ZPrinter 450 3D Printer

Being the sole RP vendor to offer 3D colour printing, what will Z Corp's next generation machine look like? Al Dean finds out with the imminent release of the ZPrinter 450 3D printer.

Written by Al Dean

BEFORE WE DIVE into this hardware evaluation, let's take stock and look at where Z Corporation and the RP industry currently stand. Firstly, let's deal with the RP industry. If you look at the players in the market, there are two opposing factions. There are those that still work within the 'Prototype' biased industry, where users require parts for evaluation. Whether that's for functional test, fit/function or aesthetic/ergonomic evaluation it doesn't really matter. What's important is that parts are built quickly and cost effectively. The opposing side are the players focussed on direct manufacturing - the 3D Systems, EOS, MCP etc of the world - looking to use the direct method of manufacturing (read: no secondary processes) to build end-use parts. Now, if you look at how these two are developing and bifurcating, it's clear that there's a split and in the context of this review we're interested in the former group – the prototyping tools.

The Prototype sector is driven by the sales of the 3D printer, whether that's from Z Corp, its arch-nemesis, Stratasys (and its Dimension division) as well as a number of other players. These machines allow you to create prototype parts very quickly and cost effectively – and when you consider that the idea is that a product concept is created, built,

This is the signature/demo part for the 450 and you can see that while the machine builds accurately and in colour, the more coarse resolution and larger layers mean that stair stepping is evident – although easily solved if you want

evaluated and typically binned within days the benefits are clear.

So, where does Z Corp fit into this? The answer is at its very core. Z Corporation's machines are one of the best examples to date of true rapid prototyping – with an emphasis on the rapid. They allow the user to generate a 3D model, print it and have it in their hands within hours. But they aren't alone. What differentiates Z Corp from its competition is simply colour. But until recently the colour capability has been the cost premium. With the entry level 310 offering only monochrome build capabilities, only the Spectrum 510, launched in 2005, truly offers flexible colour building potential.

Alongside this, while Z Corp's machines are known for their build speed and colour, they're also recognised for another thing – one that's not quite so compelling. The fact that the machines build using a powder means that these systems have gained a reputation for being rather messy. After all, lifting a model out of a bed of powder, recycling that material for reuse, then cleaning down the machine for the next build is an inherently messy business – one that doesn't lend itself particularly well to an office-type environment. So, with all that in mind, can you guess what's coming next?

It was with great pleasure that I saw the next generation of Z Corp's machines, under non-disclosure, at the recent SolidWorks World event. The new ZPrinter 450 machine sees many of these factors addressed, so without too much more preamble, let's dig into the new machine and see what it can do.

The 450 has a form factor very similar to the existing Z Corp machines, but within that machine there are a range of brand new technologies which advance the state of the art. The first is that the system is intended to be much more automated. In terms of machine set-up, this means that to get up and running, you simply connect the powder bins, the binder fluid (now in a tidy cartridge form) and print heads. You then use the new on-machine display and controls to set-up the machine. Once done, you're ready to go.

The whole build process and post-process workflow is conducted within the confines of the unit, under negative pressure – but what does that mean? OK, to build a part you load it into the Z print software, align and orient it in the build envelope as you would any other machine. When you hit print, the system checks if you have sufficient material in the machine (if you don't, changing them is very simple) and away you go. That build is then sent to the machine

The machine builds up each layer, depositing binder fluid and ink that creates both the colour and form of on the vertically moving platform. The system then recoats each layer with base powder and repeats the process to build up the complete part. Now, the automation in terms of set-up is new, as is the post build workflow.

Whereas in previous machines, you had to remove the powder manually, in the 450 the machine does it for you. The excess, unused, powder is extracted from the build chamber, filtered and recycled for the next build and the platform raises up to present the built part.

