ENDUREDGE

Modified Epoxy Technical Data Sheet

NT-350HT Modified Epoxy Prepreg

Description

The NT-350HT Enduredge Max represents the next generation highly toughened prepreg resin technology. This novel prepreg product offers outstanding surface finish and laminate quality using vacuum bag only processing. Unlimited out-time (no refrigerated storage) with zero change in process parameters over time. NT-350HT allows the parts builder to efficiently build large out-of-autoclave structures with near zero voids without complicated debulking processes or elaborate cure cycles. While NT-350HT was designed for OOA processing, it is perfectly suitable for in-autoclave processes as well. NT-350HT is suitable for aerospace secondary and primary structures, space and satellite structures and Radomes.

Product Features

- Excellent Mechanical Properties – full mechanicals without post-cure
- No Freezer Storage; >12 months out-time at ambient storage conditions (70-80°F)
- Excellent Mechanical Properties with Vacuum Bag Only processing
- Unique engineered air release channels allow excellent OOA processing
- Very thick laminates can be produced without any debulk steps
- No changes in laminate processing conditions or rheology over time
- Optimized for high quality surface finish

Neat Resin Properties

Density 1.17 g/cc
Dielectric Properties: Dk = 2.78 ; Df = 0.013
Moisture Absorption per ASTM D-5229: Post 2.2%, Standard 2.8%

PROPERTY	METHOD	RESULT
Tensile Strength	ASTM D638	8.1 ksi (56.0 MPa)
Tensile Modulus	ASTM D638	0.42 Msi (2.9 GPa)
Poisson's Ratio	ASTM D638	0.38
Shear Modulus	ASTM D638	0.152 msi (1.05 GPa)
Flexural Strength	ASTM D790	11.9 ksi (82.2 MPa)
Flexural Modulus	ASTM D790	0.31 msi (2.11 GPa)
CTE	ASTM E831	53.8 ppm/°F (96.9 ppm/°C)

DRY Tg	ONSET °F (°C)	LOSS MODULUS °F (°C)	TAN DELTA °F (°C)
Post	275°F (135°C)	293°F (145°C)	332°F (167°C)
Standard	207°F(97°C)	244°F (118°C)	305°F (152°C)

WET Tg	ONSET °F (°C)	LOSS MODULUS °F (°C)	TAN DELTA °F (°C)
Post	210°F (99°C)	235°F (113°C)	316°F (158°C)
Standard	201°F(94°C)	226°F (108°C)	293°F (145°C)

Prepreg Properties

DRY Tg	ONSET °F (°C)	LOSS MODULUS °F (°C)	TAN DELTA °F (°C)
Post	297°F (147°C)	322°F (161°C)	336°F (169°C)
Standard	244°F (118°C)	268°F (131°C)	302°F (150°C)

Method: ASTM D7028

NEXX TECHNOLOGIES

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Prepreg Electrical Properties on Fiberglass

PROPERTY (0°)	7781	6781
Dielectric Constant at 10 GHz (dry)	3.76	4.00
Loss Tangent at 10 GHz (dry)	0.014	0.012
Dielectric Constant at 10 GHz (24 hr water boil)	4.10	4.80
Loss Tangent at 10 GHz (24 hr water boil)	0.026	0.094

Prepreg Mechanical Properties on Fiberglass

PROPERTY (0°)	METHOD	7781
Flexural Strength	ASTM D7264	103 ksi (711 MPa)
Flexural Modulus	ASTM D7264	2.9 Msi (18.5 GPa)
Short Beam Shear	ASTM D2344	9.2 ksi (63.6 MPa)
Tensile Strength	ASTM D3039	60.4 ksi (416 MPa)
Tensile Modulus	ASTM D3039	3.9 Msi (26.9 GPa)

All properties normalized to 60% fiber volume except ILSS (fiber volume 40-50%)

Prepreg Mechanical Properties on Carbon

PROPERTY (0°)	METHOD	CARBON FIBER
Tensile Strength	ASTM D3039	121 ksi (836 MPa)
Tensile Modulus	ASTM D3039	9.52 Msi (65.4 GPa)
Poisson's Ratio	ASTM D3039	0.05
Compressive Strength	ASTM D6641	93.7 ksi (648 MPa)
Compressive Modulus	ASTM D6641	9.71 Msi(66.7 GPa)
Flexural Strength	ASTM D7264	138 ksi (952 MPa)
Flexural Modulus	ASTM D7264	8.8 Msi (56.1 GPa)
Short Beam Shear	ASTM D2344	9.1 ksi (62.4 MPa)
Open Hole Compression	ASTM D6484	42 ksi*

