APPLICATION BRIEF:

PAINTING FDM PARTS

STRATASYS
3D Printers and Production Systems

OVERVIEW

Fused Deposition Modeling (FDM) parts are often considered to be ideal for prototyping, research and non-visible production applications, but it is commonly believed that FDM parts cannot be finished to the level required for models that will photographed or displayed or be visible production parts. FDM technology is an additive manufacturing process that builds plastic parts layer-by-layer, using data from CAD files. FDM parts can be finished and painted to meet the cosmetic requirements for virtually any application. This means that it is now possible to take advantage of the cost savings, design freedoms and lead time advantages provided by FDM in a wide range of new applications.

APPLICATION OUTLINE

Finishing FDM parts requires patience, experience and knowledge. Build the part with as a good a surface finish as possible to minimize finishing steps. It's important to note that internal cavities are more difficult to finish, and this should be considered when designing the part. But internal surfaces often don't need to be finished or painted because they are not visible. Use a high resolution when converting the CAD model to an STL file. STL files with poor resolution will have facets that require a lot of finishing to remove.

Build the model using either the solid or sparse fill style. Orient the part vertically to minimize visible steps because these will require additional sanding and filling to remove. Select the material with finishing in mind. ABS-M30 and legacy ABS materials are usually the easiest materials to finish. Other materials can also be painted but require a little more finishing effort.

Consider using a finer resolution tip size if the part has many features or complex, curved surfaces. Finer slices have higher feature detail and less porosity so the resulting parts will be easier to finish. Process the parts using the latest version of Stratasys Insight build file preparation software and set the "visible surfaces" style to "enhanced." Remove supports manually or by using the WaterWorks soluble support removal system. If WaterWorks is used, rinse the part to remove WaterWorks solution. Dry the part under a fan. Perform an initial chemical smoothing of the outer surface using either the Finishing Touch Smoothing Station or a brushed-on solvent (optional).

Spray a light coat of primer (optional) to visualize areas that require filler. Allow to and then apply body filler to the model in areas where needed and wait for the filler to cure. Sand the filler and clean the part with wax and grease remover. Apply the first coat of primer, Check the model for any imperfections and fix them with body filler and sandpaper. Wet sand the model and clean with wax and grease remover. Apply a second coat of primer if necessary and repeat the process until the surface finish of the model meets the requirements of the application. Then apply one or two coats of paint and clear coat, matte or gloss, to protect the paint.

APPLICATION CHECKLIST

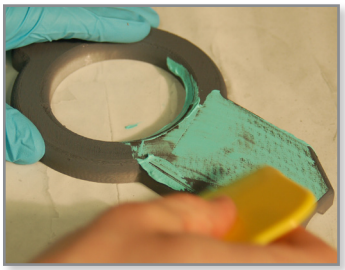
FDM PAINTED PARTS ARE AS BEST FIT WHEN:

- √ Display models/sales samples with durability of molded thermoplastic
  - Low-volume production runs
  - Custom products
  - Pilot projects
- √ Bridge-to-production
- √ High-value, low-quantity parts
- √ Stable, non-reactive properties needed
- √ Rapid delivery of complex and cosmetically pleasing parts

BENEFITS OF FDM PAINTED PARTS INCLUDE:

- √ Complex parts without molds:
  - 30% to 70% lead time reduction
  - 50% to 70% cost reduction
- √ Functionality and appearance of production parts

Applying the first primer coat



Body filler fills in voids.

Sanding the FDM part.

Applying a second coat of primer.

CUSTOMER STORY

Product Development Solutions (PDS) is a full service prototype and production service bureau specializing in CNC machined and cast urethane parts for a wide range of industries including medical, aerospace and consumer. PDS is not a manufacturer of rapid prototypes but rather it and finishing and painting services for rapid prototypes produced by its customers. MR Instruments, a company that develops RF coils for MRI equipment, offers an example of PDS's services for paint FDM parts.

Traditional approaches to building coils for magnetic resonance imaging (MRI) machines include CNC machining and room temperature vulcanization (RTV) silicone rubber molding. These approaches can be expensive and involve long lead times. Many companies producing MRI machines have begun using FDM parts for production coils.

"Up to now, the use of FDM parts has primarily been limited to research machines because many MRI manufacturers believe that FDM parts cannot be finished to the level required for machines that will be used in clinical applications," said Dave Reasor, sales manager for PDS. "We have applied our experience in finishing molded and machined parts to develop methods to finish FDM parts to meet the cosmetic requirements of MRI machines used in hospitals and clinics."

Reasor cites a recent project for MR instruments. The company previously spent about $850 to make a complex coil part with high cosmetic value for marketing or production. The lead time was about seven days. Now the company will purchase an FDM part from a service bureau that are finished and painted by PDS. Total cost is only $320 and delivery time is reduced to five days.

How Did FDM Compare to Traditional Prototyping Methods for PDS?

Method	Cost	Time
CNC machined painted parts	$850	7 days
FDM painted parts	$320	5 days
SAVINGS	**$530 (62%)**	**2 days (29%)**

Using body filler to touch up the part.

Painting the FDM part.

Inspecting the finished part.

For more information about Stratasys systems, materials and applications, contact Stratasys Application Engineering at 1-855-693-0073 (toll free), +1 952-294-3888 (local/international) or ApplicationSupport@Stratasys.com.

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