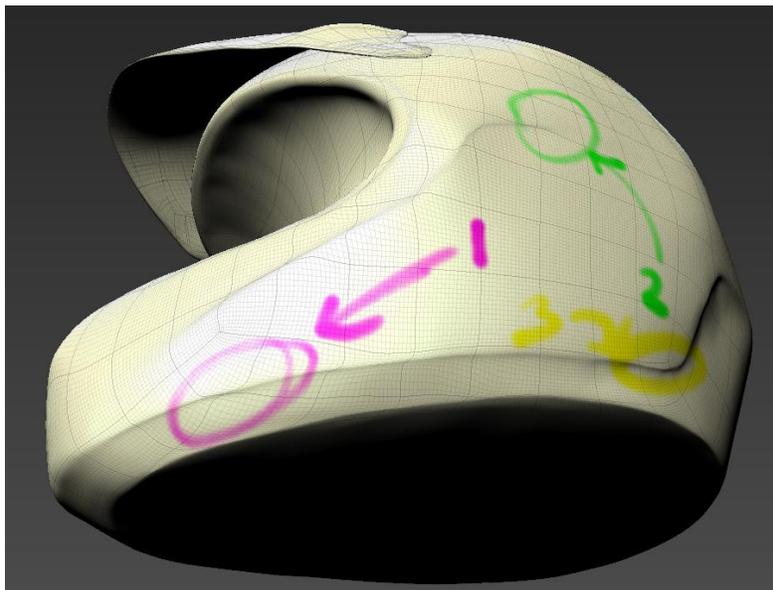
Digital Clay is a new take on an old technique. We can now pull, push, pinch and scrape a digital object as if it was made of traditional styling clay.

In the sequence of pictures below I use Autodesk Mudbox in combination with a Wacom Cintiq monitor to transform a digital clay sphere into a motorcycle helmet.

