Using New Manufacturing Technology to Restore Old Parts

1934 Alvis Firefly Door Lock Repair John Balthazar

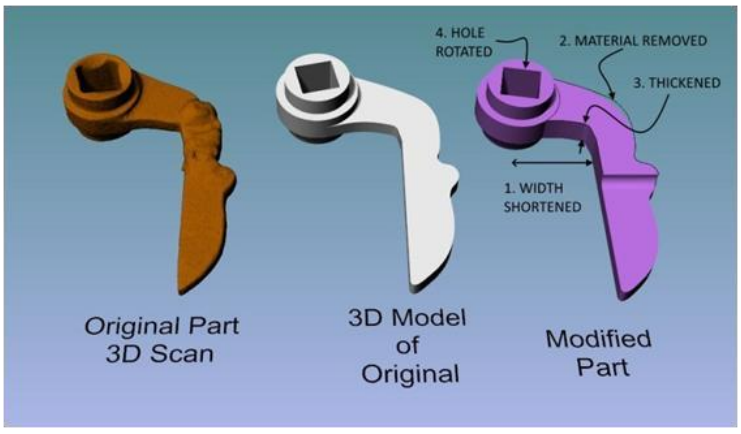
Repairing small components on old cars can be a very time consuming and frustrating exercise. The following is a simple example of how so called “advanced manufacturing technologies” can be used to speed up the procedure and, in the process, improve the design.

The problem: A faulty door latch. The problem manifested itself by the driver’s outside door handle no longer opening the door latch. The door could still be opened using the inside handle but, being a sedan, this was a little inconvenient.
Removal of the latch quickly identified the problem as being a broken lever within the lock mechanism. This lever showed obvious signs of having been repaired repeatedly in the past with multiple blobs of weld and numerous cracks. See image.
Traditional approaches to rectifying this situation are: 1. re-weld and clean up and hope it doesn’t break again; 2. re-weld, clean up and use the original as a pattern to sand cast a bronze replacement. 3. Fabricate a new one, even though the square hole is a bit of a challenge.

An additional problem was that the door handle never really did operate correctly. For some reason handle rotation was limited and would only just release the catch. Investigation found that this was due to this lever prematurely making contact with another lever used by the inner handle, stopping it from rotating. Trying to overcome the problem, owners have had to apply more force to the handle than it was designed for – contributing to the stress fractures.
Having access to some advanced technology in the way of a 3D Scanner, CAD (Computer Aided Design) Software and a 3D Printer, I decided to try a new approach.

First the broken part was superficially glued together using superglue and bicarb-soda (as a filler).
The now whole part was placed on the scanner and scanned from various directions to produce a digital copy of the part along with all of its imperfections.

This digital copy was then brought into the CAD software and, together with a Vernier to make accurate measurements of the square hole and round bush diameter, used as guide to remodel the part.