Traditionally, you would then need to move the still-fragile part for clean up and post processing, but within this system, you transfer it to the next compartment along which provides the clean up and post processing station. Again, this is done in negative pressure, so powder doesn't escape. You use a small compressed air pen to blow away the remaining powder (again, which is extracted, filtered and recycled). Once it's cleaned up, you can then use a number of the different infiltrants available (more later on) to make the model more stable. Now that your part is complete and ready, you simply load up the next part and start again. The system prepares itself, loads new powder and is ready for the next job at hand.

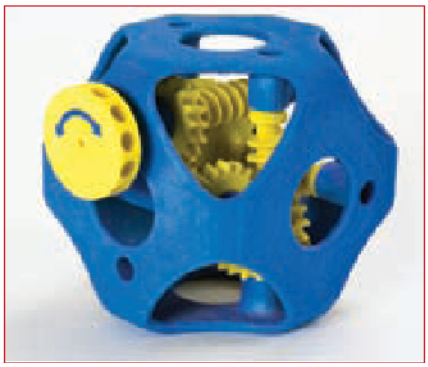
So, aside from the automation advanced, what are the differences between with this product and the existing Spectrum 510, and because this is a lower cost option machine, what's had to be compromised? The answer relates to, firstly, the build platform, which is smaller, measuring 203

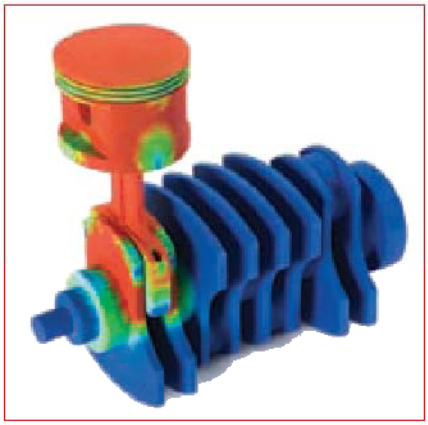
ZPrinter 450 Tech Spec

- **Build Volume:** up to 203 mm (x) 254 mm (y) 203 mm (z)
- **Build Speed:** up to 2-4 layers per minute (1" per hour)
- **Layer Thickness:** 0.089mm - 0.102mm
- **Part Resolution:** 300 x 450 dpi in X/Y
- **Colour range:** 24 bit (16,000,000 colours)
- **Primary Material:** Plaster powder composite
- **Support Removal:** n/a
- **Stackable Build Chamber:** yes (but not recommended with the automatic powder recycling)

mm (x), 254 mm (y) and 203 mm(z). Also, the print and colour resolution are not as high-definition as the 510. It prints with layers of around 0.1mm with colour resolution quoted at 300 X 450 dpi mark (by comparison, the 510 prints at 600 x 540 dpi). Lastly, you only have one material option at present, so if you're looking to make heavy use of the Z Cast or build flexible parts, then the 450 won't cut the mustard.

But how does this effect part quality? The answer is very little. The parts you get from the 450 are pretty robust once infiltrated, colour is vibrant and the resolution means that while you might not get the smoother effects of the 510, the results are just fine.





In conclusion

In terms of cost, we've discussed that this machine is the new entry level for full 3D colour printing, but what does that mean in terms of hard cash. The machine is priced at £23,400 – which in comparison to the 510 is a great deal cheaper. But you can't simply judge this machine on cost alone. The fact that it's a near closed loop system (only part infiltration is done externally) means that it can truly be operated in an office environment as there's little in the way of mesh and the machine is much quieter than previous models.

In addition, the fact that you have access to colour print at this price level means that those that may have previously considered the Spectrum Z510 now have a lower cost option and in an increasingly mainstream and competitive rapid prototyping market, that only means one thing – a machine that sells a lot of units. The ZPrinter 450 3D Printer appears to be the next generation, or at least the next major milestone in the evolution of Z Corporation's product range and even after all these years, the company is still the only vendor to offer full colour printing capabilities – something which more and more users are looking for. The good news is that the entry level to full colour just got cheaper, cleaner and as a result, much more attractive.

Product	ZPrinter 450 3D Printer
Supplier	Z Corporation www.zcorp.com
Price	£23,400