*Data normalized to 60% fiber volume. * OHC 3K 2x2 twill AS4D 0/45 all others on 3K Grafil TR30S 2x2 twill*

Prepreg Mechanical Properties in Uni-Directional Fibers

PROPERTY	METHOD	RESULT
Tensile Strength	ASTM D3039	355 ksi (2451 MPa)
Tensile Modulus	ASTM D3039	21.9 Msi (150.4 GPa)
Compressive Strength	ASTM D6641	208.9 ksi (1440 MPa)
Compressive Modulus	ASTM D6641	20.4 Msi (140.6 GPa)
Flexural Strength	ASTM D7264	170.9 ksi (1178.3 MPa)
Flexural Modulus	ASTM D7264	19.9 Msi (137.1 GPa)
Short Beam Shear	ASTM D2344	12.4 ksi (85.0 MPa)

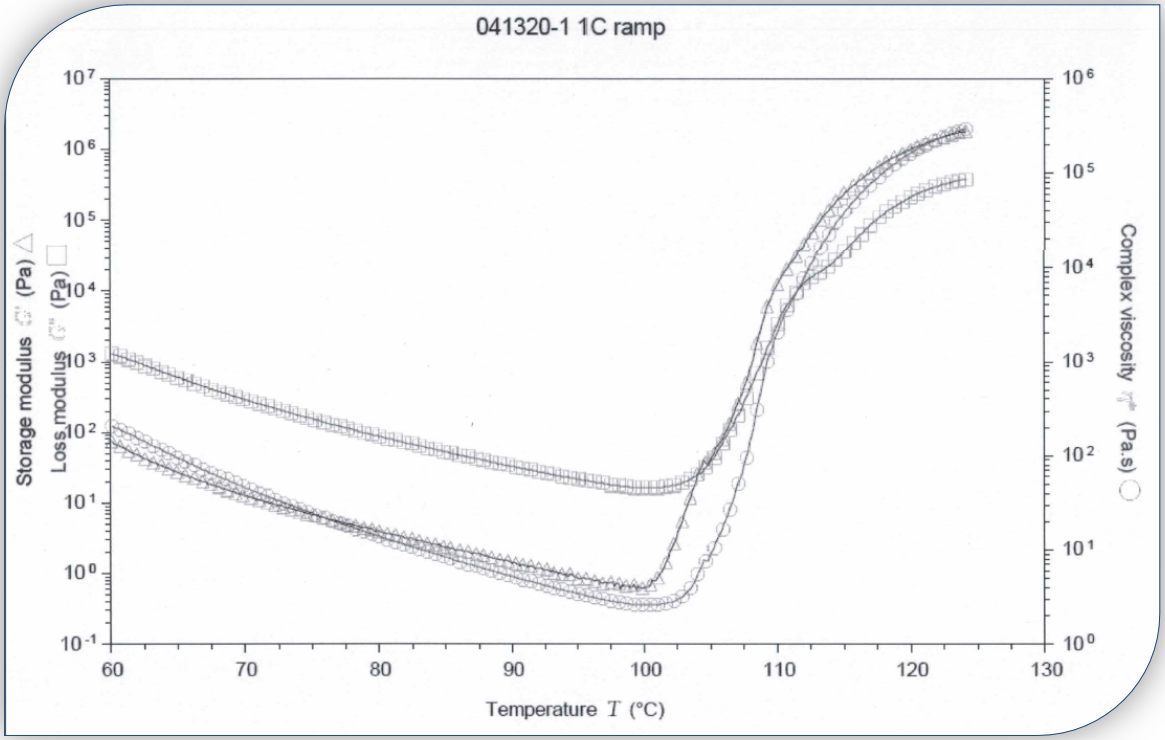
Hexcel IM-7 fiber NT-350 resin system autoclave cured. Normalized to 57% fibert content (except SBS)

