

AroPly® RFI 350 Resin Film Infusion System Zyvex Nano-Engineered Composite

Technical Datasheet

April 2016

Description

AroPly® RFI is a lower cost alternative to traditional prepreg. Resin Film Infusion (RFI) is a variant of VARTM (Vacuum Assisted Resin Transfer Molding) or RTM (Resin Transfer Molding). AroPly® RFI flexible resin films enable quality composite components to be manufactured using a reliable, low cost manufacturing process. Normal curing takes place at 177°C (350°F). AroPly® RFI 350 flexible resin film contains an optimum level of carbon nanotubes for additional toughness and enhanced mechanical properties. The carbon nanotubes use molecular dispersion technology to ensure enhancements are evenly distributed throughout the resin.

Features

AroPly® RFI Flexible Resin Films

- Carbon nano-tube enhanced for additional toughness and stiffness
- Readily available at 300 g/m² and 24" wide (others available)
- Flexible resin film with low tack for easy handling and placement, minimal cracking
- Lower cost alternative to prepregs, with small volumes available
- Can be used with virtually any fiber or fabric, including woven carbon, E-glass, S-glass, Aramid, stitched fibers and fabrics, non-woven mats, and braided fibers, etc.
- Out of autoclave processing for reduced costs
- Can also be used to enhance core adhesion or where additional resin is required
- High fiber volumes can be achieved with relatively low void contents
- EH&S benefits with clean lay-ups and minimal waste
- Reduced inventory loss if film expires since you can keep the fabric, unlike prepregs where they must be discarded together

Benefits over traditional prepregs

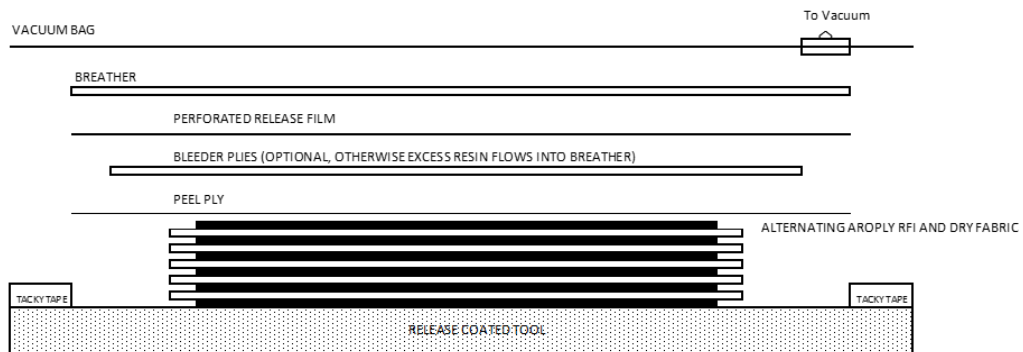
- Shorter lead times
- Lower cost with smaller volumes available
- Much lower minimum purchase quantity
- Less inventory loss if product reaches expiration
- Use multiple fabric/fiber formats with a single film for lower costs manufacturing

AroPly® RFI 350 Resin Film Infusion Processing

- AroPly RTF flexible film is interleaved between dry fabric or fibers.
- The exact interleaving sequence is determined by knowing the Fiber Areal Weight of the fabric or fibers, and the Resin Areal Weight of the AroPly RTF.
- The lay-up is vacuum bagged, and vacuum is pulled and the cure sequence begins.
- The fabric or fiber layers should be slightly oversized so the vacuum breather has good contact.
- As the cure cycle begins, the resin film melts and flows through the dry fabric or fibers.

- Additional pressure plates and/or shrink wrap can also be employed to add pressure to the part.
- The lay-up may also be autoclave cured with vacuum.
- Excess resin can be controlled through the breather, or porous peel ply can be utilized with an appropriate amount of bleeder plies.
- As for an RTM alternative, the resin film is added with the dry preform into a tool die, and then cure with vacuum.
- To determine the number of AroPly® RFI Films to use, simply divide the resin areal weight (RAW) of the AroPly RFI into the total FAW of the preform and multiply by 0.9.
For example, if you are using twelve plies of 6K carbon fabric at 380 g/m² and the AroPly RFI is 300 g/m², you would need 10 plies of AroPly RFI $((12 \times 380)/300) \times 0.9 = 13.68$

Figure 1 | Lay-Up Design (typical)



Mechanical Properties

Table 1 | Mechanical Characteristics – AroPly RFI 350 resin film with 3K Plain Weave Carbon Fabric, AS2 FAW 200

Test ¹²	Test Method	0° Value
Flexural Strength	ASTM D 790	170 (ksi) 1170 (Mpa)
Flexural Modulus	ASTM D 790	9.85 (Msi) 67.9 (Gpa)
Compressive Strength	SACMA SRM 1R-94	125 (ksi) 862 (Mpa)
Tensile Strength	ASTM D 3039	140 (ksi) 966 (Mpa)
Tensile Modulus	ASTM D 3039	12.6 (Msi) 86.9 (Gpa)

Poisson's Ratio	ASTM D 3039	0.34
Short Beam Shear Strength	ASTM D 2344	8.5 (ksi) 58.6 (Mpa)
Glass Transition Temperature	ASTM D 7028-07 Peak Tan Delta	356 (°F) 180 (°C)
Glc Strain Energy Release	ASTM D 5528-07	3.3 (in-lb/in ²) 578 (J/m ²)

Testing: Values normalized to 60% fiber volume. Values are typical and are not intended as a specification value.

