MakerBot Replicator+ 6th generation 3D printer review

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With this 6th generation, MakerBot has fixed some major issues and upgraded some key aspects of its technology with the latest version of its flagship desktop 3D printer, the Replicator+. You can buy it through Makerbot directly if you're in the US. Us Brits can get it through Amazon UK.

The company claims the MakerBot Replicator+ prints 30% faster than its predecessor and that it has a 25% larger build volume – an area of 29.5 x 19.5 x 16.5cm. The machine's gantry and z-stage rails (*below*), on which the print head moves back and forth and side to side, were also redesigned for greater precision and reliability, according to MakerBot.

While I did see some marked improvements in this sixth generation of the Replicator line of desktop printers, it still fell short of my expectations in both print quality and speed. But let's talk about some of the pluses first.

As with past MakerBot Replicator desktop 3D printers, this is one of the best-looking machines on the market. The Replicator+ and its Smart Extruder+ are well-designed products and have lots of bells and whistles, such as an onboard camera

with 640p x 480p resolution that allows you to watch objects being printed from your desktop or mobile device.

Theis 3D printer is substantial. It has a smart look with its black plastic unibody and LED-lit interior. The filament reel loads onto a rack that slides down and disappears into a rear compartment, which also saves space.

The Smart Extruder+ comes with its own processor and has a sensor system that communicates with the MakerBot Desktop application (available for OS X or Windows) and the MakerBot Mobile app (for iOS or Android) to keep users informed about the status of a print wherever they go. For example, the filament detection sensor notifies users – on their computer or smartphone – when filament is absent and automatically pauses to enable print recovery.

Another attribute is how the Smart Extruder+, which I reviewed earlier this year, simply attaches itself magnetically to its mount for easy cleaning or change out.

MakerBot is also the founder of the industry's oldest and most robust user community website, Thingiverse, which offers makers the ability to download hundreds of thousands of printable designs.

As with the last MakerBot Replicator I reviewed, setup of this machine was a snap. I had it up and running in about 10 minutes.

After removing packing material and loading the PLA filament spool onto a retractable hanger bay, you simply follow the instructions on a startup menu on the MakerBot's 2.25 in. x 2.75 in. LED screen. The machine's build plate is also factory-leveled so the printer doesn't need to be leveled out of the box, as was necessary with its predecessor.



The Replicator+ has an easy-to-navigate LED screen.

You can also wirelessly pair the Replicator+, which acts as a Wi-Fi hotspot, using the MakerBot Mobile app, which allows you to print from your smartphone or tablet. The Replicator+ has an Ethernet port and is cloud-enabled so you can control it remotely with the MakerBot Print desktop app or the MakerBot Mobile app. I stuck to using a USB cable to import .stl files to the Replicator+.

With MakerBot Print – the company's free CAD/slicer software – you can import .stl files and auto-arrange models during print preparation, and then print them on one or more printers.

The Replicator+'s build plate was also redesigned so models now adhere to it far better than they did on the previous generation of printers. The last Replicator desktop I tested had big issues with model bases warping prior to print jobs finishing because they detached at the edges from the build plate. I even used masking tape to help models adhere – to no avail.



The Replicator+ was able to easily handle printing multiple projects at the same time. Here's the result of printing four Pokemon-style chess pieces, which it was able to complete in relatively good time – one hour and 50 minutes.

Another aspect of the new build plate that I really loved is that it's easily removable – it simply slides forward and off – and it's extremely flexible, which helps in removing models after they're finished. Just remove the plate, bend it this way and that, and the models more easily detach than they did from the previous machine.

Lastly, MakerBot claims this new printer is "28% quieter" than its past machines. I'll heartily agree with that statement.

