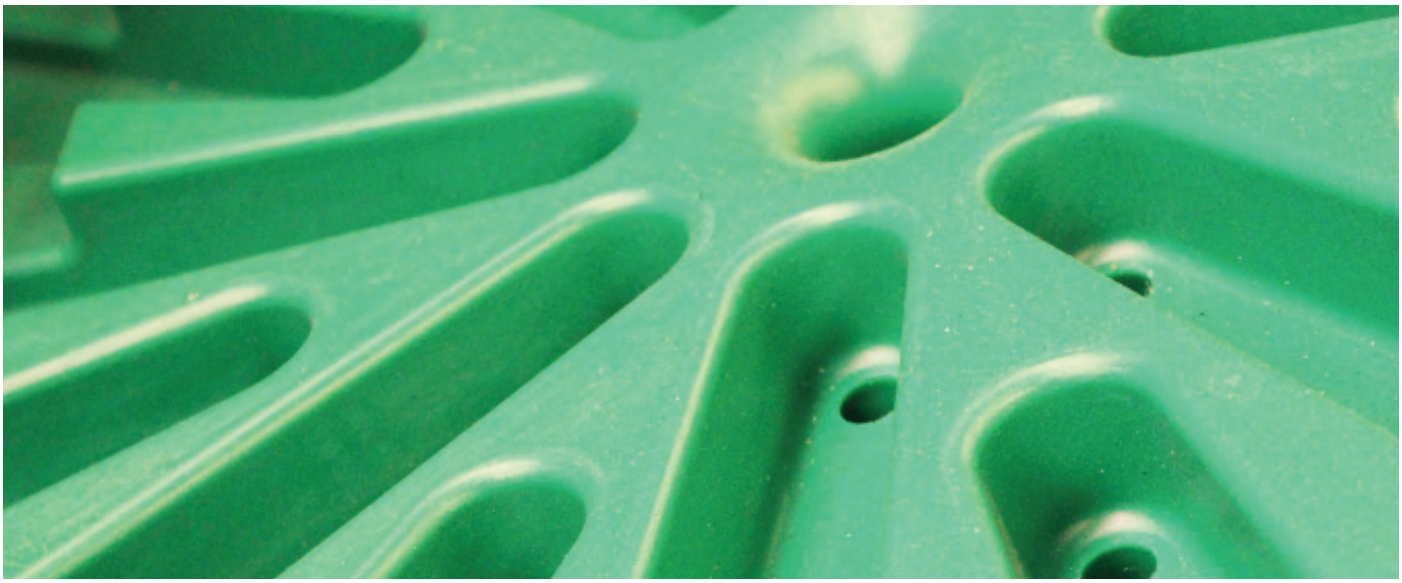
tecni-form
delivering world-class excellence

from our design library

Example Project



> Let us show you how a project goes from initial drawing...to finished product

Introduction

Rotational moulding projects may take many different forms, the data available at the outset may vary from the proverbial 'cigarette packet sketch' to a fully defined 3-D CAD model complete with all associated documentation. The tool may consist of two parts with a flat split line, fabricated from sheet steel to produce a simplified version of the moulding (as a proof of design concept) or at the other end of the scale it can consist of multiple parts CNC machined from aluminium billet, with complex side cores and core sliders, and multiple moulded-in inserts etc.

With such a variety of inputs and outputs the nature of the work of getting from one stage to the other can obviously be very varied; tecni-form have therefore chosen a project where two forms of data were used at the outset, and two different methods of manufacture were used for the two tools required, thus giving a broader description of the nature of the work than would be possible when describing most projects.

Stage 1 – Design Review

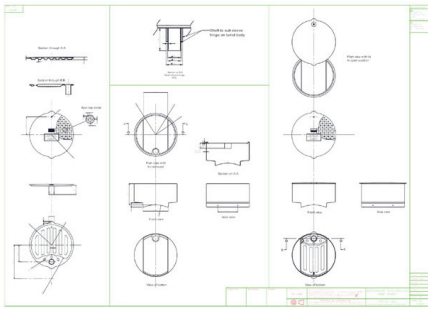


Figure 1

The project started with the receipt from the customer of a drawing (see figure 1), 3-D CAD model, and a specification for end-use.