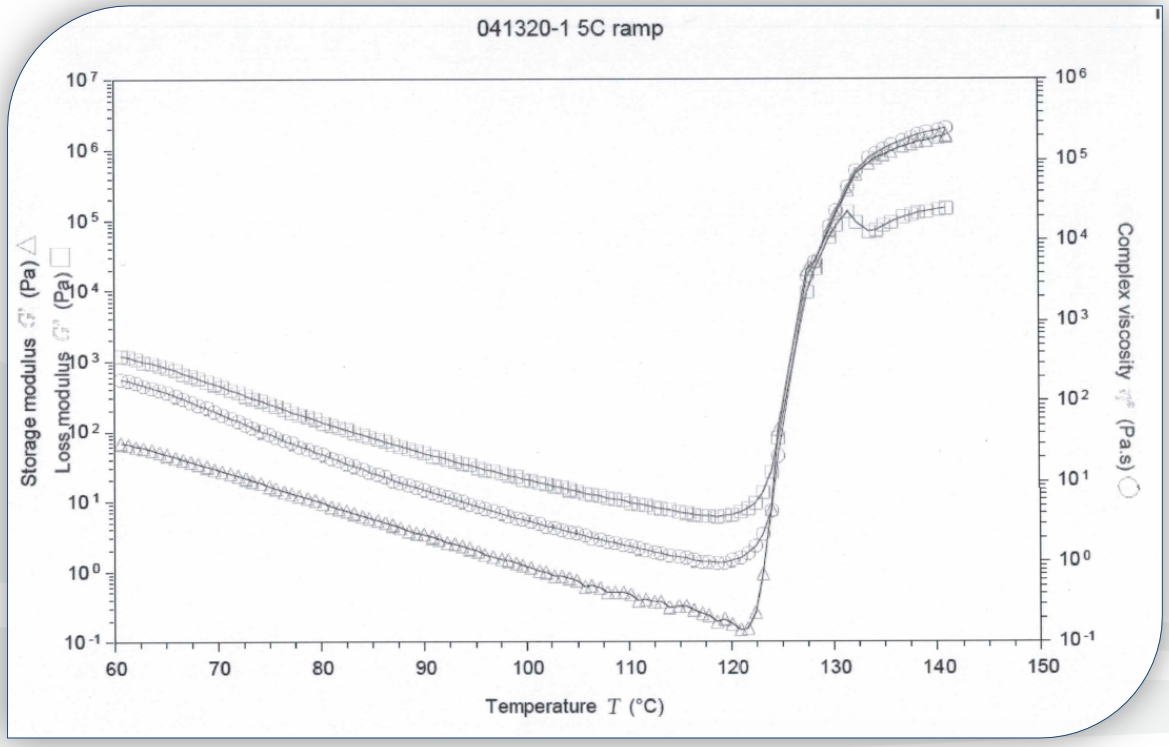
NEXX TECHNOLOGIES

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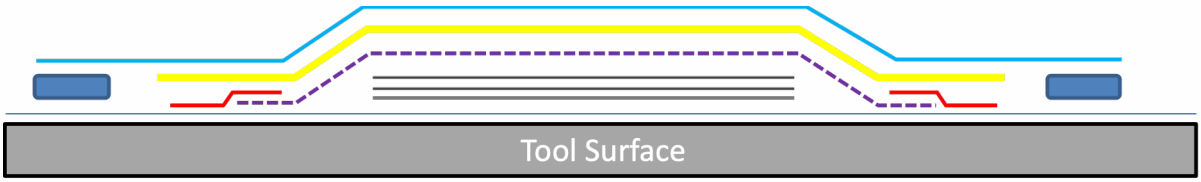
Technical Data Sheet





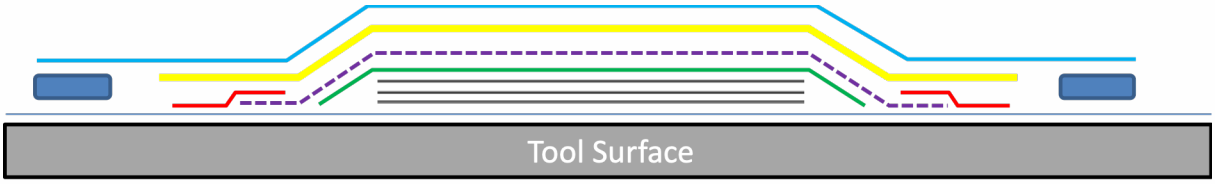
NEXX TECHNOLOGIES

Layup option for minimal configuration



1. Release Agent (Marbocote 45Eco type)
2. NEXX Layup (up to 25 plies).
3. Teflon film + small holes (pattern no less than 10x10cm)
4. Sealant Tape (all around)
5. Breather (the thinner the better)
6. Rubber sealant (all around)
7. Vacuum Bag

