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Vibrant 3D Color Without the Mess

An office-friendly system, the ZPrinter 450 3D printer is the forerunner of Z Corp.'s next wave.

By Al Dean

Z Corporation is well known within the product development industry for doing two things. First, its 3D printers are known for the speed with which they can build parts. The rate of construction of models is quicker than much of its competition — around the 1 inch per hour mark.

Secondly, Z Corp.'s products are also now known for one single differentiator: color. Only Z Corp. offers the ability to take a full-color 3D digital model from your MCAD or CAD system and create a replica that contains not only the form of the part but also the aesthetic quality. By combining the layer-based build process similar to that found in many other systems with inkjet printing technology, Z Corp.'s machines can build your parts in 3D color, allowing you to communicate much more than just geometric form.

What is also known about Z Corp.'s products is that due to their powder-based build process, there is a certain amount of mess involved. 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 inherently a messy business — which doesn't lend itself to an office-type environment. Realizing this as a potential barrier to true "in-office" users, the company has gone back to the drawing board with its latest product; the ZPrinter 450 3D printer is redesigned to combine the things it has always done well, and addressed this key concern for many.

The three Rs of 3D Printing — Recycle, Reuse, Repeat

To get up and running with the ZPrinter 450, you connect the powder bins, the new binder fluid cartridges, and print heads. You use the new on-machine display and controls to set up the machine. Once done, you're ready to go.

But the real innovation is found when the machine starts building. The process (and postprocessing) is conducted within the unit, under negative pressure. OK, to build a part, you load it into the ZPrint software, align, and then orient your model in the build envelope as you would any other machine. When you hit print, the ZPrinter 450 checks to see if it has sufficient material to do the job. If it does not, changing the binder cartridge, powder canister, or printhead is a very simple operation.



The new ZPrinter 450 builds on Z Corp.'s existing 3D printing technology and creates a near-closed loop-automated system that takes much of the manual processes out of the workflow to create fullcolor 3D concept models.

If you do have enough materials, away you go. Your build is then sent to the machine.

The ZPrinter 450 builds each layer, depositing binder fluid and ink to create both the color and form of each layer on the vertically moving platform. The system then recoats the layer with base powder and repeats the process — building up the part.



The integrated air pen lets you remove excess powder from the model under negative pressure — that excess is then recycled and reused automatically.

Now the automation in terms of setup is new, and so too is the post-build workflow. Whereas in previous machines, you had to remove the powder manually, the ZPrinter 450 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 cleanup and postprocessing. But within the Z450, you transfer it to the next compartment, the cleanup and postprocessing station. Again, this is done in negative pressure, so powder doesn't escape. You use a small compress air pen to blow away the remaining powder, which, again, is extracted, filtered, and recycled. Once your part is cleaned up, you can then use a number of the different infiltrants available (more on this later) to make the model more stable. Now that your part is complete and ready, you simply load up the next part and start a new build.

So, aside from the advanced automation, what are the differences between this product and the existing Spectrum 510? And, because the ZPrinter 450 is a lower-cost machine, what's been compromised? The answer relates to, firstly, the build platform, which is smaller, measuring 8 3 10 3 8 in. as compared to the 510's 10 3 14 3 8 in. build platform. Also, the print and color resolution is not as high-definition as the 510. The Z450 still prints with layers of around 0.004 in. with color resolution quoted at 300 3 450 dpi mark (by comparison, the 510 prints at 600 3 540 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 Z450 won't cut the mustard.

So, how does all this affect part quality? The answer is very little. The parts you get from the ZPrinter 450 are pretty robust once infiltrated, and the color is vibrant. And while the resolution means that you might not get the smoother effects of the 510, the results are just fine in my opinion.

Truly an Office Machine

In terms of cost, we've discussed that this machine is the new entry level for full 3D color printing, but what does that mean in terms of hard cash? The machine is priced at \$39,900, which, in comparison to the Spectrum 510, is a great deal less expensive.

But alongside the cost, the near-closed loop in which parts are made means the system can truly be operated in an office environment as there's little in the way of mess. And the ZPrinter 450 is much quieter than previous models. The fact that you have access to color print at this price level means that those that may have previously considered the Spectrum 510 now have a lower cost alternative and in an increasingly mainstream and competitive rapid prototyping market, which 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. Even after all these years, it's still the only vendor to offer full color printing capabilities — something that more and more users want. The good news is that the entry level to full color just got cheaper, cleaner, and as a result, much more attractive.



An example part shows the potential for using color to communicate design concepts.

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ZPrinter 450

- > Build Speed: 2 – 4 layers per minute
- > Build Size: 8 3 10 3 8 in.
- > Layer Thickness: 0.0035 – 0.004 in., user selectable
- > Resolution: 300 3 450 dpi
- > Number of Printheads: Two — one tricolor, one clear
- > System Dimensions: 48 3 31 3 55 in.
- > System Weight: 425 lbs
- > System Software: 3D viewing, text labeling, scaling functionality

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Z Corp.'s ZPrinter 450 enables you to use color in many ways, such as this realization of FEA results in a drive system prototype.