Original drawing from the customer - Figure 1

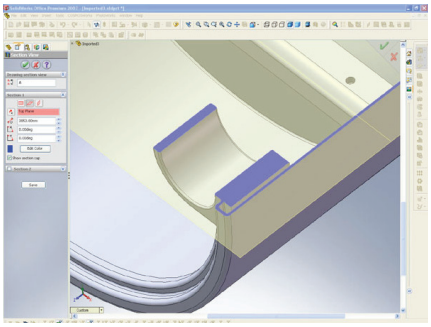


Figure 2

A review of the drawing and the CAD models indicated that, although the overall concept of the design was satisfactory, a number of features could not be rotationally moulded and would need to be changed (see figures 2, 3 & 4).

Unmouldable features (excessive change in wall section) - Figure 2

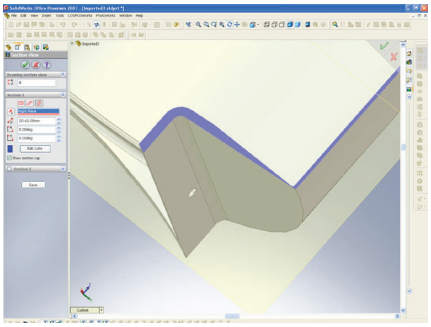


Figure 3

One of the requirements of the end-use specification was unclear and their calculation based on these figures gave a total load which was extremely high and would undoubtedly have lead to failure of the product. tecni-form therefore clarified the figure with the customer and their new calculation gave a lower load. Unfortunately this still gave a marginal condition so tecni-form carried out a finite element analysis (FEA) yielding a factor of safety (FOS) of 0.5, proving that their initial concerns were correct.

Unmouldable features (excessive change in wall section) - Figure 3

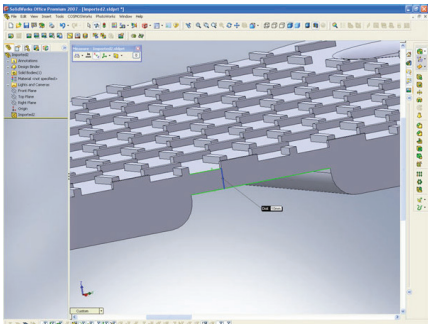


Figure 4

It was agreed that the design needed to be optimised to improve its load-bearing as well as modified to remove the unmouldable features. This could not be undertaken by the customer due to limitations of their CAD system and it was therefore agreed that tecni-form would carry out the work.

Unmouldable features (wall-to-wall spacing too close) - Figure 4

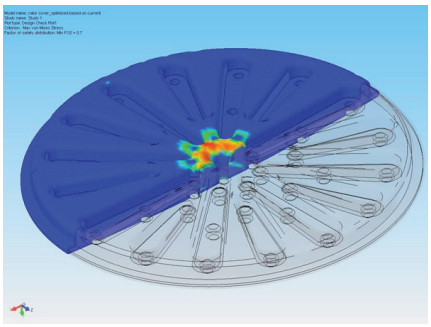


Figure 5

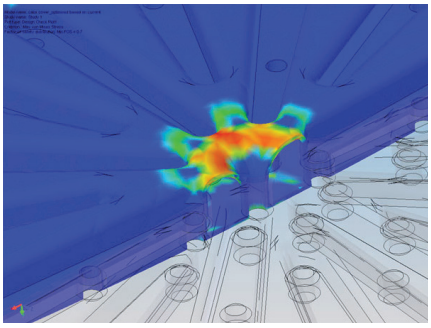


Figure 6

Stage 2 – Design Optimisation

A series of optimisations led to a design with a factor of safety of 0.8 occurring in one localised area, and more generally a factor of safety greater than 2.

It was agreed that the design needed to be optimised to improve its load-bearing as well as modified to remove the unmouldable features. This could not be undertaken by the customer due to limitations of their CAD system and it was therefore agreed that tecni-form would carry out the work.

tecni-form informed the customer of two options for taking the project forward:

1 Carry out a more in-depth FEA (which would be outsourced) and further optimise the design in CAD until the desired FOS was achieved, but with a degree of uncertainty still remaining due to the inevitable numerical assumptions that are made in all FEA studies

2 Release the current design for production and carry out extensive product testing prior to production release.

The customer decided that the second option was the most sensible route to follow. A more general review of mouldability and functionality was then carried out as illustrated by figures 7-12.

