CYCOM® 977-3

CYCOM® 977-3 is a 350°F (177°C) curing resin. It is a toughened epoxy resin with 350°F (177°C) dry and 270°F (132°C) wet service capability. CYCOM® 977-3 is formulated for autoclave or press molding and can be cured at 350°F (177°C) for six hours. Unidirectional tape and woven fabric impregnated with CYCOM® 977-3 resin will retain tack for 21 days at 75°F (24°C). It has a long mechanical out life suitable for fabrication of large structures.

Typical applications for CYCOM® 977-3 include aircraft primary & secondary structures, critical impact resistance, and crucial hot/wet performance applications.

Features and Benefits

- 350°F (177°C) cure
- Available on fabric and tape
- 350°F (177°C) dry service temperature
- 270°F (132°C) wet service temperature
- Laminate and sandwich panel usage
- Autoclave or press mold processing
- Toughened epoxy using Syensqo's proprietary "co-continuous" morphology
- Impact resistance

CHARACTERISTICS

Table 1 | Physical Properties

Property	CYCOM 977-3	Test Method
Cured Neat Resin Density pcf (g/cc)	80.5 (1.29)	ASTM D792
Shelf Life	12 months at or below 10°F (-12°C) from date of shipment	
Shop Life	21 days at 75°F (24°C)	

Table 2 | Product Availability

Property	
Roll Width	49 in - 58 in (1240 mm – 1470 mm)
Roll Length	60 yds (55 m)

Resin Viscosity

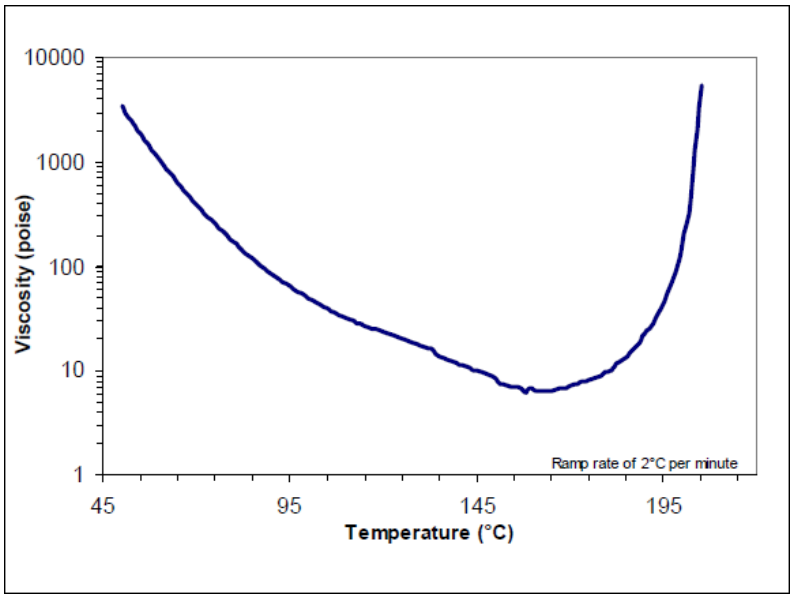

Figure 1 | Characteristic Viscosity Profile for CYCOM® 977-3: Ramp Rate 3.6°F (2°C)/minute

PROPERTIES

Table 3 | Typical Cured Neat Resin Properties[1]

Property	Test Condition	CYCOM 977-3	Test Method
Compression Yield, ksi (MPa)	75°F (24°C)	27 ± 0.3 (186 ± 2)	ASTM D695
Flexural Strength[2] ksi (MPa)	75°F (24°C) 250°F (121°C)/ wet[3]	21 ± 4 (145 ± 28) 10 ± 0.4 (69 ± 3)	ASTM D790
Flexural Modulus[2] Msi (GPa)	75°F (24°C) 250°F (121°C)/ wet[3]	0.55 ± 0.01 (3.8 ± 0.07) 0.35 ± 0.3 (2.4 ± 2)	
G_{Ic}[4], in·lb/in^2 (J/m^2)	75°F (24°C)	1.2 ± 0.1 (217 ± 24)	ASTM D5045
K_{Ic}[4], ksi·in$^{1/2}$ (MPa·m$^{1/2}$)	75°F (24°C)	1.0 ± 0.09 (0.9 ± 0.08)	ASTM D5045
RDS DMA Tg[5], °F (°C) G′ G″ Tan Delta	250°F (121°C)/ wet[3]	352 (178) 372 (189) 374 (190)	ASTM D7028

[1] Cured at 355°F (179°C) for 6 hours

[2] Flexural testing performed using a 3-point loading fixture at a 16:1 S/D ratio

[3] Wet = 7 days water immersion at 160°F (71°C)

[4] K_{Ic} and G_{Ic} tested using 3-point bending mode

[5] Tested at 9°F/minute (5°C/minute)

* NOTE: Tg data is not applicable for U.S. export control classification or licensing. For export-related information please contact us.