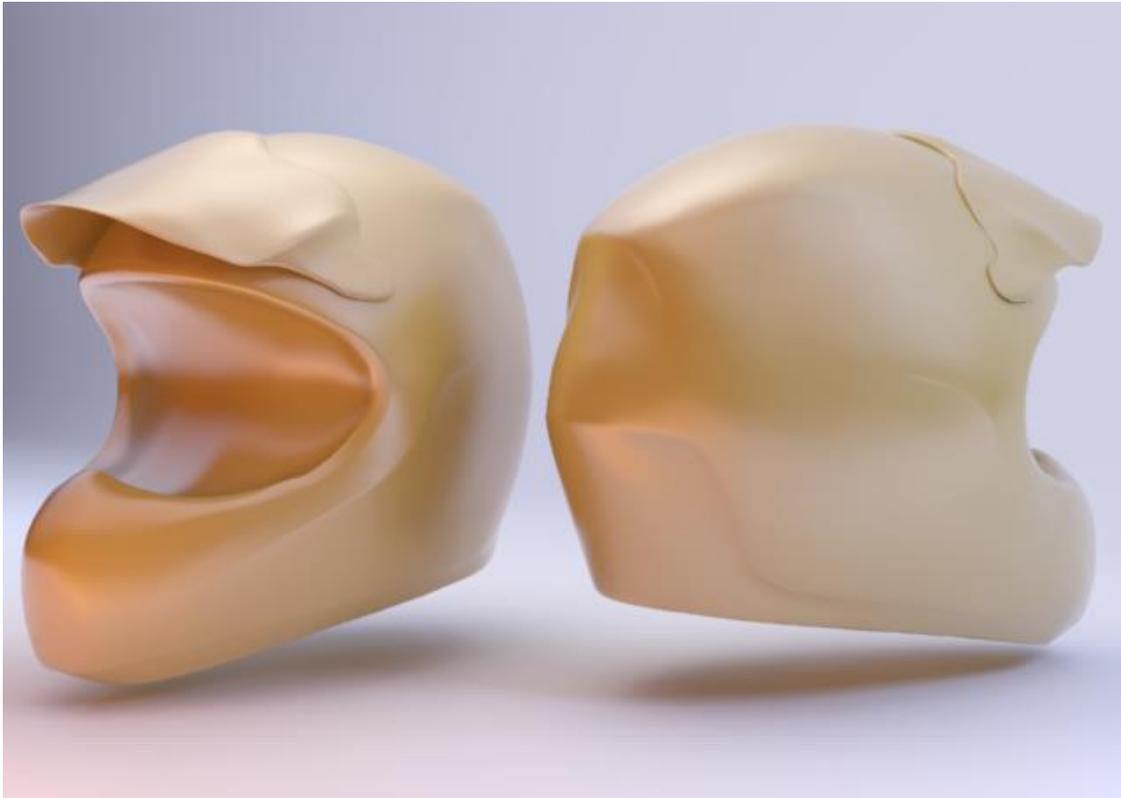


Now I would normally work to a set of underlay drawings to help me keep to a predefined shape but for this example I decided to sculpt the helmet by eye alone.

Note that as I work I have the ability to paint directly onto the digital clay to reference areas that need to be refined.



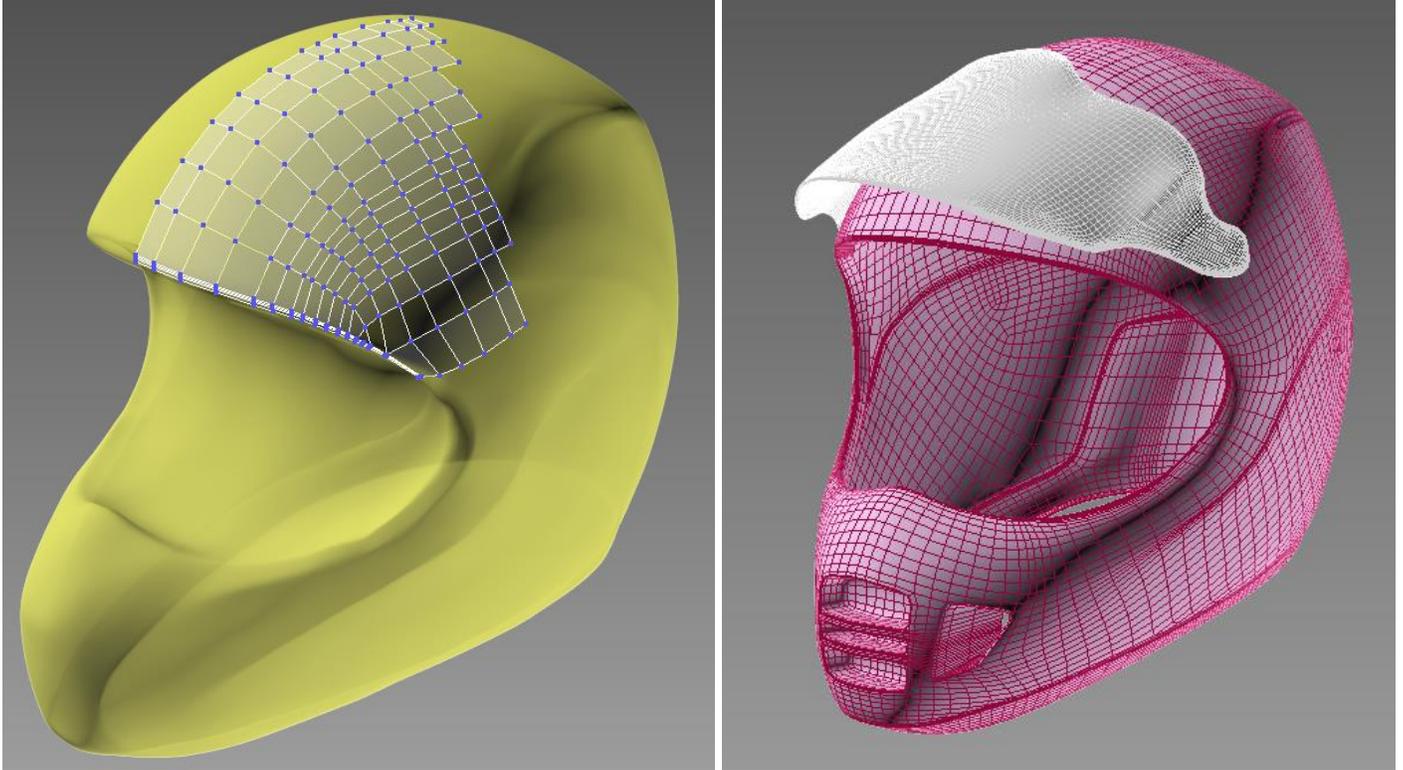
My goal at this stage is to sculpt a primary form that meets the design objective. Once I am happy with the overall proportions I can then start to think about adding in details.