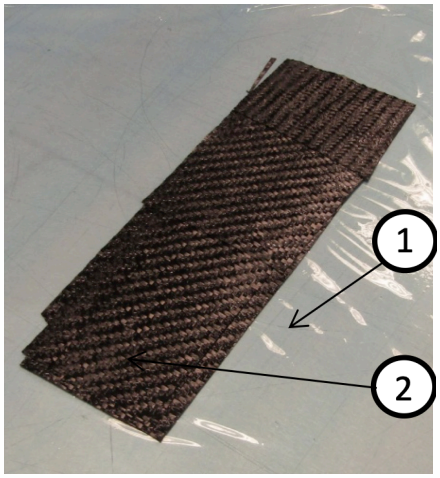
Layup option for improve bag side. Use this when bag side has to be taken into consideration.

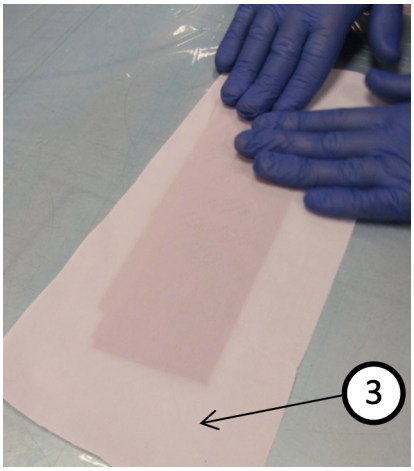


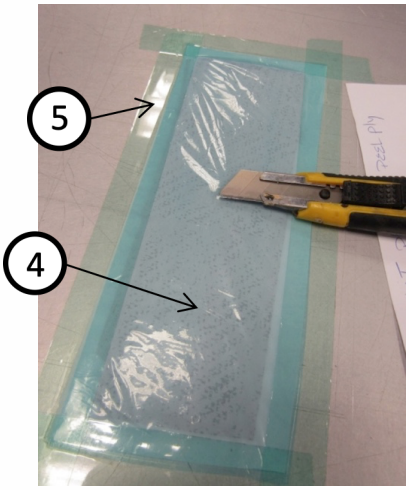
1. Release Agent (Marbocote 45Eco type)
2. NEXX Layup (up to 25 plies).
3. Peelply
4. Solid Teflon film + holes in pattern no closer than 10cm apart
5. Sealant Tape (all around)
6. Breather (the thinner the better)
7. Rubber sealant (all around)
8. Vacuum Bag

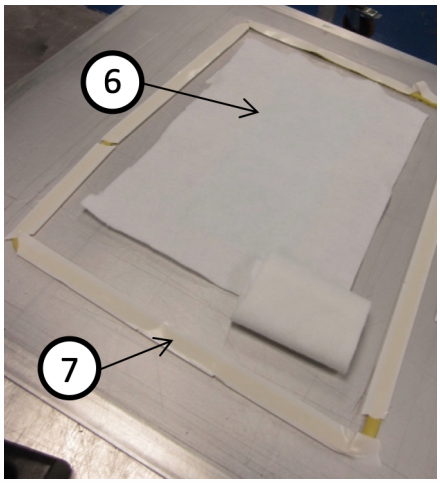
Poor results unless vacuum is applied throughout full cure process including while in oven.

