



Figure 1: An untreated metal insert.

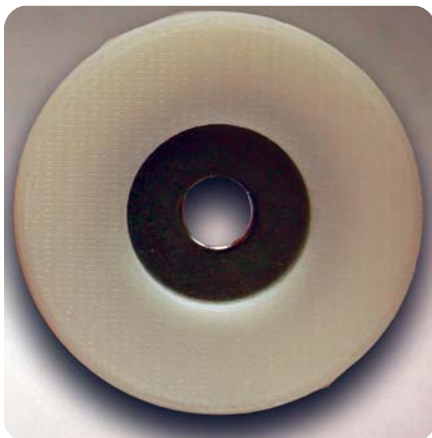


Figure 2: A treated metal insert.



Figure 3: Degreasing metal insert.

## Plastic adheres to metal with a simple spray.

### Real Challenge

It is well known that a part being built on an FDM system can be paused and a metal object inserted into the part being built. But the challenge is to properly adhere the FDM material to the metal insert once the build is resumed. There are mechanical and chemical differences between metal and FDM plastic that prevent adhesion.

Previous attempts have produced parts where the FDM plastic layers directly above the metal looked like figure 1. After closer inspection of part in figure 1, the tool paths had not adhered to the metal at all. At best, the tool paths had stretched across the space at different points. It was many layers above the metal before enough material had accumulated for the part to take proper shape again.

### Real Solution

Since the FDM build process starts out every time on a clean sheet of acrylic, to fix the problem, one needs to somehow coat the metal with acrylic and the FDM plastic should adhere to it. After some experimentation, it was determined that one needs to coat the metal with an acrylic spray before you extrude FDM plastic over it (fig 2).

To perform the process, one must understand the following:

- FDM parts can contain a metal object as long as the metal object has a flat and true top horizontal surface when inserted.
- While processing the part in Insight Software, it is necessary to manually remove the support tool paths from the cavity where the metal insert fits into the FDM part.
- When processing the part in Insight Software, it is possible to insert a “pause” in the build process at the layer that is on the same plane as the top surface of the metal part.

To apply acrylic treatment to the metal part it is recommended that the metal insert first be wiped clean using a degreaser and soft cloth (fig 3). The degreaser used in experimentation was PPG’s Acryli-Clean DX 330.

Once the metal part is clean, set the metal part face up on a piece of cardboard in an area that is clean and dust free. Spray one coat of acrylic on the metal and let set for 5 minutes. A second coat is suggested, setting for another 10 minutes (fig 4). The acrylic spray used in experimentation was Rust Oleum – Painter’s Touch – Multi Purpose Paint - # 1901 Clear Gloss Acrylic.



Figure 4: Spray with acrylic.



Figure 6: Press firmly on the insert.



Figure 5: A few drops of super glue aids in preventing movement of the metal insert.

A few drops of cyanoacrylate (typical super glue) aids in preventing movement of the metal part after the build resumes. At the time of build pause, open the door of the FDM machine and place a few drops of cyanoacrylate on the plastic surface that will interface with the metal object (fig 5). Immediately insert the metal object into the cavity and apply pressure for a few seconds while the cyanoacrylate sets (fig 6).

Wait 2 minutes for the metal insert to warm up and resume the build. Once resumed, you will find that the FDM plastic will extrude seamlessly over the metal surface, laying down perfect beads of road and raster.

## Real Results

Stratasys applications engineers discovered that FDM plastic will extrude seamlessly over metal surfaces laying down perfect beads of road and raster if the metal is first coated with acrylic. The result is adhesion never before possible.

## More Information

Contact a Stratasys Applications Engineer by calling 800-937-3010 or visit [www.stratasys.com](http://www.stratasys.com) for more information.

For more information about Stratasys systems and materials, contact your representative at +1 888.480.3548 or visit [www.stratasys.com](http://www.stratasys.com)

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