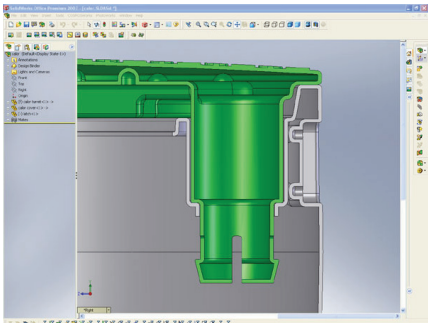


Figure 7

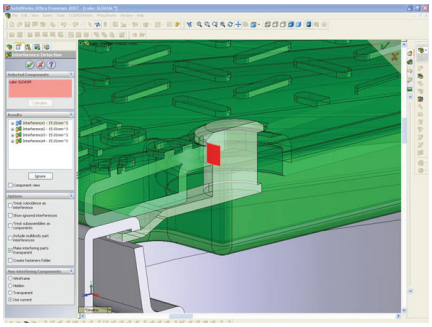


Figure 8

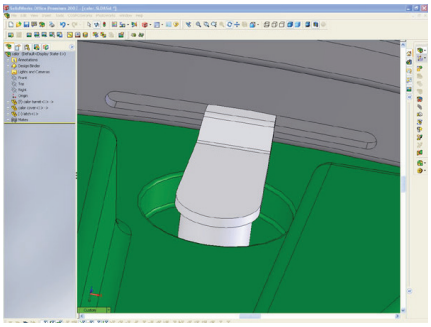


Figure 9

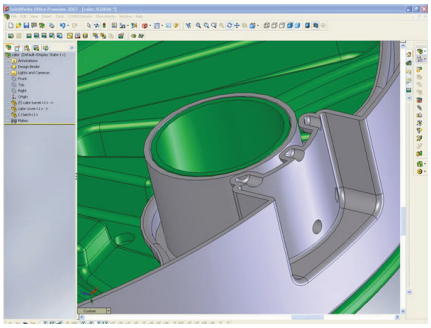


Figure 10

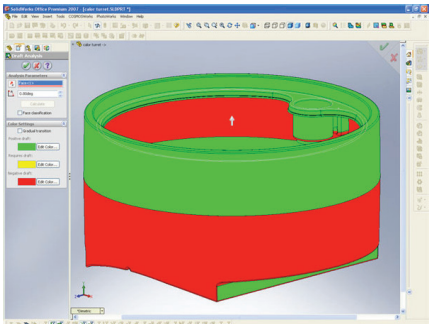


Figure 11

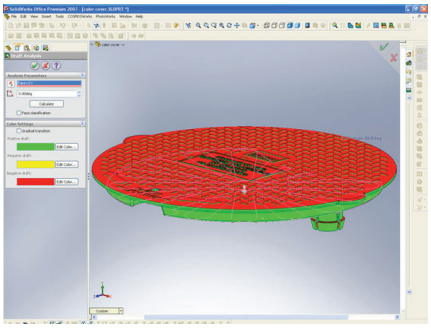


Figure 12

Figure 13

3-D Cad files, 2-D drawings and a product rendering were supplied to the customer and a further review with them resulted in the design being accepted. As the tools were to be produced from 3-D CAD data IGES files for each of the mouldings were exported from SolidWorks and sent to the toolmaker along with a tecni-form tooling specification sheet supported by a number of CAD generated images.

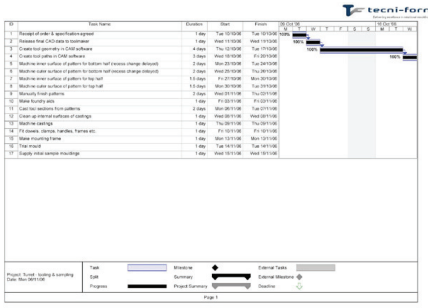


Figure 14

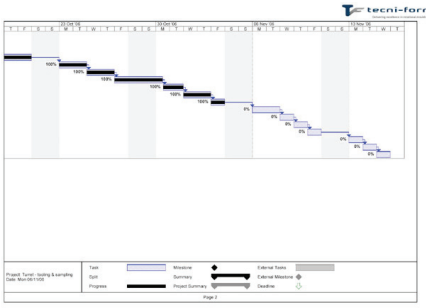


Figure 15

Stage 3 – Tooling Review

After an initial meeting with the toolmaker sufficient information was available for them to create an accurate tooling program from which tecni-form produced their version for the customer which included sampling, as illustrated in figures 14 and 15.

The toolmaker then created the models of the various parts of the tool using Delcam Powershape and supplied tecni-form with IGES files for them to review the design. As tecni-form have extensive experience of IGES from this system they used Delcam PS-Exchange to view the files rather than using their cad systems, as illustrated by figures 16 to 23.

A benefit of using 3-D CAD which is sometimes overlooked is the ability to verify tooling designs fully before any physical work is carried out on the tooling, in this case the amendments were relatively minor consisting of the following (figures 20 - 23):

- Changes to the method of clamping the side cores on both tools
- A change to the position of the alignment dowels and bushes and the lever points for the cover tool
- Revision of the strengthening webs on the top half of the cover tool
- Fabrication for the spigot section of the cover tool to reduce the amount of stock removal and therefore reduce cost and lead-time.