Table 4 | Typical Prepreg Properties, 5 Harness Satin (5HS) Standard Modulus Carbon Fiber [33 Msi (228 GPa)]

Property	Test Temperature	CYCOM 977-3/5HS AS4 6K	Test Method
0° Tensile Strength ksi (MPa)	75°F (24°C)	126 (869)	ASTM D3039
0° Tensile Modulus Msi (GPa)	75°F (24°C)	9.8 (68)	
0° Interlaminar Shear Strength ksi (MPa)	75°F (24°C)	13 (90)	ASTM D2344

Table 5 | Typical Unidirectional Tape Properties, Intermediate Modulus Carbon Fiber [40 Msi (276 GPa)]

Property	Test Condition	CYCOM 977-3/IM7 12K	Test Method
0° Tensile Strength ksi (MPa)	75°F (24°C)	364 (2510)	ASTM D3039
0° Tensile Modulus Msi (GPa)	75°F (24°C)	23.0 (159)	
Tensile Failure Strain %	75°F (24°C)	1.46	
0° Compression Strength ksi (MPa)	75°F (24°C) 250°F (121°C)/ wet[1]	244 (1680) 195 (1340)	ASTM D695
0° Compression Modulus Msi (GPa)	75°F (24°C) 250°F (121°C)/ wet[1]	22.3 (154) 21.2 (146)	
0° Flexural Strength ksi (MPa)	75°F (24°C) 250°F (121°C)/ wet[1]	256 (1770) 162 (1120)	ASTM D790
0° Flexural Modulus Msi (GPa)	75°F (24°C) 250°F (121°C)/ wet[1]	21.7 (150) 21.2 (146)	
0° Interlaminar Shear Strength ksi (MPa)	75°F (24°C) 250°F (121°C)/ wet[1]	18.5 (128) 11.4 (79)	ASTM D2344
Compression After Impact[2,3] ksi (MPa)	75°F (24°C)	28 (193)	ASTM D7136 / ASTM D7137

[1] Wet = 7 day immersion in 160°F (71°C) water

[2] 25/50/25 orientation

[3] 270 in·lb/in (30.5 J) impact level

PROCESSING

Recommended Cure Cycle

The following cure cycle is recommended for CYCOM® 977-3 materials. Cure cycles should be tailored based on application.