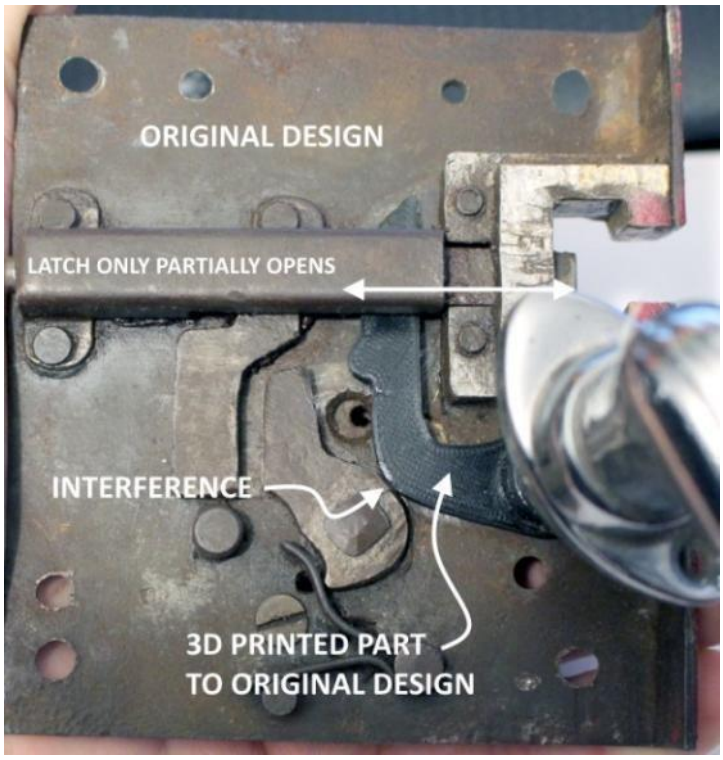


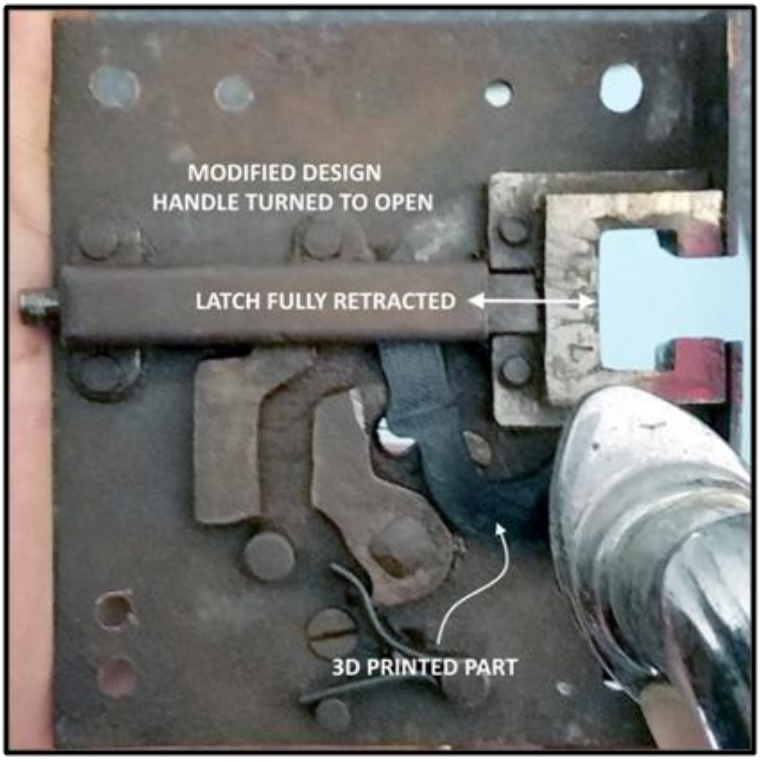
This re-modelled part was then 3D printed using a PETG plastic (Polyethylene terephthalate glycol). Not as strong as the metal part but good enough for testing purposes.

This part is about 60mm long and 14mm deep and took a bit less than an hour to print. That is a long time to sit and wait but considering you can just let it run unsupervised and go off and do some shopping with the wife, it’s a real win win.

The 3D printed copy of the original part was installed back into the latch assembly and tested. It was immediately evident where it was interfering and how the design could be improved. A test fit on the car also reminded me that the handle never sat horizontal but always drooped down a few degrees.

With these improvements in mind, the part was redesigned in 4 ways: 1. To give more clearance to the other lever, the arm was moved closer to the pivot. 2. Some material was removed from the outer edge. 3. To improve the strength and resistance to fatigue, the lever was thickened up, and finally 4. The square hole was rotated a few degrees to





correct the droopy handle.

Another hour later and the modified part was ready. It proved to be a great success. As it turned out, the PETG with the modifications felt like it was completely adequate to perform the job and was installed in the car. Time will tell… Nylon would have been a better choice of material; it is much stiffer, with better wear resistance and durability than PETG, but I didn't have any at the time.

So how practical and cost effective is this new approach?

Total time spent including scanning (15min), design (60min) and printing two design iterations (120 min). About 3½ hours in total including testing. Not a lot of time from the hobbyist point of view but perhaps a different matter if you are paying a professional at commercial rates, particularly where only a single part is required.

Given that you have the digital model of the part, the cost for having the part commercially printed in Nylon is about $20.00. To have the same part printed in metal is about $80.00. This is an example of a simple part with no critical tolerances or high speed bearing surfaces. If this was the case, then a metal printed part may be needed – requiring additional finishing on a mill and or lathe.

The biggest impediment to using this technology in the backyard workshop is having access to the advanced technology and also the skill set required to use it. There are numerous free, cloud-based CAD systems on offer. They do however require a lot of time and dedication to master. The scanner is not really necessary but it greatly simplifies the reverse engineering of existing components, particularly parts with complex geometry.

3D printing has limitations and is not a panacea for all restoration work. It is just another tool we should consider. 3D printing technology is evolving at a tremendous pace and with time will be cheaper, faster and stronger, and it will definitely replace the use of fabrication and sand or investment casting as the preferred method to produce smaller parts like these.