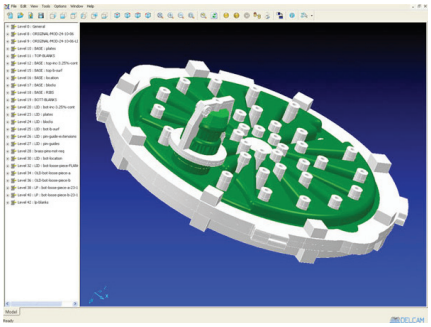


Figure 16

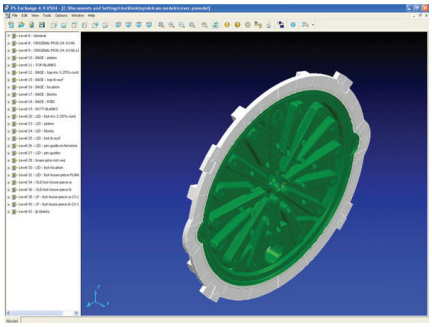


Figure 17

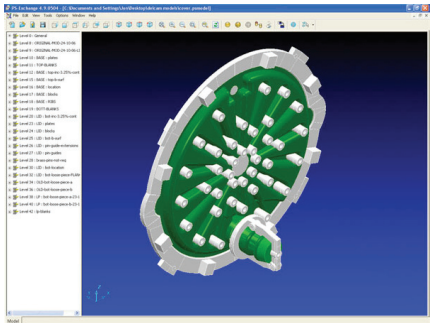


Figure 18

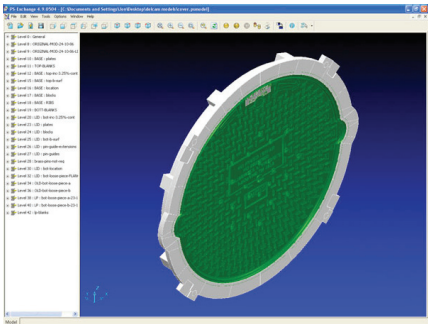


Figure 19

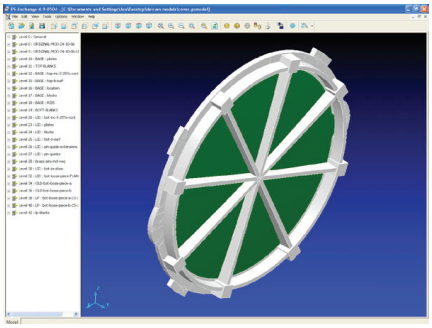


Figure 20

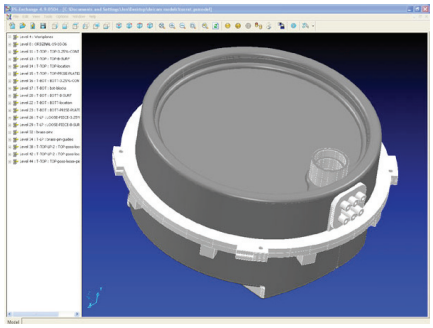


Figure 21

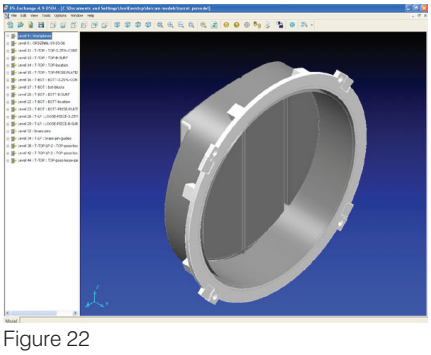


Figure 22

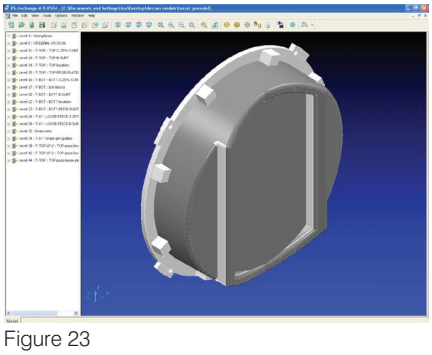


Figure 23

tecni-form were then able to give approval for tooling manufacture which in the case of the cover tool was to be directly CNC machined from aluminium billet and for the turret tool from aluminium castings produced from CNC machined patterns.