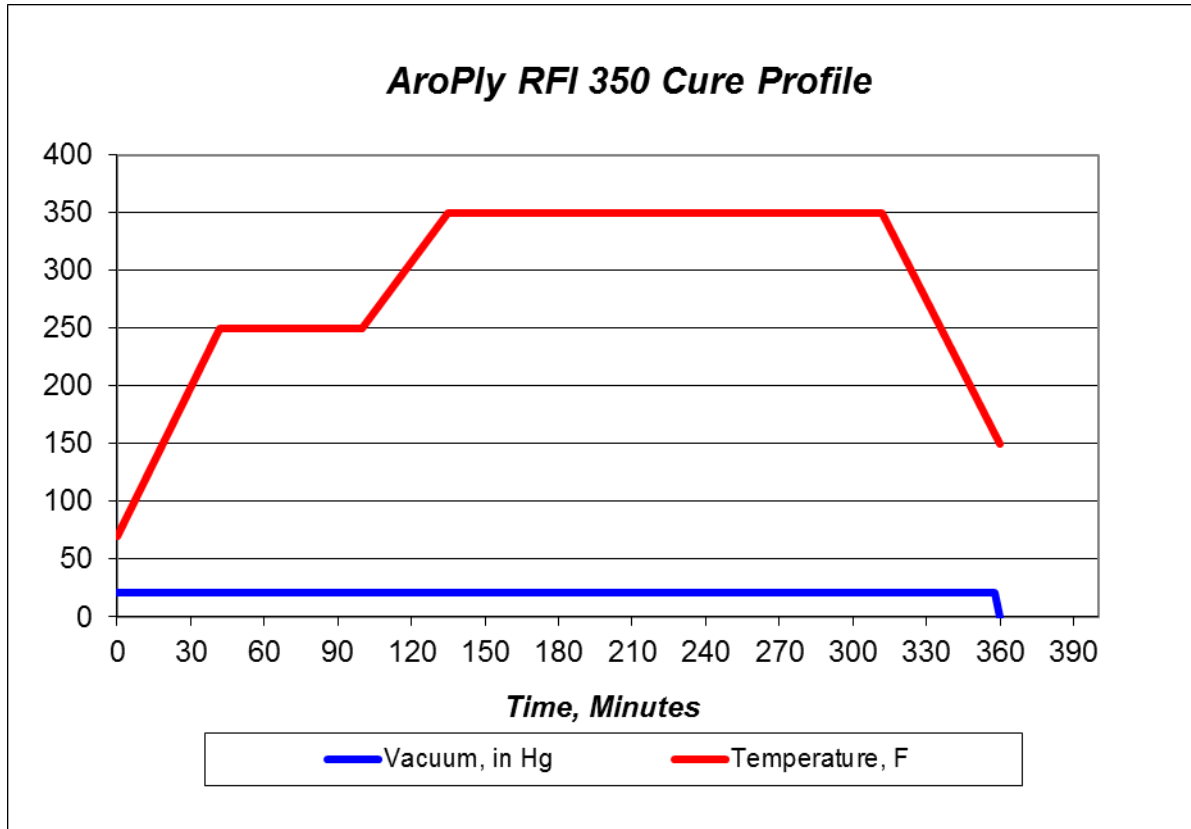
AroPly® RFI 350 Resin Film Storage Life

- Tack life – 21 days @ 22°C (72°F)
- Out life – 30 days @ 22°C (72°F)
- Shelf life – 1 year @ -18°C (0°F)

Cure Timing

(Recommended) Ramp temperature 1 - 4°C per minute to desired cure temperature below. Hold at desired temperature for designated time below. Minimum vacuum is 21 inches of Hg.

Figure 2 | Vacuum Oven Cure Cycle (typical)



Safety Handling

Zyvex Technologies provides its customers with a product specific Material Safety Data Sheet (MSDS) to cover potential health effects, safe handling and use information.

Zyvex encourages its customers to review all relevant MSDS prior to use.

Disclaimer

Zyvex Technologies believes that the technical data provided is accurate as of the published date. Performance values are considered representative but are not intended as a specification.

Contact Zyvex

For United States quotes, orders and product information call toll free 877.Go.Zyvex (877.469.9839).

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