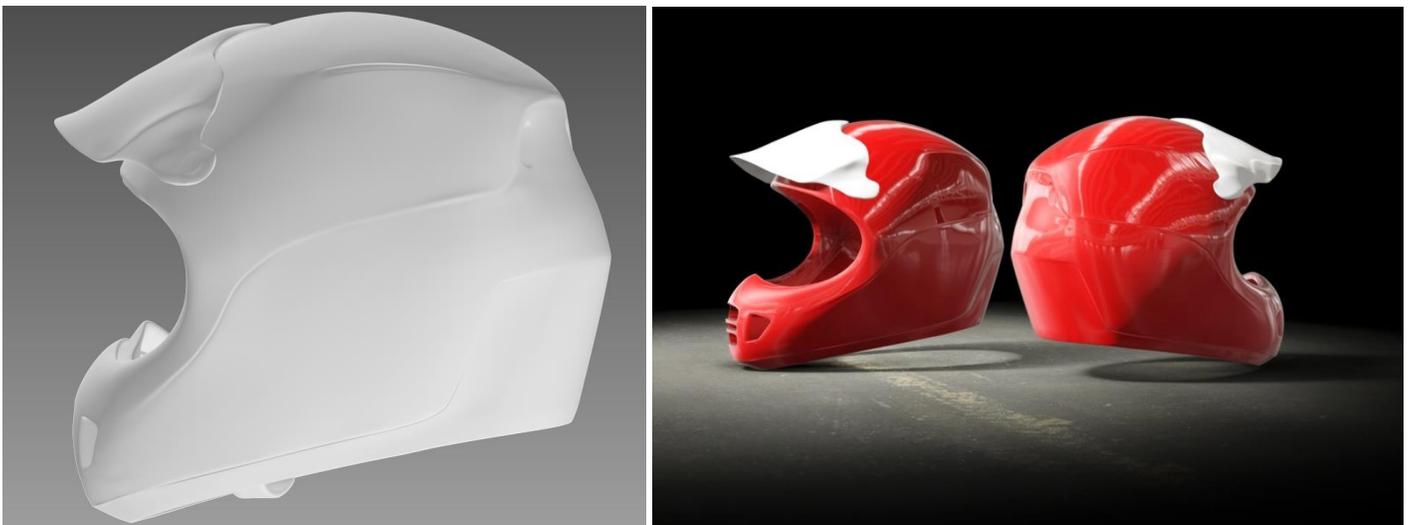
## Retopology and Detail Design

Now any digital clay model is always going to be complex and full of small imperfections. So in order to clean up the design ready for the next stage of details I use a process known as 'retopology'.

I start by exporting the digital clay model into Autodesk 3ds Max. Then using the digital clay model as a reference I create a new polygon surface over the top of the original clay surface.