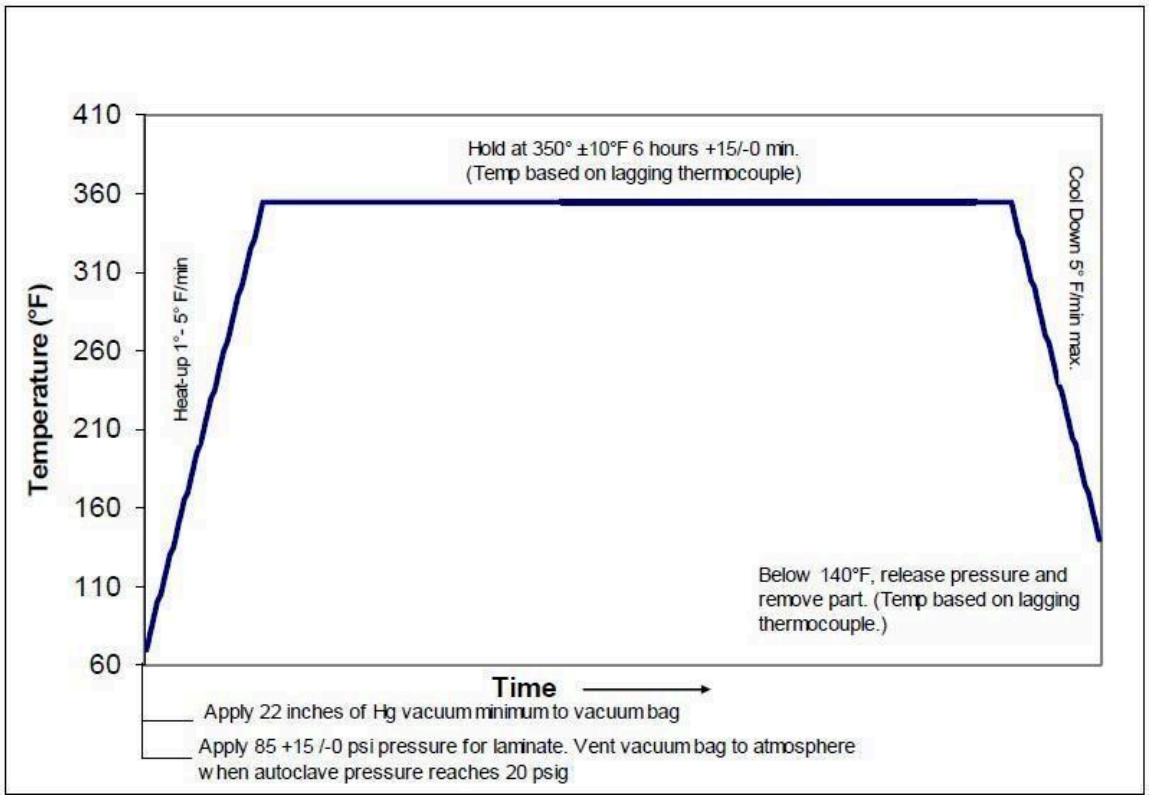

Figure 2 | Recommended Cure Cycle for CYCOM® 977-3

Lay-Up/Bagging

Treat surfaces that lay-up will touch with a release agent. As each ply of material is positioned, work out any wrinkles or entrapped air with a paddle or roller before removing backing. Take care not to distort the material during lay-up. Insert a thermocouple into the lay-up near the center ply of the thickest edge section, outside the net trim line.

To eliminate porosity, keep the resin under pressure during cure with the use of a compressible dam. Non-permeable fluorocarbon-coated fabric should be placed over the lay-up to protect the bag system in vacuum or autoclave cures.

Install a vacuum bag by standard techniques. Insert at least two vacuum ports through the bag, connecting one to a vacuum source and the other, at a point furthest away from the source, to a calibrated vacuum gauge. Position the part in the oven or autoclave and draw vacuum to check for bag or system leaks. Figure 3 shows the recommended lay-up for CYCOM® 977-3 materials.

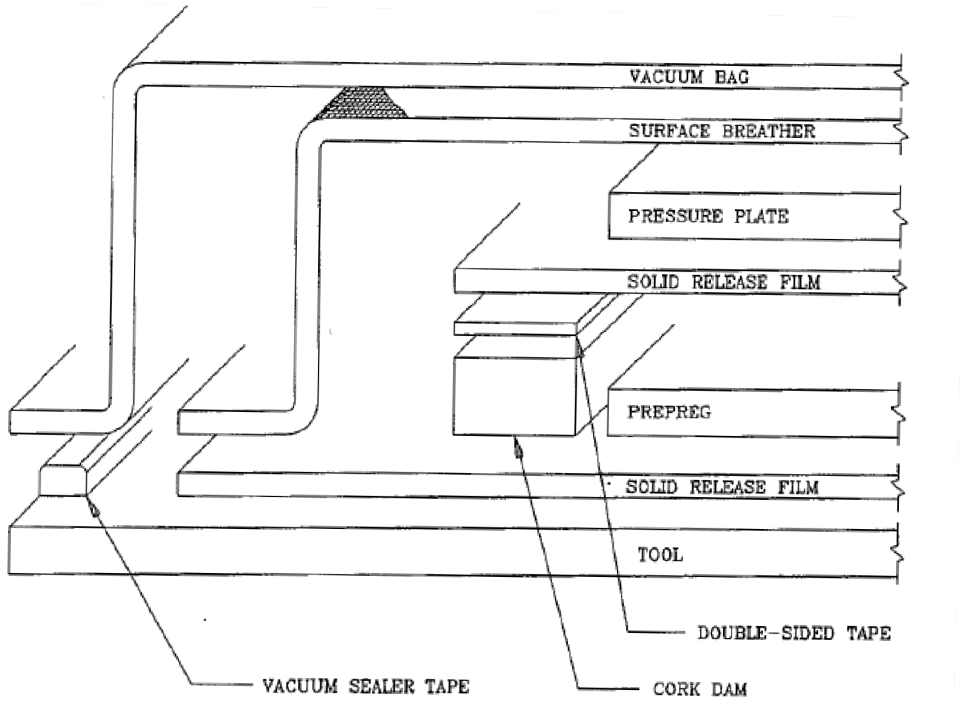

Figure 3 | Recommended Lay-up for CYCOM® 977-3

HEALTH & SAFETY

Please refer to the product SDS for safe handling, personal protective equipment recommendations and disposal considerations.