Colin McGrory | Technical Director | Sandwell UK

Additive Manufacturing at Sandwell UK

IT WAS SOME 20 YEARS AGO that I purchased two SLA machines for my employer. We were primarily developing quarter- and third-scale wing profiles for wind tunnel testing. It was the quickest method to produce a large volume of components for intensive development programmes. At the time it was the only method available so the options we have now are something of a sweet shop of methods and materials.

In 2018, the staff at Sandwell decided it was time to investigate the Additive Manufacturing market for our own needs. Much of our shot peening and finishing work is low-volume and rapid turnaround; hence, 3D manufacturing looked to hold the key for both masking and fixturing.

Colin McGrory, Technical Director with Sandwell UK, was the 2016 Shot Peener of the Year

After trawling the Internet, we decided there were too many options. Whilst all the machines promoted this and that feature we had a pretty fixed idea of what we needed to achieve from a machine. SLA and powder bed machines were out—too messy, too complicated, especially on the powder management side.

We wanted the simple world of FDM (Fused Deposition Modeling). With the wide range of filament materials available now, it would provide us with a toolkit of materials to suit our applications. The operational side and functionality was not immediately evident from the 2D world of the Internet, so we decided to visit one of the large trade shows.

It became apparent that there was much to learn—heated beds, feed rates, filament sizes, multiple print heads, temperature ranges, etc. In a world where the technology is developing so rapidly we decided to jump in, purchase what we considered to be a good professional machine, and use it as a platform to understand the process. Once installed and the software downloaded, these machines are incredibly easy to use.

We embarked on a series of trial-and-error builds in different orientations and using different materials. We referenced the same model to check for dimensional stability and accuracy (and the resistance to shot impacts).

Within a few weeks we had shortlisted three materials that provided support, stability and accuracy. These materials could be used in a shot peening machine and, providing our program didn't dwell too much on these fixtures, they were perfectly adequate for our short batch-run applications.

Now, after 12 months, we could not do without our 3D printer. It is used daily and forms part of our suite of machines used for the production of masks and fixtures alongside our CNC mill and lathe.

OK, so you do need good CAD skills to get the best from one of these machines, but once you appreciate the flexible manufacturing approach and capability there are very few limitations to what can be produced. You really do have to rethink the design process. The design options are limited only by your imagination with a 3D printer.

We are shot peening and finishing more and more of our client's additive-manufactured parts so it's rather satisfying to produce masking and fixturing by the same process.

3D Printer Glossary

Mr. McGrory references the following 3D printers in his article. This information is taken from the "Guide to Additive Manufacturing" by ITAMCO (www.itamco.com).

Fused Deposition Modeling (FDM) is a form of Material Extrusion. It's perhaps the best known additive manufacturing process. FDM extrudes a thermoplastic filament through a heated nozzle and onto a build platform. The material then solidifies as it cools, although not until it fuses to adjacent layers. FDM uses a wide variety of thermoplastic filaments, metal and wood.

Powder Bed Fusion (PBF) melts particles and fuses them together. Particles of plastic or metal powder are either "sintered" (partially melted) or fully melted using thermal energy in the form of a laser, beams of electrons, or a heated print head.

Stereolithography (SLA) uses the Vat Photopolymerization process. Its roots are the first 3D printers. SLA uses a build platform in a tank of liquid polymer. A UV laser shines from beneath the object and maps each layer. When finished, the platform rises and liquid resin pools below the object to begin the next layer.