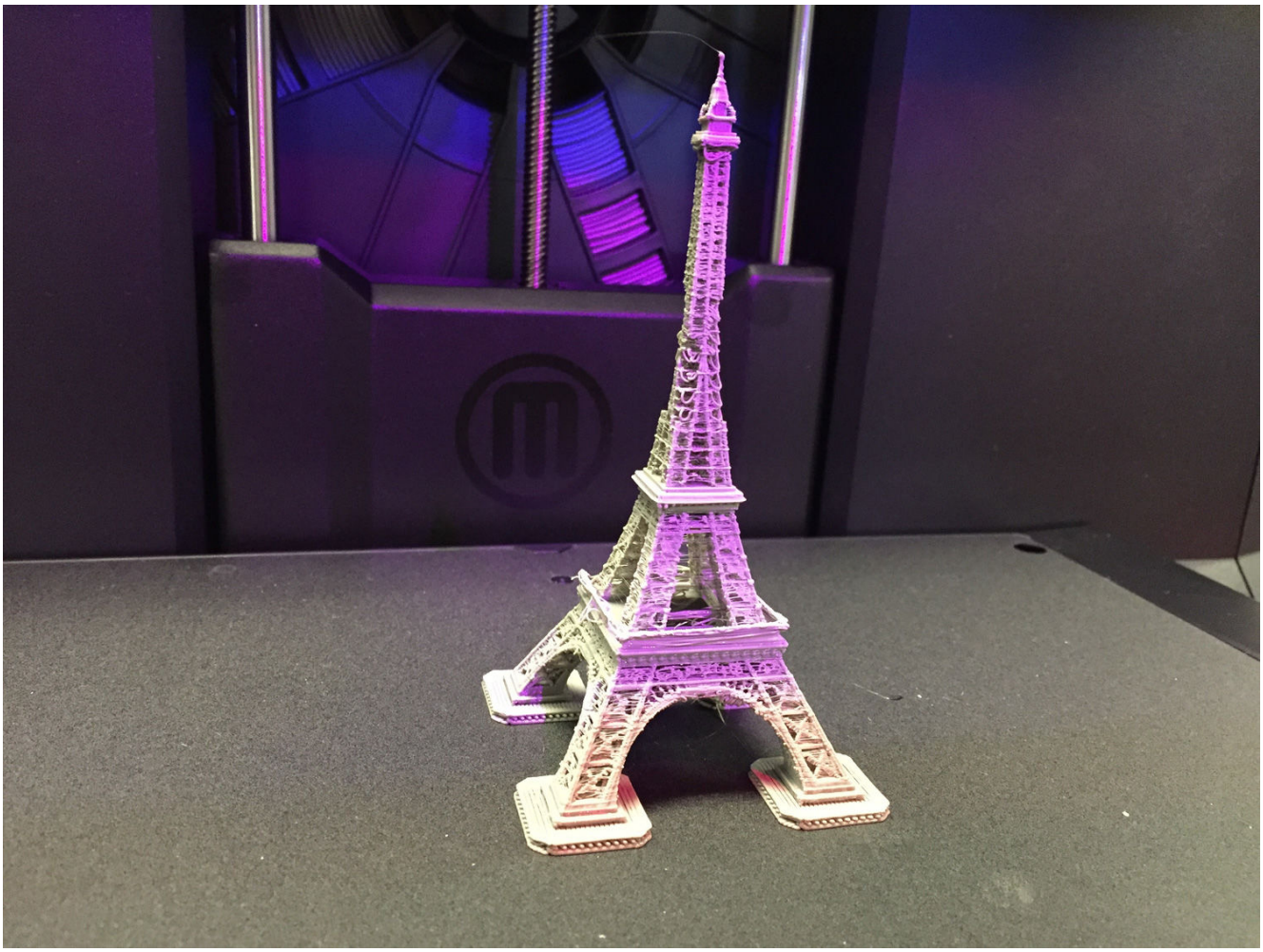
Print quality

The first print job I completed was a five-link chain that came in the Replicator+'s onboard flash memory. It printed accurately and without problems.

Next came my litmus test for all 3D printers: The Eiffel Tower.

The last MakerBot Replicator I tested was unable to print my go-to, 5-in. tall model of the Eiffel Tower. It’s an intricate piece with a great amount of detail in its scaffolding that’s always a challenge for 3D printers to replicate. Some are more successful than others. The previous Replicator, however, was unable to complete the task and ended up extruding a spaghetti-like hairball atop the first stage of the tower.

The new Replicator+, however, was able to finish the task, though not as accurately as I’d hoped it would. While the model was decent, small details such as the tower’s inner latticework and pedestrian walkways and handrails were far from accurate, in fact, the handrails wound up as a collapsed thread around the outside of the tower.