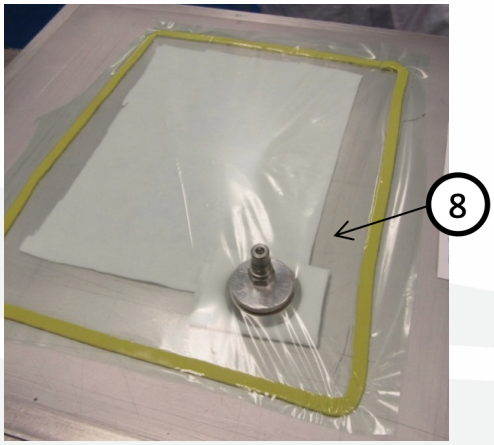
Layup process for improved bag side



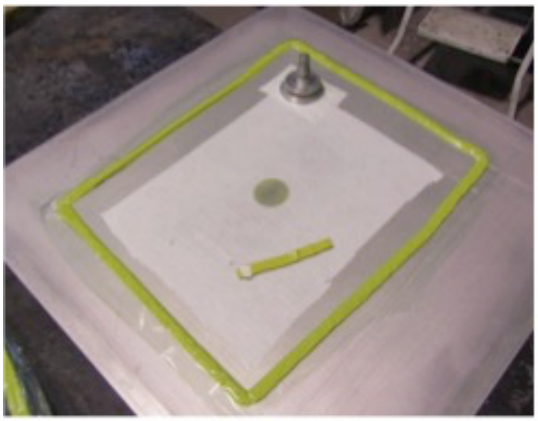


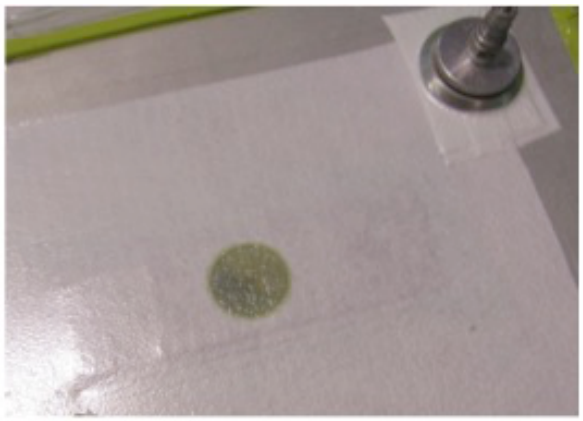


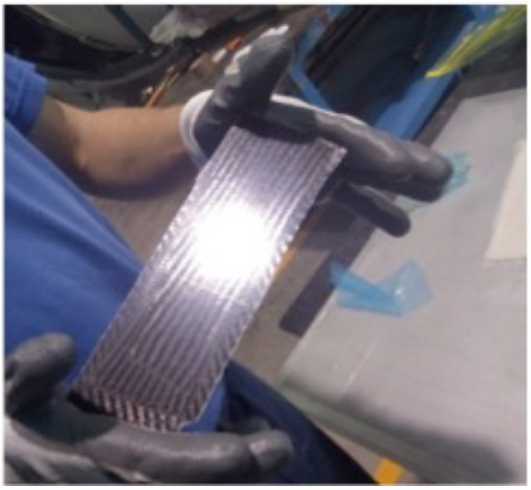


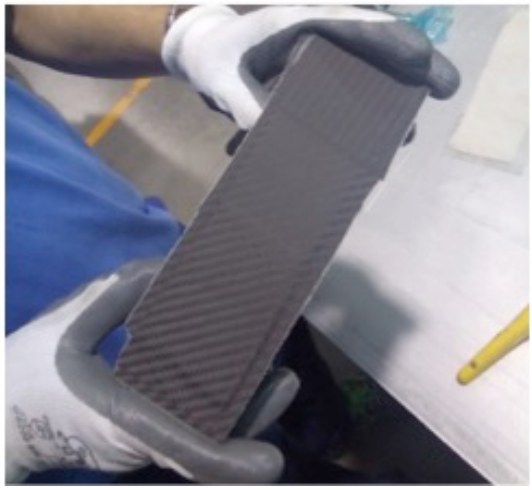


Proper cure process will show a small leak through the tack hole on the Teflon film (4) creating a drop on the breather.







