

Think printing

Are you looking at 3D printing as a possible source of electronic enclosures? **Nick Allen** explains what is viable and what is not.

Unless you've been under a rock for the last 10 years, you will have heard about 3D printing. But many engineers are still wondering how they can use it for anything other than prototyping. However, 3D printing can provide a cost effective way to construct custom enclosures and this article will explain how, when and why you should consider using 3D printing for your product.

First of all, how does the process work? In a nutshell, you make an object layer by layer from digital 3D CAD data. Solidworks and AutoDesk Inventor offer professional packages that are intended for producing files for 3D printing. Files are saved into the STL format and printed via extrusions, sintering, UV curing or a

range of other bonding techniques. SLS – selective laser sintering – is known universally as the best process for producing plastic parts due to its balance of cost, strength, speed and surface finish in comparison to other methods.

If you're looking into producing electrical enclosures, you need to determine a few key points before you choose 3D printing over traditional methods, such as injection moulding or CNC milling. Remember, 3D printing is not always the answer; in fact, it rarely is. But, in some cases, it can be the perfect solution.

3DPRINTUK has a few questions that are asked of first time clients, providing an idea of whether their product is going to be viable.

How big?

This is probably the most important question as size is the main cost in 3D printing. Unlike other methods, complexity isn't an issue – cost will only be associated with how much

material is used or how much space/time it takes up in the printer.

Service providers will often charge for the space your product takes in the machine, using a simple XYZ bounding box pricing structure, so the smaller it is, the cheaper it is. However, something twice the size is eight times the cost, which might seem scary, but something half the size is much cheaper!

If you're in the market for making clips, mounts, fixings or fastenings for PCBs, then you could be about to hit the jackpot. But if you're looking to make a computer tower, be prepared to be disappointed.

How many?

The double edged sword of 3D printing is that it requires no tooling. No tooling means no set up fees, which is great, but no tooling also means no economy of scale, so your unit cost remains roughly the same, no matter how many you order, except for slight discounts based on guaranteed business.

The good news is that you only need to order what you want, meaning you don't need to order 10,000 units and hope you use them all. If you need 457, order 457; when you need

3D printing could be an economic solution to enclosure requirements, particularly if your design only requires low volumes



more, order what you need. And if you need to make a design change you don't have to retool.

How long will it take?

This isn't too important if you've got time, but if you're in a rush, most bureaux have a premium expedited service. If you get a quote and you like it, don't sit around; pay it, as you might get a sting in the tail if you dawdle.

Most good 3D printing bureaux will supply a decent sized order in two weeks, and some can do it in a few days. However, this can come at a premium rate.

Is the product viable for 3D printing?

You now have to weigh the answers to these three questions and compare them with traditional methods. The larger your model, the lower the volume and vice versa; the smaller the model, the more you can produce before traditional methods become more appropriate.

The price for a single 3D print can be as low as 50p for a fixing/ fastening/ mount, so you can push quantities into the thousands and it will still be viable. Meanwhile, the lack of set up costs means it could be the perfect solution if you only want to order a few.

As the product increases in size, the quantity for 3D printing to be viable will reduce – remember, size increase is cubic, so the price increases incredibly quickly. Something the size of an iPhone starts to head towards

£20 per unit, while something the size of the box the iPhone comes in can cost £100 per unit, meaning it's only viable if you're ordering a very small number, or even a one off.

In summary, the smaller the better.

What about the finish?

While all this might sound well and good, can 3D printing provide a part with decent properties and a smooth surface finish? The answer is yes; but it depends on which machine you use and how fussy you are.

If you're looking for an injection mould quality gloss finish, you're chasing a rainbow, but if you want a strong smooth item, then there is a solution in the form of vibro polished laser sintered parts. This approach takes the surface finish from 'powdery' to 'soft mint' without affecting the dimensions of the part drastically. The result is far smoother than fused deposition moulding (FDM) and far cheaper and stronger than single layer sintering (SLS).

Should I buy a machine?

Again, this depends on answers to the above questions. If you're making one or two non aesthetic enclosures quite regularly, then get a desktop FDM machine. But if you want something to make batch production runs, then use a bureau. SLS machines are large, messy and start at £100,000, so unless you have a huge workload, they are not worth buying in house.

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Case studies

A few examples of where clients have opted for 3D printing instead of injection moulding during the last year. Quotes have been gathered from the UK and the Far East and are based on supplied information. The actual models are under non disclosure and imitation parts have been created for this article, although the principle is the same.

Wire guide

A simple clip to tidy some wires in a small standalone electronic enclosure.

Size: 15 x 4.5 x 25mm
Quantity required: 1000
3D printed unit cost: 50p
Total project cost: £500
Injection tooling cost: £1000
Injection moulded unit cost: £1.60 (for 1000)
Total project cost: £2600
Viable 3D printed quantity: 10,000+

HD SDI PCB enclosure

Compact two part enclosure for broadcasting equipment.

Size: 50 x 50 x 13mm
Quantity required: 100
3D printed unit cost: £6 per pair
Total project cost: £600
Injection tooling cost: £3000
Injection moulded unit cost: £1.80 per half (for 100)
Total project cost: £6600
Viable 3D printed quantity: 1200

Bluetooth speaker case

Custom Bluetooth speaker for event

Size: 50 x 60 x 60mm (five parts)
Quantity required: 50
3D printed unit cost: £25
Total project cost: £1250
Injection tooling cost: £9000
Injection moulded unit cost: £4.30 (five parts)
Total project cost: £9215
Viable 3D printed quantity: 400

The PCB enclosure (below left) and the Bluetooth speaker case were both cheaper to produce using 3D printing