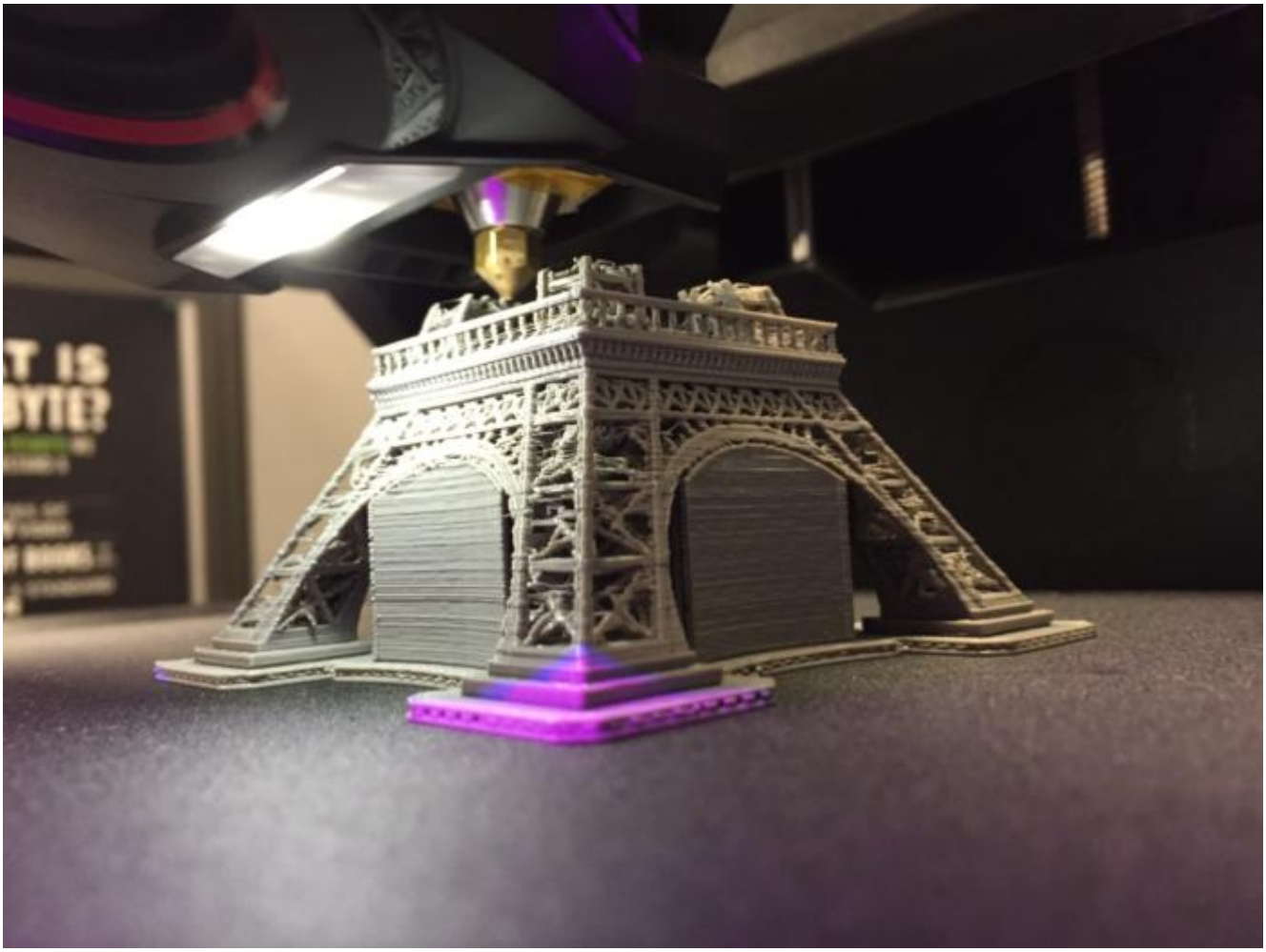


The Replicator+ struggled to create more intricate details on

models. Here, a 5-in. model of the Eiffel Tower was completed in just under two hours, but the spire and lower pedestrian walkway and railing were not accurately reproduced.
MakerBot's technicians sent me another .stl file containing another version of the Eiffel Tower – about 30% larger than the original job (or 6.5 inches in height) – to print. That print job completed the pedestrian walkway and had some success with the scaffolding, but the detailed latticework was poorly formed. This, I believe, is mostly due to the machine's rather poor resolution. It also took about five hours to complete the task.

While the Replicator+'s specifications state it's able to create layers from 100 microns to 400 microns (0.001mm to 0.004mm) in size, it was sometimes not accurately extruded – leaving finished models with more post-print cleanup than I'm used to.

As far as speed, the smaller Eiffel Tower took one hour, 55 minutes to complete. Compared to one of my more favored printers – the $1,250 (Amazon price) LulzBot Mini that I reviewed last year – the MakerBot Replicator took about 10 minutes longer to complete the task. The Lulzbot was also far more accurate in creating details.