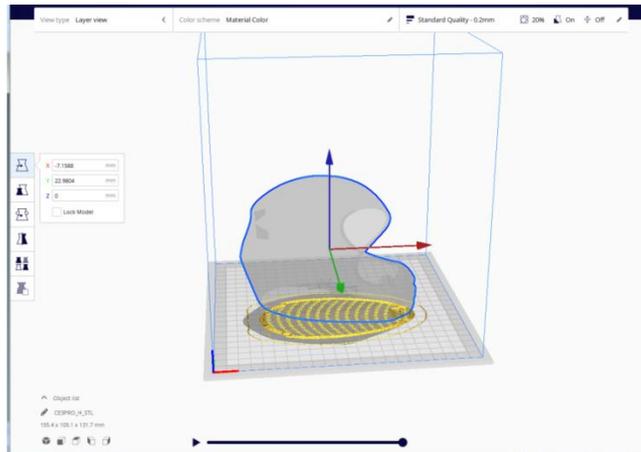


With a clean mesh established I can then cut in the vents of the helmet, adjust the overall proportions and fine tune the smaller details until I am happy with the design.



## 3D Printing & Rendering

With the 3D model we now have it would be easy to export out a .STL file. This would allow us to 3D print the helmet model giving us a realistic physical prototype to evaluate.



For this example I jumped straight ahead to creating a visual rendering of the concept. One of the great advantages of using Autodesk Mudbox is that I can switch back into the program and use it to paint freehand directly onto the 3D model.



## What about Manufacturing?

If we move forward with a concept then it is important to understand that I have been creating the 3D model by using what are known as *'polygon modelling' tools*.

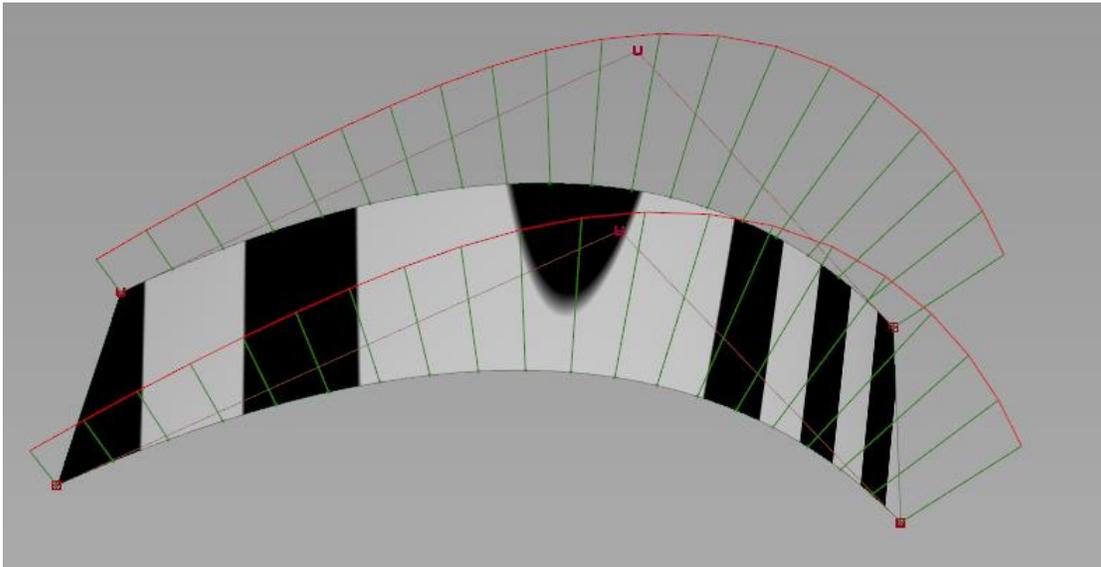
Polygons by their nature are composed of straight lines that form flat surfaces. This means that it is impossible to ever make a perfectly smooth surface.



For conceptual work when I want speed and control this is not an issue.

However if we wanted to manufacture this design then we need to change the 3D modelling approach and use what are called NURBS.

