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SOLUTION GUIDE
AIS™ PACKAGE

Stratasys AIS™
Additive Manufacturing for Aerospace

The Challenge

Additive manufacturing (AM) processes and materials offer significant benefits across industries, improving manufacturing efficiency, performance, and supply chain resilience. However, qualifying AM parts when required by regulation or specific standards remains a complex and often ambiguous process for companies. One of the primary challenges is the absence of an established qualification framework and a set of pre-qualified materials. While many companies have experience with AM, they may not fully understand the critical aspects required for qualification within their specific industry. This results in a lack of clear guidance and information needed to meet qualification standards.

Additionally, some organizations that are well-versed in traditional manufacturing qualification processes may struggle to translate these principles to AM, which operates under different design, material, and manufacturing considerations.

Also lacking is a database of AM material properties that engineers can use to design and develop parts using the AM process in a regulated industry such as aerospace. The absence of material property data means companies are left to develop this information on their own, a process that can be extremely expensive and time-consuming.

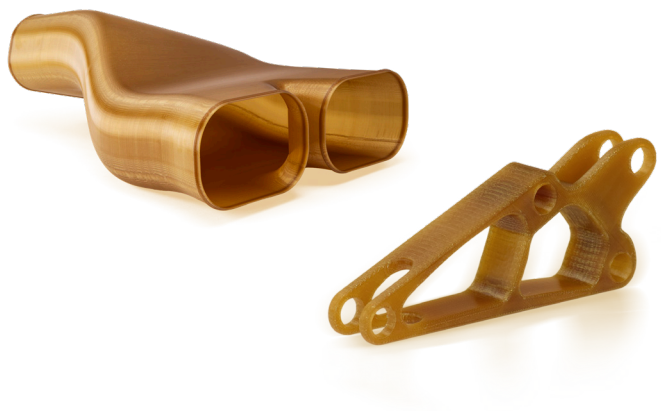
Consequently, when companies independently develop their own qualification data, they typically view it as proprietary, which inhibits its availability within the broader industry community. This creates an environment where each organization must develop its own data and processes, resulting in a lack of universally accepted properties available for universal use.

The Solution

In response to this challenge, Stratasys collaborated with industry OEMs and certification bodies to create a qualification pathway for additively manufactured parts. To that end, Stratasys developed Advanced Industrial Solutions – AIS™, a comprehensive resource that includes the necessary tools, documentation, and training needed to guide companies through the qualification process.

In addition, the material database, developed in collaboration with NCAMP (National Center for Advanced Materials Performance) resides in the public domain, accessible to organizations seeking to streamline their qualification process.

The AIS solution also includes a sample equivalency test template that can be used by an organization to understand the types of tests, specimen count, and quality expectations an NCAMP equivalency program entails. This enables the applicant to be well positioned when approaching NCAMP to develop an appropriately tailored test plan.



What's Included

The AIS product consists of the following components:

Hardware and Materials

- Stratasys F900® 3D printer
- Stratasys ULTEM™ 9085 resin CG (certified grade) material
- Stratasys Antero® 800NA material
- Stratasys Antero® 840CN03 material

AIS Machine Readiness Package

Documentation:
- Material and Process Specifications
- Process Control Document (PCD)
- Sample Equivalency Test Plan

Training:
- 3 days onsite training

Toolkit:
- All of the tools needed to execute the PCD

Supporting Items

Moisture Analyzer:
Computrac Vapor Pro XL from ARIZONA (available through Stratasys)

Vacuum-Oven & Pump:
Thermo Scientific; Vacutherm; VT 6130 M & Agilent IDP3 2.1 CFM Scroll Pump (sold externally)

Gram scale: Any off-shelf balance with 0.1 mg accuracy

Material and Process Specifications

The **Material Specification** governs the production of the raw resin for the ULTEM™ and Antero materials and their conversion to filament. It focuses on the critical characteristics of upstream raw stock to ensure a high-quality material is provided to customers. A combination of in-line and post-processing inspection techniques, following quality standards set by the extrusion industry, are used to convert incoming material into reliable, high performing feedstock for Stratasys 3D printers.

The **Process Specification** controls the entire workflow from material handling through part removal and part inspection required for coupon-level fabrication, and is a basis for a part-level process specification. The Process Specification also provides the information needed to ensure the F900 printer operates within specification for achieving and maintaining high performance and low variability. This document was the result of several years of parameter isolation and validation to strike a balance between unlimited design freedom and stable, repeatable part production.

Both of these documents provide the specifications necessary to attain consistent print results and allow documented traceability from the part back to the raw material production lot.

The **Process Control Document** provides a step-by-step guide to check that the printer and material combination conform with both the process and material requirements.

AIS Materials

A key part of the AIS product is the materials: ULTEM™ 9085 resin CG, Antero 800NA, and Antero 840CN03. These high-performance thermoplastics possess an ample strength-to-weight ratio and good high-temp operating characteristics. These materials are also compliant with 14 CFR 25.853 governing flame, smoke, and toxicity characteristics.

All three materials come with complete documentation to provide users with full traceability from the raw resin to the finished part. **A Certificate of Analysis** for the raw resin includes test results for a number of material properties including pull force, moisture content and melt flow. This document reflects the Sales Order Number, Stratasys manufacturing lot number, material batch number, and the resin lot number. Test methods are in accordance with 14 CFR 25.53 and ASTM standards.

A Stratasys **Certificate of Production Conformance** specifies that the filament is manufactured per established specifications and provides material identification information, including filament spool lot number.

The information contained in these documents form a complete chain of traceability from the raw material pellets to the manufactured FDM filament spool.

AIS Printers

Another foundational element of the AIS product is the low-variability F900 printer tip. This specially configured configuration is needed to produce consistent, reliable build results with the AIS materials. The AIS solution is available with a newly purchased F900 printer.

Using an enhanced material deposition process, AIS-configured printers provide very consistent results, minimizing production variability. This supplies the mechanical property repeatability necessary to demonstrate equivalency to meet qualification program needs. In addition, this configuration results in an increased ultimate tensile strength of the ULTEM™ 9085 resin CG material, compared to test results on the standard printer configuration.

Supporting Items

The vacuum-oven and pump combination provide a method to dry the material prior to machine use to a level required by the process specification and needed to achieve the low variability, high performance results the AIS offers. The moisture analyzer provides a method to measure the material moisture to ensure it meets the requirement specified in the process spec. The gram scale is used for a specific system check outlined in the PCD.

How To Get It

The complete AIS solution is available from Stratasys and Stratasys resellers. Contact your local Stratasys sales representative for more information.

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