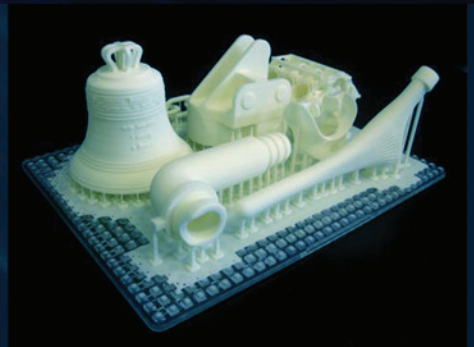




Hardware Review

3D Systems' V-Flash® 3D Printer

A Big Printer in A Small Package



MCADCAFÉ
Publishing

V-Flash®
Personal 3D Printer





Hardware Review

3D Systems' V-Flash® 3D Printer

A Big Printer in A Small Package

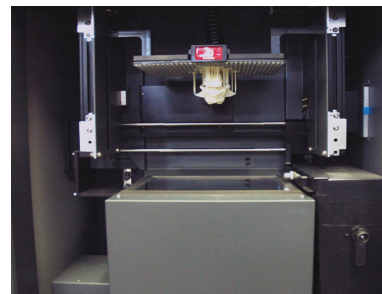
Since 3D Systems first introduced the V-Flash® 3D printer in spring 2009 it has gained a wide and diverse audience – ranging from medical professionals who use this desktop printer to model intricate anatomical structures, to students who have network access to the machine, and to artists, inventors, and entrepreneurs. This review explores why this 3D printer has gained such broad acceptance, the technology behind the printer, and also how it stacks up in a sophisticated rapid prototype service bureau environment.

How it works – Gravity is your friend



V-Flash® in Operation (Video)

The V-Flash® printer has few moving parts, and with less to go wrong its reliability is greatly enhanced. The bulk of the mechanical action takes place in the removable cartridge that contains liquid UV curable resin and a mechanism for depositing this, in layers, on a build pad. A plastic sheet, built into the cartridge, extends from the cartridge



V-flash® Door open - Printing upside down

uniformly coated with liquid resin. Then, a build pad is lowered into contact with the coated sheet which deposits a layer of resin onto the pad followed by a flash of focused UV light that hardens only the build portion of the layer. The sheet then retracts, is re coated and extends, and the process is repeated until the 3D model is complete.

During each pass only the build portion of the resin is hardened while the remaining liquid is reused for subsequent layer builds conserving and extending the life of the five-pound cartridge. Unlike other 3D print technologies V-Flash® uniquely builds each model suspended upside down from the build pad. Because gravity keeps the model suspended in place less material is needed for support posts providing additional material conservation.

3D Systems offers low cost cleaning and curing stations to round out the hardware package, and provides very well thought out print set-up software that allows you to automatically or manually place multiple 3D models on the build pad with an intuitive WYSIWYG display that shows the models' placement and orientation.

The printer also has its own unique IP address allowing you to operate it from anywhere, and technical support people, with your permission, can also access the printer to run diagnostics. Also, because the V-Flash® printer is Web enabled you don't have to do anything when 3D Systems

issues a firmware update. The update is automatically downloaded and installed for you so you're always running the latest release.

Real World V-Flash® Printing

It's fortunate that [Proto Café](#), one of Silicon Valley's most prolific 3D printing service bureaus is right down the street, and when I was invited to look over their shoulder while they used the V-Flash® printer, and then learned that their customers included the likes of Lockheed Martin, NASA, Loral Aerospace, Tesla Motors, and a broad range of large and small clients I knew that I'd hit the mother lode.

Proto Café purchased their V-Flash® 3D printer nine-months ago, complete with cleaning and curing stations, and I was anxious to learn about their experience and get a hands-on tour of V-Flash® in action.

The V-Flash® 3D printer was introduced by 3D Systems in 2009 to meet the entry level rapid prototyping demands of first prototype iterations, and for individuals, schools, and companies. At Proto Café this desktop machine is typically the first point of entry for many designs.

Sandra Madrigal, Proto Café's Founder told me that they house virtually every rapid prototype (3D Printer) machine available, with technologies ranging from [Stereolithography](#) (invented by 3D Systems' Executive VP, [Charles Hull](#) who also invented .stl, the standard format for model data exchange.), [Selective Laser Sintering](#), [ProJet technology](#), [Fused Deposition Modeling](#), and of course, the [V-Flash® technology](#) that's at the heart of this review.

"The V-Flash® is absolutely, bar none, the highest quality entry level 3D printing device on the market today," said President, Phillip Trinidad, "and, the V-Flash® really helps us by giving a non technical audience the ability to make their creations come to reality."

"These users typically come to us to do early-on iterations of their concepts, then they'll come back a second and third time, but eventually they often purchase a V-Flash® system for themselves. This helps our business because the V-Flash® printer gets them dialed into the rapid prototype iterative process, and once they're ready to move into more complex projects and designs that require ultra super fine resolution, and very tight production tolerances and materials, they come back to us to make this happen. We empower them, as V-Flash® owners to realize quickly how similar to 2D printing, 3D printing really is."

"Also, If a design firm is working on the next generation PDA, for example, and they want to feel how the phone fits in their hand, it is a lot less labor intensive to build the concept model using the V-Flash® printer then it is to machine it in foam or do [REN shaping](#)."