NURBS surfaces are based on mathematically defined curves allowing for the creation of the highest quality surfaces.



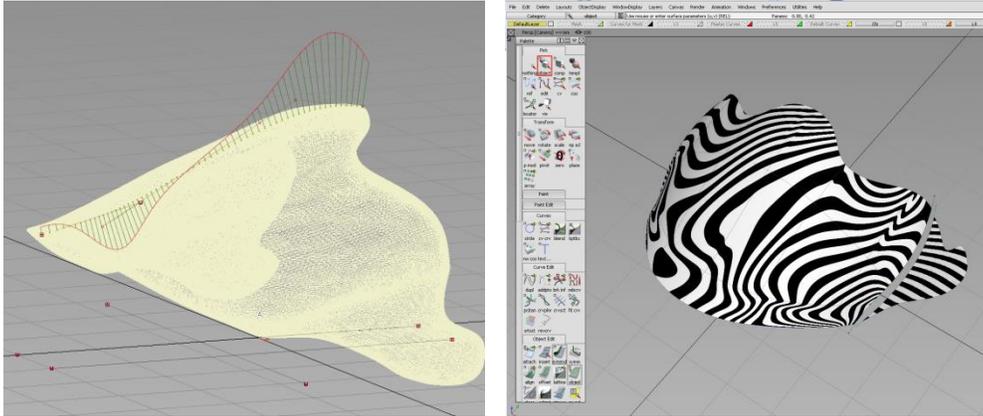
For NURBS work I use Autodesk Alias. Alias has been the industry leading software for the creation of precisely sculptured surfaces since 1985.

## Surfacing

I start by importing in the mesh from 3ds Max and use this as a reference over which I will build a new set of NURBS surfaces.

In the example below I am laying out the preliminary curves for the peak of the helmet by projecting curves onto the clay mesh.

I then rebuild each curve and slowly create the surfaces until I am happy with the model.



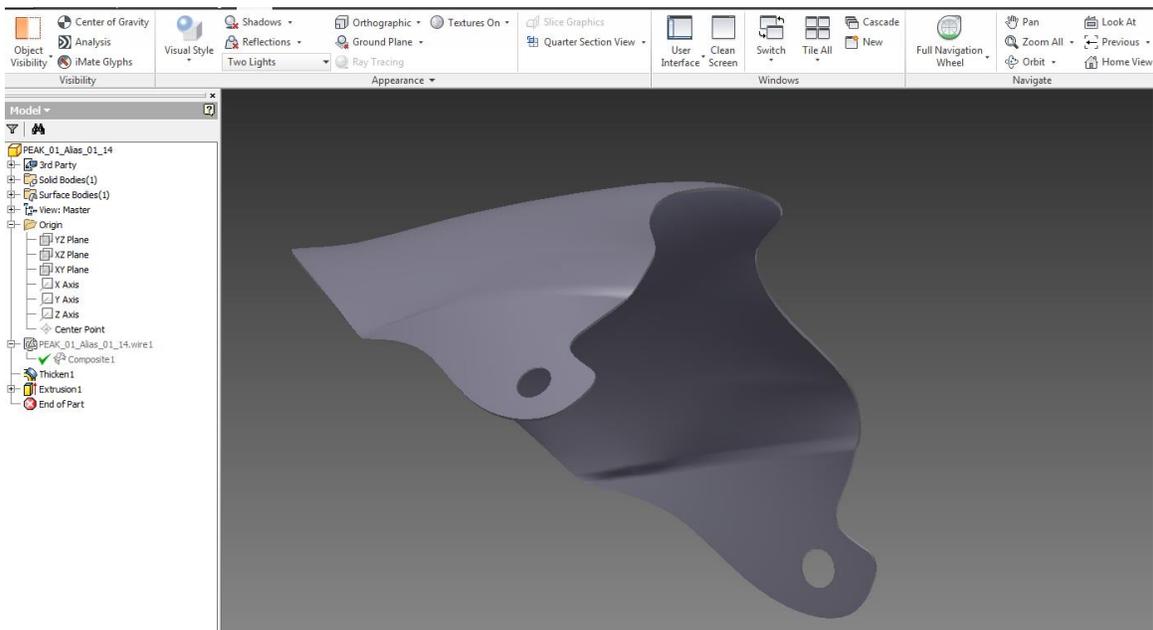
Once finished I stitch all of the surfaces together and export out the part in a neutral file format.