Lucas Mearian

The 6.5-in. tall Eiffel Tower during its build. The Replicator+ automatically deposited both the raft and the scaffolding to help support the tower's arches. While it built the tower sufficiently, the details were somewhat muddled.

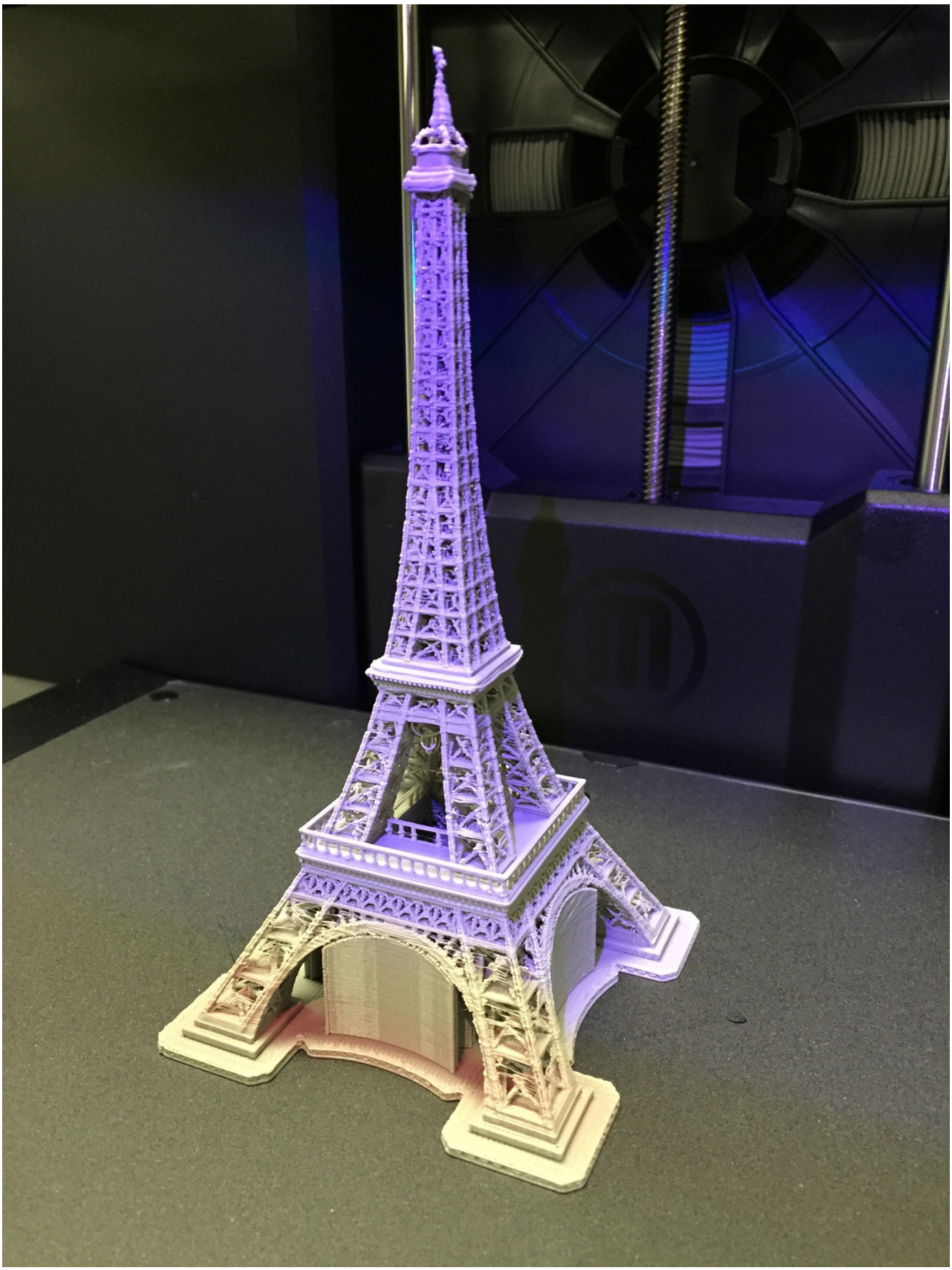
Next, I printed a set of four Pokemon-style chess pieces. The print job tests how well the machine is able to build multiple objects at the same time. Again, the chess pieces were completed, and relatively quickly (in one hour and 50 minutes), but there was more post-print cleanup needed for filament that went astray or hung down from tails and ears.

