

3-D Printing Expands Possibilities

There's a charm, right? At least that is what I hope with this DMI ripper project! I remember stating in the first article I did on the ripper that sometimes you have to take yourself out of your comfort zone. Well, this project still has me out of my comfort zone. There are days when I am grateful for the experiences and the knowledge I've learned. And then there are days when I wish I would have given that ripper back to the owner and told him to find someone else! But seriously, I have learned a lot.

Last time, I explained quite a few aspects of 3-D printing, including the types of printers. I also gave some insight on printed metal parts.

With the parts I had printed, I continued to make progress on the ripper. I was able to use the printed metal parts to give the ripper the detail I wanted. I used a carbide 0.050 end mill to do my drilling. It wandered from time to time, but it did an excellent job drilling the bronze and stainless steel parts. I just had to be careful to make sure the bit was started in the exact place I wanted it.

For the spring-loaded shanks, I found a nice 0.200-diameter spring that fits into the spring assembly. Along with a few 0-80 bolts, things were coming together.



A 3-D printed U-bolt fixture.

I was able to get the disc assembly working just like the real model using a scratch-built cylinder, along with the spring dampening assembly. The hitch mount was fitting good and was bolted to the main frame, then the tongue hitch worked in both the single and double bar configuration.

I had attempted to have the main lift assembly printed in bronze, but when the price came back at \$70, I figured I could build this piece out of brass for far less. After I built the lift assembly, I also added some of those scratch-built cylinders. I found they were too stiff to lift and lower the ripper, so I applied a small amount of penetrating oil to the cylinder rams. Then it would not hold the ripper in the lifted position. After trying to remove the excess oil from the ram, I finally just disassembled the cylinders and cleaned them. They do a better job holding the ripper up, and you can at least move them now.

Now that the rippers and disc assembly, along with the frame, were assembled, it was time to move onto the disc itself. The disc blades are held on through an arm that uses two U-bolts wrapped around the frame, then sit at an angle, holding the 24-inch blade.

I had a bunch of the original blades and mounts

that were all just glued together on the Gottman model, but I wanted better. I decided to produce the parts in 3-D again, so I set out to duplicate the parts but with better detail. With a little effort, I was able to draw the disc blade mount so that it used the two U-bolts, just like the real model. But I wanted to try a different printing style. Shapeways offered a high detail print, so I chose to take that option.

With the disc blade mounts drawn, I knew I was going to have to build those U-bolts one at a time. With 20 blades, that meant 40 U-bolts. But why not build a fixture in the virtual world and have it printed? So, that is just what I did. I drew the fixture with a couple different options, just in case my math wasn't right, and I sent that file as well. I decided to have the fixture printed in bronze after seeing the incredible strength this product had. Two weeks later, I had disc mounts and a fixture.

With the fixture in my possession, I made a trip to Ace Hardware and purchased piano wire, which is basically just solid steel rods with a very fine diameter. I had intended to use 0-80 as the size of the U-bolt, so I was going to need piano wire 0.058 diameter and then use a die on each end of the bolt to cut threads and mount the disc



Some of the assembled parts. The gold parts are printed bronze.

mounts.

After purchasing the piano wire, I discovered it was probably one of the best investments for this project. I could stick one end of the piano wire into the fixture until it bottomed out. I then used a vise grip and clamped the wire to the fixture. After clamping it, I bent the wire and used a hammer to get a nice tight 90-degree bend. Then I clamped a second vise grip to hold that bend and removed the first vise grip. With the second vise grip, I made the second 90-degree bend, creating the U. With the second bend made, I cut the wire off flush with the base of the fixture and started another bolt.

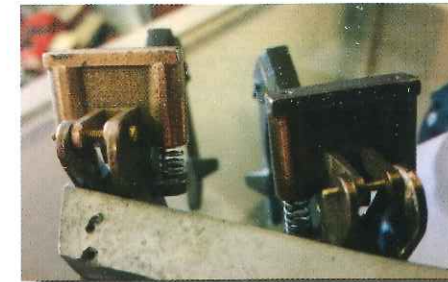
Once I had 40 U's, I used the 0-80 die to cut a thread on each, making the U-bolt. I then assembled them onto the ripper. This is where I learned that the high-detail printed part did indeed have a better finish and more detail. But it was also more fragile. I managed to break a few during assembly and later while handling the ripper.

Next were the blades. I had lots of the cast blades that would fall apart without doing much more than touching them. I remembered I once had a fixture made to stamp fender washers into disc blades. I purchased 1.5-inch fender washers with 3/16 centers. First, I took the washers to the bench grinder and cut a knife edge on each of the blades. Then I used my fixture, along with an arbor press, to bend the disc blades. After the blades were all knife edged and bent, I used some 3/16 rivets and installed them onto the mounts.

This brings me to where I am at right now. I do not know 100 percent what the future of this project is going to be. I have talked with a spin-cast operator about casting all the parts I had printed, hoping I could get the cost of the ripper down to a sensible level. Without any of my labor, I have more than \$1,000 in 3-D printed parts in this ripper. If I use these 3-D printed parts as prototypes, I could get that cost down to where it needs to be. I will tell you that this 3-D print is outstanding for prototypes.

I have drawn a model of the Detroit 8-71 engine that I plan to install in a Precision 5020, making a Kinze conversion. I have had numerous 1/16 scale tires printed to be used as prototypes. I have friends building parts for 1/16 scale pulling tractors and 1/64 scale implements.

It is definitely like a lot of other



The spring assembly for the shanks installed. The silver one is stainless steel while the gold one is bronze.



The disc blade stamp I had made.



The ripper at this point.



My 12-inch disc sander.

items – that new phone, that new truck or that new TV – there is a lot to learn. I have learned that I am not nearly as good as some others, but I have also learned that there are people who will help you just like they helped me.

Trying to mass produce by using 3-D printing may not be the best route with 1/16 scale due to the size and the pricing of the parts. But if you use the 3-D printing along with resin casting, spin casting or whatever form of reproduction you can do, these printed parts can open a whole new world to many custom builders and fabricators.

The ability to make things square, centric, even or parallel just raises the bar of the hobby. I could not imagine trying to build some of the items, especially tires, without the help of 3-D printed parts.

Tool of the month

This month, I am going to focus on my 12-inch disc sander. I feel it fits in with the whole prototype theme here. I bought my one-horsepower electric disc sander from Northern Hydraulic for about \$150.

I know most of you may think you don't need a sander like this and it is

too big, but I can tell you I would be lost without it. It gives you a straight edge! Do you know how nice that is?

I cannot begin to describe all of the different ways I use this sander. I have used it numerous times on small projects, but then used it when building large products when you need to have extreme control of the item you are sanding. I most often use an 80-grit paper I get off eBay.

Living just northwest of Dyersville, Iowa, in the heart of farm country and farm toy replica country, Chuck Steffens has found a niche in the toy world, building high-detailed replicas in his spare time. He shares his experiences with Toy Farmer readers, hoping to lead other collectors to personalize one of their own tractors. Comments or suggestions can be directed to csteffens@wildblue.net.

