Epocast® 1614-A2 Structural Void Filling Compound

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Low-density epoxy void filling compounds continue to be the materials of choice in manufacturing, refurbishing and repairing aircraft interior components. Specifically, overhead stowage bins, cabin galleys, bulkheads, floors and sidewalls that contain inserts, hinges and other attachments are strengthened using high-performance, lightweight epoxy void filling compounds. Composite panel edges are also sealed with epoxy void filling compounds to improve durability and resistance to moisture incursion. Many of the these products in the Huntsman portfolio are flame retardant and exhibit low flame, smoke and toxicity characteristics to comply with FAA FAR 25.853 regulations.

Low-density epoxy void filling compounds are supplied as two-component and one-component systems. One-component systems, that are supplied frozen, offer higher mechanical strength and elevated temperature performance over two-component systems. The thawed, one-part materials are easy-to-extrude pastes with extended work lives of up to eight hours at room temperature to accommodate use on large panels and parts.

Recently, Huntsman expanded its family of Epocast® low-density, frozen, epoxy void filling compounds with next-generation Epocast® 1614-A2 epoxy. The new product is designed to provide aircraft OEMs and suppliers with extended storage stability, higher strength, better crack resistance in thick sections, and greater product consistency than traditional void filling compounds.

Background

Huntsman has been an innovator and leading aerospace industry supplier of adhesives, void filling compounds and laminating systems for more than 60 years. Manufacturers of commercial, business and general aviation aircraft, as well as helicopters, rely on Huntsman aerospace materials. Our products are qualified to numerous aircraft OEM specifications throughout the world and are also included as approved materials in Structural Repair Manuals and Service Bulletins.

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To meet the needs of aerospace customers and their broad range of applications, Huntsman manufactures epoxy and polyurethane systems to the industry's most demanding product standards. Among the characteristics offered by our versatile families of aerospace products are:

- Wide range of densities
- High strength and toughness
- Rigid to flexible performance
- High-temperature capabilities
- Flame retardance/low flame/smoke/toxicity
- Low coefficient of thermal expansion
- High corrosion and fatigue resistance

Our global R&D team continuously experiments with new chemistries and technologies to fullfill today's requirements, anticipate tomorrow's needs and comply with ever more stringent health, safety and environmental regulations, including REACH and TSCA. Our process control programs, from raw material qualification to end-product production, ensure high quality and dependability.

New Epocast® 1614-A2 Epoxy Structural Void Filling Compound

As composites are used for increasingly demanding structural applications, aircraft manufacturers have recognized the need for higher strength materials while always seeking to maximize production cost efficiencies. The improved mechanical performance, particularly at elevated temperatures, offered by one-part epoxy void filling compounds has propelled the growing selection of these products for fabricating composite aircraft components.

Accompanying the recognized strengths of these one-part systems has been the disadvantage of a limited shelf life. Even when stored at -20°F (-29°C), the leading commercial frozen epoxy syntactic is stable for only three to six months. If this shelf life could be extended, both manufacturing and transportation costs would be reduced. Other desired enhancements included improved quality consistency and application flexibility.

A multi-year research program recently yielded a product that satisfies these objectives. Epocast® 1614-A2 epoxy void filling compound is an epoxy-based product containing neither halogen nor other SVHC components that are restricted by REACH. It is a reddish-brown colored, easy-to-extrude paste with a 24-hour open time after thawing, offering a wide processing window for use on large, complex parts.

After application, the product cures quickly with minimal exotherm, in one to two hours at temperatures between 250°F (121°C) and 350°F (177°C), per aerospace industry requirements.

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Table 1. Comparison of Epocast® Low-Density Epoxy Void Filling Compounds

Property	1614-A2 Frozen, 1-c	1614-A1 Frozen, 1-c
Density, g/cc	0.68 – 0.75	0.75
Consistency at 77°F (25°C)	Paste	Paste
Work Life at 77°F (25°C), hrs.	24	8
Shelf Life, months at +35.6°F - 104°F (+2°C - +40°C) at 0°F (-18°C) at -20°F (-29°C)	 — 18 —	 — — 3
Cure Schedule	1 hr at 350°F (177°C) or 90 min. at 250°F (121°C)	1 hr at 350°F (177°C) or 90 min. at 250°F (121°C)
Max. Service Temperature °F (°C)	350 (177°C)	350 (177°C)
Compressive Strength, psi at 73°F (23°C) at 350°F (177°C)	 13,000 – 18,000 7,000 – 9,500	 14,500 7,000
Lap Shear Strength at 77°F (25°C), psi	1,700 – 2,000	1,000
Flammability	Self-extinguishing	Self-extinguishing

Epocast® 1614-A2 epoxy void filling compound also offers improved mechanical properties compared with Huntsman's first-generation, one-part epoxy void filling compound, Epocast® 1614-A1 (see Table 1). The advanced product demonstrates particular strengths when used in thick sections on large honeycomb composite panels, retaining good handling characteristics and resistance to cracking after an elevated temperature cure cycle.

Moreover, the new Epocast® 1614-A2 void filling compound maintains high extrudability (>1,000 g/min) after eighteen months (1-1/2 years) of storage at both 0°F (-18°C) and -20°F (-29°C). This extended storage life represents a significant advantage over other frozen void filling compounds. Compressive and lap shear strengths are also unaffected by extended storage.

Conclusion

New Epocast® 1614-A2 epoxy void filling compound holds great promise for enhancing both the mechanical performance of one-part epoxy void filling compounds and significantly extending shelf life. Field testing for applications on honeycomb core parts built for aircraft interiors as well as structural panels such as landing gear doors and ramps have been positive.

For more information about Epocast® 1614-A2 epoxy void filling compound, call 888-564-9318.