303 CASE STUDY: EPOXY TOOLING SPEEDS TIME TO MARKET

Tine Hejslet Jørgensen, Danish Technological Institute, Aarhus
Email: tine.jorgensen@teknologisk.dk

For about one year Danish Technological Institute has been able to offer rapid tooling services from our Product Development centre in Aarhus. The most often used tooling method is casting aluminium filled epoxy over a basis model, stereolithography or Actua/ThermoJet.
This case study describes a rapid tooling job we made for Tandberg Data ASA in Oslo.

Tandberg data ASA is a leading global supplier of advanced, tape based data storage products for the professional market. The company offers a wide range of products for backup and other user applications within data storage management. The corporate offices and manufacturing facilities are located in Norway but the company is well known world wide for its innovation in magnetic storage technology and has significant marketing, sales and support operations in many other countries.

During the last months of 1999 Tandberg Data ASA was developing a system for write protection of data storage media. This system included the small lever (245mm^3) shown in figure 1. The lever should be injection moulded in PBT and Tandberg Data ASA decided to try epoxy tooling in order to quickly obtain 300 prototypes made in the right material and by the right process.

As the lever was very small a double tool was designed. The negatives of the upper and lower tool parts were built on SLA 5000 and a loose insert was made in aluminium. In order to finally obtain a tool with good surfaces and a smooth ejection of moulded parts some surface finishing was performed on the two SL models.

The aluminium filled epoxy material has a low strength compared to aluminium or steel. Little pins and ribs tend to break of the tool during ejection because the moulding contracts onto these features as it cools.
To avoid this four little steel pins were placed in the four holes on the SL models (see figure 2a and 2b). When a cast was taken from each tool negative the pins were casted into the tool and thereby replacing the little pins that would otherwise be made of aluminium filled epoxy.
When the two tool castings had cured an inlet and two holes (one behind each part) for ejector pins were drilled. The tool was then ready for injection moulding.

The injection moulding machine we use for this type of job has a very clever utility. The screw can be rotated so that clamping and injection happens vertically, see figure 3. This is very useful when a low number of parts is required from a mould as there is no need for bolsters etc. The tool is simply placed on the plate and located with the inlet on the right spot. It doesn't need to be fixed or locked in any way. When one injection moulding cycle has been run through the tool is taken out, opened and the moulded parts ejected by manually pressing out the two ejector pins.
If a greater number of parts is needed this method is obviously too time consuming. The tool should then be fixed into a bolster so that tool opening, ejection etc can happen automatically.

In the lever tool 150 shots were made in white PBT. Figure 4 shows the tool and some moulded parts and figure 5 shows a close up photo of one moulded part. The delivery time for 300 prototypes was about 2 weeks.

At the same time as the prototypes was ordered from Danish Technological Institute, Tandberg Data ASA also ordered a conventional steel tool from their toolmaker.

Three weeks before the steel tool was finished Tandberg data ASA could use the prototypes to make design tests to verify that the lever had the correct function. When the steel tool arrived the prototypes were just replaced with real parts. In total including quality tests etc. Ørnulf Jansen of Tandberg Data ASA estimates that the use of rapid tooling enabled them to release the system 6-8 weeks earlier than what was originally planned.

The case from Tandberg Data ASA is one of several examples we have experienced during the last year on how epoxy tooling can speed time to market for a product.
The method has it limits concerning part complexity, small details, moulding material etc. but many problems can be overcome by inserting steel or aluminium inserts, good surface finishing and increasing the draft angles. Some parts we still haven't been able to make by injection moulding in an aluminium filled epoxy tool, but if a part is suitable for this process you get prototypes in the exact material at a low price and with a very rapid delivery time.