Antero 800NA
Best Practice

Antero 800NA is a high-performance polymer with strong mechanical properties along with exceptional material properties – such as temperature resistance, chemical resistance, exceptional wear properties, and ultra-low outgassing – making it ideal for low-volume, highly customized production parts and functional prototypes that need to withstand more intemperate conditions. Antero 800NA's primary advantages over Stratasys' high-performance materials – ULTEM™ 9085 resin, ULTEM™ 1010 resin and PPSF – are its high chemical resistance, low outgassing, and wear properties.

System Overview and Compatibility

Antero 800NA is available on the Fortus 450mc and Stratasys F900 with a 0.010 inch (0.254mm) slice height. It uses a new support material, SUP8000B™, which is a breakaway support system similar to the other Stratasys high-temperature material offerings. This support material is however, easier to remove than the other breakaway support systems. Antero 800NA will require the hardened system upgrade and will utilize a custom T20F tip for the model material, an existing T16 tip for the support material, and a new purge ledge specific to Antero 800NA.

Note: The Fortus 450mc and F900 each use a different purge ledge. Fortus 450mc: Purge Ledge 511-00800-S. F900: Purge Ledge 511-00601

Antero 800NA and SUP8000B are available in standard 92.3 cubic inch, Fortus Plus canisters and the material will use the existing high-temperature material build sheets.

Part performance and quality are similar to ULTEM™ 9085 resin with the advantage of increased chemical and wear resistance. No additional moisture or processing requirements are needed to build using this material.

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Part Design

Designing parts for Antero 800NA follows much of the same process for designing other FDM parts and design for additive manufacturing guidelines should be followed (e.g. utilizing self-supporting angles where possible, observing minimum wall thicknesses, allowing proper clearance for assemblies). A general list of design for additive manufacturing guidelines can be found in the Fused Deposition Modeling (FDM) Design Guidelines document.

Unique to Antero 800NA and other high-performance FDM materials, is the breakaway support system used to support the model material in areas of overhang to prevent sagging. Although SUP8000B is one of the easiest supports to be removed by hand, the designer should take this into account while designing the part. Self-supporting angles (angles greater than 45 degrees from the build platen) should be used whenever possible to eliminate support material. Areas that require support must be accessible for removal.

Processing

The main consideration that should be taken into account during processing is again support removal. In areas where support cannot be eliminated by part design, the part must be orientated such that the support is accessible for removal. Perforation layers can be added to the support structure to aid in removal of large areas of support.

Default processing parameters should be used unless the user is sufficiently advanced and has determined that the changed values produce better results for a specific geometry.

Part Packing

Multiple Antero 800NA parts can be packed together in the same build. This often reduces build time (due to elimination of tip swaps between model and support for each part) and should be used to increase system utilization by eliminating downtime when operators are not present (e.g. add another part to the pack such that the build will finish in the morning, rather than at night or pack multiple parts together for a longer build over the weekend).

For higher quality seams and a reduced potential for purge material in the part, a sacrificial tower should be included in the pack, up to the full height of the parts (under the Options > Sacrificial tower menu in Control Center and under Print Settings > More Settings > Sacrificial Tower Type > Full Height).

System Preparation

The system should be prepared using the tips, build sheets, and with the hardened system components as detailed in the system overview section of this document. Before building parts, a tip calibration must be performed when switching from another material to Antero 800NA, when replacing the tip at the end of its recommended life, or any other time either the model or support tips are removed from the head.

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The tip life of the T20F Antero 800NA tip is four canisters of material. The user will receive a warning after three canisters of material and will be prevented from starting another build after four canisters of material without first changing the tip. It should be noted that many short toolpaths are harder on the tip than longer toolpaths. If building parts with many short toolpaths, it is recommended to change the tip when the tip warning is displayed (after three canisters of material) in order to not see a decrease in part quality.

Support Removal

Parts are easily removed from the build sheet by removing the build sheet from the machine and flexing the sheet. Once parts are removed from the build sheet, support material can be removed by breaking it off by hand, using a chisel or scraper, using pliers, or by using various picks or other tools.

Post-Processing

Antero 800NA can be sanded, painted, media blasted, bonded, machined, drilled, receive inserts, etc. similarly to other thermoplastics.

Annealing

Note: See the Antero 800NA and Antero 800NA Annealed data sheets for unannealed vs. annealed material properties.

The purpose of annealing is to use heat to alter the crystalline microstructure of the material in order to augment properties such as strength, hardness, and ductility. In some materials, it is also used to remove stress in a material by relaxing the internal bond stresses.

The act of annealing consists of heating a material above its recrystallization temperature (Tc), maintaining a suitable temperature for a suitable amount of time, and then cooling.

Figure 1: Annealing can be completed in standard industrial ovens.

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Process Overview

1. Set the oven to 392 °F (200 °C) and allow the oven to reach this temperature while completing the steps below.
    - It is desired to have the temperature high enough to minimize the amount of time the annealing process takes, but not to have it too close to the melt temperature of the material. The temperature of 392 °F (200 °C) was determined through testing to be a good set point for annealing.
2. Arrange specimens to be annealed in a half full container of fine sand. Salt can alternatively be used which ensures all of the packing media is removed from the specimens as they can be soaked in water after annealing to dissolve the salt. Proceed to cover the samples once arranged so that they are completely submerged in the sand. The sand will prevent the specimens from moving in an uncontrolled manner as the temperature exceeds the recrystallization point. This will prevent the specimens from warping or deforming during the annealing process. It also enables the specimens to anneal slowly which prevents any undue stresses associated with rapid heating/cooling.

Figure 2: Specimens should be placed in a sand bath to prevent deformation while being annealed.

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3. Place sand bath containers in the oven for three hours and allow the oven to reach the set point temperature of 392 °F (200 °C) after inserting the samples before starting the countdown to removal.
4. Once removed from oven, allow the specimens to cool to ambient temperature before removing them from the sand bath.

   Note: The sand will retain the heat for a period of time. One hour is typically the minimum amount of time for the sand to cool.

5. After cooling, remove the samples from the sand. Clean off as much sand as possible into the container at this point. The remaining sand can be washed off with water or removed with other appropriate means if water cannot be used.

Figure 4: In oven

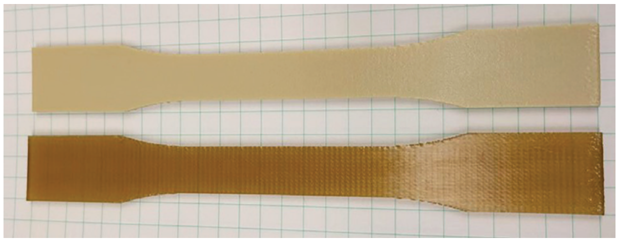

Figure 5: Un-annealed (top) vs. annealed (bottom) Antero 800NA specimens

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