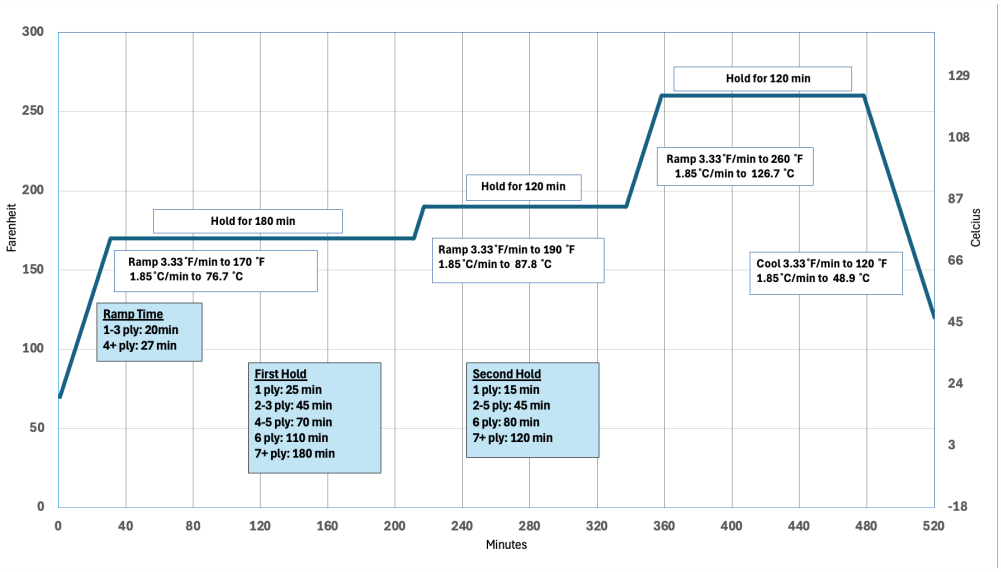


TOOL SIDE BAG SIDE

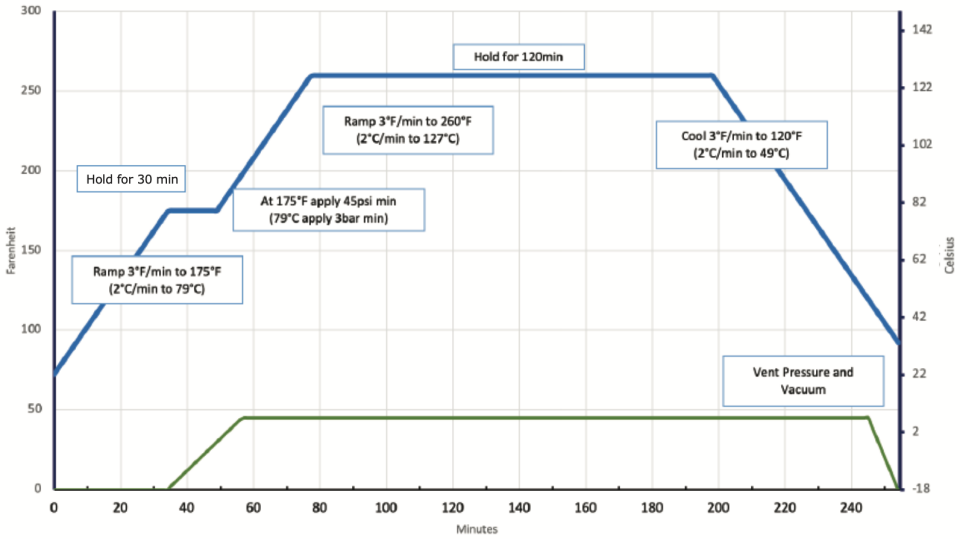
Poor results unless vacuum is applied throughout full cure process including while in oven.

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NT-350HT Baseline Oven Cure



NT-350HT Baseline Autoclave Cure



Ramp rates for cure may vary between 2-7 F (1-4 C)

For higher Tg use a 350 F (177 C) postcure

EPOXY PREPREG, ADHESIVE, AND RESIN GUIDELINES AND HANDLING PROCEDURES

The following guidelines are provided to our customers to assure that best practices are used to attain the best results from NEXX Technology's epoxy products. Keep in mind that these procedures represent best practices for all composite prepreg and adhesive materials.

FREEZER STORAGE

Freezer storage is not required. It will not damage the product but is completely unnecessary. The product is designed to be kept on the shop floor at temperatures below 100°F (37°C) for over a year with no changes in properties, rheology or processing conditions.

MOISTURE ABSORPTION AND SENSITIVITY

While very resistant to moisture absorption after cure, epoxies can be adversely affected by moisture uptake prior to cure. Other materials may experience moisture buildup when they are removed from frozen storage. Fortunately, the Enduredge prepreg does not require freezer storage. It will always be ready for immediate use

HANDLING MATERIALS

When handling any prepreg materials, always wear clean, powder-free latex gloves. This assures that no hand oils are transferred to the prepreg and/or composite during processing. The presence of oils in the part could lead to problems in both mechanical and electrical performance of the part. This also guards against dermatitis that may occur with some users.

USE OF HONEYCOMB AND FOAM CORE MATERIALS

When using nonmetallic honeycomb and foam core materials for sandwich structures, the materials should always be dried in an oven prior to lay-up to drive off any moisture that may be in the core. The core should be cooled in the presence of a desiccant to avoid moisture uptake. Following drying, it is always best to use the material as soon as possible. Recommended core dry time/temp: 121°C (250°F) for 3-4 hours.

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