Overall, I think the chess piece print job was a success. However, the pieces were no more precisely replicated than those I'd printed previously on a $270 machine – XYZprinting's da Vinci Mini. But the da Vinci Mini failed to accurately reproduce the Eiffel Tower – so it did lack the level of precision for more intricate models that the MakerBot offers.

No longer a consumer player

With a comparatively high price point, the MakerBot Replicator line was never a big seller in the consumer market.

In September, MakerBot CEO Jonathan Jaglom announced the company was “repositioning” itself away from the home and hobbyist market to focus more on selling machines to educators and small businesses – the two leading arenas for desktop 3D printers, according to analysts.



The completed 6.5-in. tall model of the Eiffel Tower. The Replicator+ was able to complete the task in about five hours.

While the home consumer market isn’t booming, 3D printers, materials and services are seeing double-digit growth year

after year. 3D printer shipments are expected to experience a compound annual growth rate (CAGR) of more than 16% through 2020, according to IDC's U.S. 3D Printer Forecast, 2016-2020.

Revenue from 3D printing hardware alone is expected to grow from $815 million last year to $1.96 billion in 2020. The largest segment within the 3D printing market is fused filament fabrication, or fused deposition modeling (FFF/FDM) machines. Last year, FFF or FDM printers made up 76% of the 3D printers shipped in the U.S., according to IDC.

While the majority of those printers are at the low end of the market, the consumer segment "has clearly not materialized as many had predicted," IDC said. That's pushing many 3D printer makers to shift toward producing higher-end machines aimed at the education and professional prototyping markets.

So while MakerBot, which was purchased by commercial 3D printer manufacturer Stratasys Ltd. two years ago, is selling the right technology, it has struggled with sales and in the third quarter of 2016 suffered a 29% revenue decline year over year. Stratasys and its chief competitor, 3D Systems, have also struggled.



On the left is a Pokemon-style chess piece printed with the cheap da Vinci Mini 3D printer from XYZprinting. On the right is the same piece printed with the MakerBot Replicator+. While the Replicator+ was able to create better detail with more intricate objects – such as the Eiffel Tower – on less detailed pieces, the difference was not as noticeable.

FDM 3D printers aren't particularly fast in the first place, because they work with layer upon layer of thermoplastic filament, but some machines are markedly faster than others. The MakerBot Replicator+ isn't one of those. The machine sits squarely in the middle – it's neither really slow nor really fast.

The MakerBot Replicator+ is also limited to one type of filament, the popular and biodegradable polylactic acid (PLA). Other consumer and commercial 3D desktop printers offer the ability to print with two or more common materials, such as acrylonitrile butadiene styrene (ABS) or polyvinyl alcohol. It's simply a matter of allowing the extruder temperature to

be adjusted for those other plastics.

Machine quality issues

I've encountered quality issues with MakerBot's Replicator desktop printers in the past. Their Smart Extruders seem to court problems, such as filament extruder jams. I've sent more than one head back to the company only to have another fail as well. This time, the print heads weren't a problem.

My first Replicator+ review unit, however, was still unable to print, even after troubleshooting it with MakerBot technicians over the telephone, so I ended up sending the machine back to the company. The problem turned out to be with the print head offset to the build plate; it kept positioning itself directly against the build plate, so it was unable to extrude filament. Instead, the print head scraped itself across the build plate, damaging it. (The print head must be positioned at the correct distance from the build plate or it won't work properly, if at all.)

MakerBot technicians discovered the machine I'd been using was missing its "Homing Pins" – three small plastic cylinders that insert into the two front holes and a back center hole on the build plate. They're essential to calibrating the distance of the extruder to the surface, and without them some of the homing procedures may work, but printing will always be unsuccessful.

The issue, MakerBot stated in an email to us, is known to affect "far less than 1%" of its printers, and the company thought it had already discovered and corrected the issue.

A few weeks later, I received a second review unit, which worked without problems.

Bottom line

Each time I receive a MakerBot 3D printer, I hold high hopes for its success. It’s an expensive desktop machine that boasts a lot of thoughtful engineering and high-tech bells and whistles.

Unfortunately, in the two areas that count most – print speed and quality – I think this machine still falls short and MakerBot still has work to do to address this.

I have no doubt that the Replicator+ is a better quality machine with higher reliability than its predecessors. But if you’re going to charge $2,500 for a desktop printer, I believe it had better produce some of the highest-quality print jobs around, and this machine simply doesn’t.

Once again, I cannot recommend the MakerBot Replicator+. While it’s nowhere near the bottom of the market in terms of quality, I believe it sits squarely in the middle – and for the price, that’s not a good place.