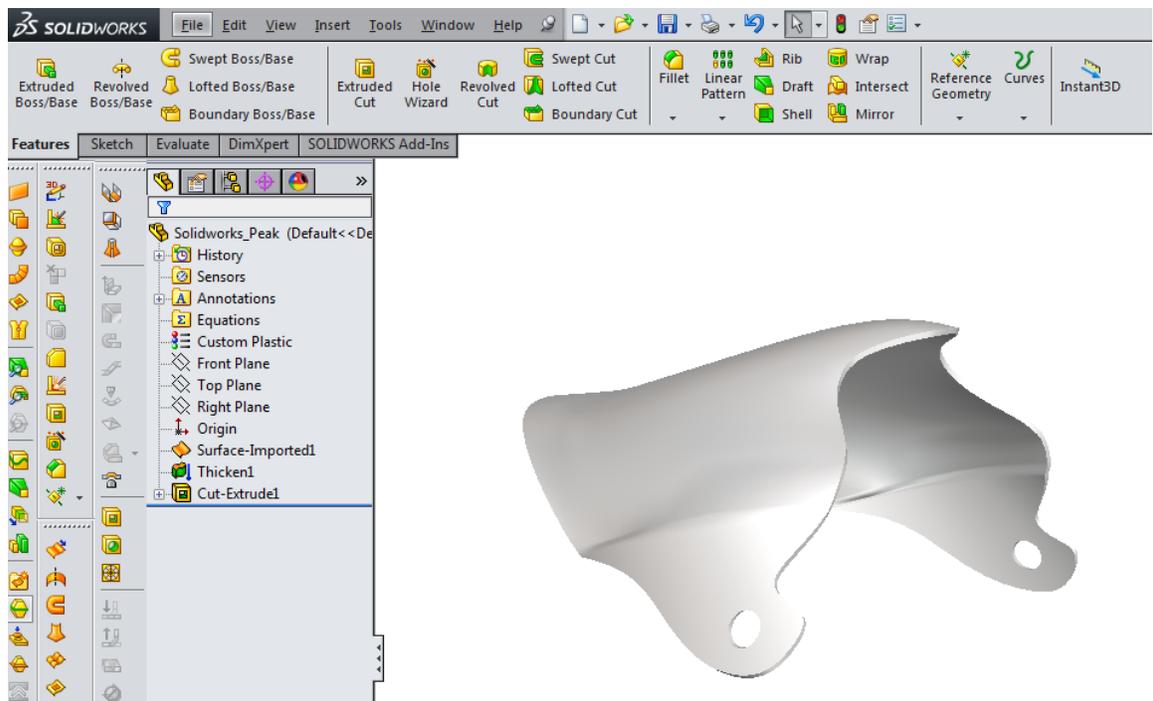
## CAD

I can import the Alias work into any standard CAD software and start to add in any precisely toleranced features that are required.

The visor part file is shown in Autodesk Inventor:



The same file in Solidworks:



Now that we have the CAD data established we could start to design the tooling required for manufacturing. Alternatively we could create a manufacturing drawing in order to commission parts from a supplier.

## Conclusion

I hope this quick example has shown you that digital clay is an extremely versatile tool that allows new ideas to be explored a lot faster than if just using standard CAD software.

Remember that it is not just motorcycle helmets that can be sculpted. Automotive bodywork right through to hand held consumer products all lend themselves to this approach.

If you have a design idea that you would like to discuss then get in touch today:

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