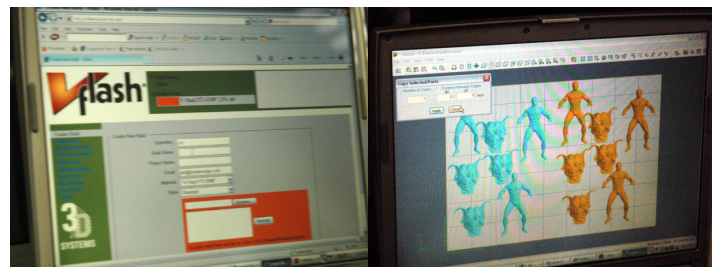
When I asked these two executives what drove their decision to purchase the V-Flash® printer they told me that their decision included a number of factors, including the price point, the high level of detail that you get on the parts, and also because they like to house as many current technologies as possible so they have options for their customers and can maintain their level of expertise.

Both Sandra and Phillip said that they've had a very good experience with the V-Flash® printer, and Sandra told me that, "There was some level of skepticism when we first saw the V-Flash's price point. But, when we experienced the quality of the parts it produced, and then to think, wow it's only in the \$10 to \$12K price range, there was no question that we made the right business decision."

When I asked Phillip if they had experienced any problems or issues with the printer he told me that, "The only time we had a hiccup was when a cartridge ran out of resin in the middle of a job, and we didn't have a replacement cartridge available. But, the good news was that the print job stopped at that point, and when we received a replacement cartridge the next day we were able to pick up the build where it left off. Other than that," he said, "we've had absolutely no problems or down time with this printer, and if we did, we know we can quickly have a 3D Systems specialist on the phone remotely diagnosing the system."

Looking Over Phillip's Shoulder

I looked over Phillip's shoulder as he began the print process by loading a disposable build pad into the V-Flash® printer and closing the door so outside light wouldn't



V-Flash® Setup & Print Software in Action

affect the build. The process flow was carefully thought out by 3D Systems' engineers, who made the software smart enough to warn you and suspend the job if you forget to load the pad.

Phillip next imported .stl design files into a computer running 3D System's configuration and print software. Phillip told me that "You can grab the .stl files locally, or by accessing them over a network." Once the models were imported, they appeared on the screen and Phillip oriented them to his liking. He also pointed out that, "When the model appears on the screen and is correctly oriented you simply hit Print and the machine gets to work."

Most times you'll want to create variations of your model, produce more than just one, or produce multiple models on one tray. You're not limited to producing one design per job, but can load as many different designs as will fit on the board. The computer's screen displays the pad and shows how your part or parts are oriented and fit on it. You can scale and place your parts manually while looking down on the loaded pad and you can quickly create copies of your models with a simple click and drag of the mouse. If a model goes over the tray's boundary edge during manual placement the part turns orange to warn you. You'll never get this warning however, if you let the software automatically place the models on the board in the most space efficient way.

Finally, Phillip clicked the Print button on his computer and the V-Flash® did, in fact, get to work. The whole process was as fast and easy as printing on the 2D printers that we're all familiar with.

Once the job was working Matt Sehenuk, Proto Café's General Manager gave me a quick tour of the V-Flash® cleaning and curing stations. He told me that, "You immerse the new part into the cleaning station that's filled with solvent, and it's then cleaned by agitation." He also said that, "You could, of course clean the part by hand, but this just isn't a practical option in this production facility." He next showed me the curing station where the part is bathed in bright UV light to take it to its final cured state. When the part first comes out of the V-Flash® printer it is approximately 95% fully cured and exhibits a slight yellow-greenish tint. Later, when it pops out of the curing station it's fully cured with a consistent cream surface color, true-to design detail, and a smooth hard surface finish.



Multiple designs on build pad. (Shown in display case)

The Specs

For a cost effective and affordable 3D Printer V-Flash® boasts some very impressive specifications:

- Build volume: 230 x 170 x 200 mm (9" x 6 ¾" x 8")
- Build speed: Up to 10mm (0.4") per hour (Z)
- Native Resolution: 728 x1024 DPI (xy)
- Layer thickness: 102µ (0.0004")
- Min. vertical wall thickness: 0.64mm (0.025")
- Standard 110 / 220V outlet
- Office environment
- CE, cTUVus, RoHS, and WEEE compliant

([View the full specs here](#))

Summary

The V-Flash® printer's well thought out and simplified design makes it extremely reliable by definition. I also found it to be as easy to use as my desktop printer, and can now understand why it's been such a popular addition to 3D System's product line.

3D Systems pioneered 3D printing when it was founded in 1986 by Chuck Hull, the inventor of Stereolithography and the .stl file format. Chuck remains with the company as its CTO and Executive VP. Today, 3D Systems is the only company in the industry to offer a full range of additive manufacturing technologies, from production systems to 3D printers, materials and complete design-to-manufacturing solutions.

Along with the invention of Stereolithography (SLA) they've acquired and continue to develop Selective Laser Sintering (SLA) systems and materials.

3D Systems has taken their knowledge and experience and applied it to the V-Flash® 3D printer, designed to offer an affordable and easy to use solution that addresses the needs of almost every industry – aerospace and defense, transportation, architecture, education, medical, dental, and consumer goods – and that fits perfectly into the workflow of a typical 3D printing service bureau like Proto Café.

[Click here](#) to learn more about this versatile 3D printer.

By David Heller

David Heller has written more than twelve technical and fiction books published by Addison-Wesley, Simon & Schuster, Prentice-Hall, McGraw Hill, and more, and is a technical writer and professional columnist.