



**SOLVAY**

asking more from chemistry®



A Unique Approach to  
**Composite Tooling**

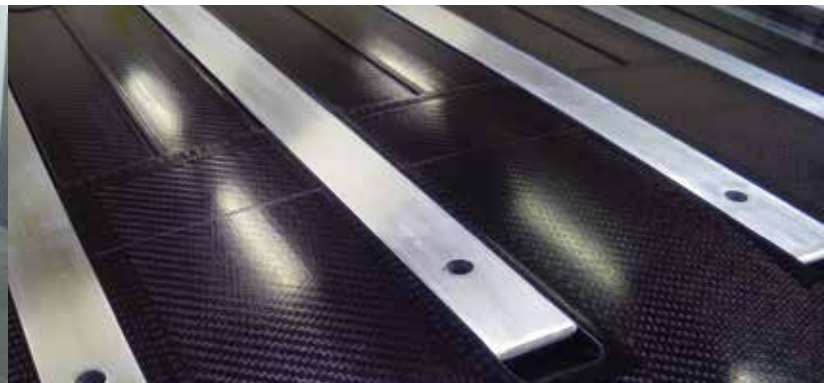
**COMPOSITE  
MATERIALS**



Solvay's innovation extends to providing a complete tooling solution to the customer part manufacturing experience, offering composite tooling materials and their process consumables, as well as a complete range of composite tooling design and hardware solutions. This unique combination of tool design, tool manufacture, and ongoing innovation in materials and process technologies makes Solvay a world leader in composite tooling.



Carbon fiber tool



Carbon fiber tool with Omega section aluminum inserts

## A Real Competitive Advantage

Solvay's composite tooling expertise is second to none: through our expertise, technology, products, flexibility, technical support and wide-reaching network of partners, we offer innovation with real advantage to the composites industry, focusing on developing new material and tooling technologies to meet future demands.

## The Most Extensive Offering

- Tooling prepreg suitable for use in all market sectors (unidirectional and fabric, using carbon and glass fibers).
- Compatible vacuum bagging consumables (low and high temperature capable).
- Full range of tooling ancillaries, including tooling block, backing structures and sealing systems.
- Tooling hardware manufacture, including composite tools, and reusable silicone tools.
- Worldwide manufacturing, design and technical support.
- Commitments to short lead-times from all sites.

# Tooling Materials

With a broad product portfolio and customer focused distribution facilities, Solvay is truly a global one-stop shop for tooling and vacuum bagging materials.

## Prepregs and Composite Materials

- Low temperature initial cure out-of-autoclave systems.
- Possibility to use of low cost/low temperature master models.
- Combination of good mechanical performance, toughness, leading to the manufacture of robust tooling.
- Bismaleimide prepregs for high temperature capable tooling.
- Ease of use with a broad processing window.
- Excellent surface finish.

## Composite Materials Product Selector Guide

	Product Form	Out Life (days)	Service Temp. °F (°C)	Cure Flexibility/Recommended Cure °F (°C)	Cure Method
<b>DForm® Fabric</b>	Epoxy Prepreg	3	356 (180)	8 hours at 140 (60) Post-cure 15 minutes at 392 (200) plus 8 hours at 374 (190)	Autoclave
<b>CYFORM® 22</b>	Epoxy Prepreg	3 to 4	350 (177)	168 hours at 68 (20) or 5 hours at 131 (55) Post-cure 5 hours at 390 (200)	Autoclave
<b>CYFORM® 777</b>	Epoxy Prepreg	12 to 15	350 (177)	48 hours at 122 (50) or 3 hours at 194 (90) Post-cure 5 hours at 390 (200)	Autoclave
<b>CYFORM® 1-5-1</b>	Epoxy Prepreg	3 to 4	356 (180)	40 hours at 95 (35) or 8 hours at 140 (60) Post-cure 15 minutes at 392 (200) plus 8 hours at 374 (190)	Autoclave
<b>LTM® 12</b>	Epoxy Prepreg	3	356 (180)	70 hours at 86 (30) or 5 hours at 158 (70) Post-cure 15 minutes at 392 (200) plus 8 hours at 374 (190)	Autoclave
<b>LTM® 13</b>	Epoxy Prepreg	2	320 (160)	70 hours at 86 (30) or 3 hours at 158 (70) Post-cure 15 minutes at 392 (200) plus 8 hours at 374 (190)	Autoclave
<b>LTM® 16</b>	Epoxy Prepreg	6	356 (180)	70 hours at 104 (40) or 4 hours at 176 (80) Post-cure 15 minutes at 392 (200) plus 8 hours at 374 (190)	Autoclave
<b>LTM® 202</b>	Epoxy Prepreg	4	356 (180)	8 hours at 140 (60) Post-cure 15 minutes at 392 (200) plus 8 hours at 374 (190)	Autoclave
<b>LTM® 205</b>	Epoxy Prepreg for caul plates	21	356 (180)	Cure range: 176–248 (80–120) Post-cure 2 hours at 356 (180)	Vacuum/ Autoclave
<b>LTM® 212</b>	Epoxy Prepreg	2	356 (180)	40 hours at 95 (35) or 8 hours at 140 (60) Post-cure 15 minutes at 392 (200) plus 8 hours at 374 (190)	Autoclave
<b>LTM® 217</b>	Epoxy Prepreg	8	356 (180)	20 hours at 131 (55) or 5 hours at 176 (80) Post-cure 15 minutes at 392 (200) plus 8 hours at 374 (190)	Autoclave
<b>LTM® 317-1B</b>	Epoxy Prepreg	21	302 (150)	16 hours at 150 (65) or 5 hours at 176 (80) Post-cure 2 hours at 284 (140) or 2 hours at 356 (180)	Vacuum
<b>DForm® Fabric</b>	BMI Prepreg	45	374 (190)	6 hours at 350 (177) Post-cure 6 hours at 440 (226)	Autoclave
<b>DURATOOL® 450</b>	BMI prepreg	45	374 (190)	6 hours at 350 (177) Post-cure 6 hours at 440 (226)	Autoclave

## Process Materials

Solvay offers a comprehensive range of vacuum bagging consumables, designed to work in perfect combination with tooling prepregs to optimize processing and produce the optimum tool surface and laminate quality – two essentials for tool usability and longevity.

### These include:

- Vacuum bagging film
- Breather fabric
- Flow media
- Release film
- Peel ply
- Release fabric
- Sealant tape
- Adhesive tape
- Self-adhesive tool release
- Elastomers
- Tapes and sprays
- Combination products
- Prefabricated vacuum bags
- Reusable intensifiers and cauls
- Fittings and hoses for autoclave/oven
- Hoses, wrap and connectors for infusion

For long term component manufacturing, we offer two solutions to minimize part variability and ensure reproducible part quality:

- Reusable vacuum bag assemblies that can be added to the tool structures to create a complete tool solution.
- Fabricated pre-shaped vacuum bags which reduce labor time, materials waste and which enhance part to part consistency, if traditional vacuum bagging film solutions are preferred.

The manufacture of components from the composite tool can be further optimized through the integration of intensifiers and selectively reinforced cauls.

## Process Materials Product Selector Guide

Prepreg product	Bagging film	Release film	Sealant tape	Peel ply	Breather	Flash tape	Hose	Valve
<b>Epoxy tooling prepreg processing</b>	HS8171	A5000	SM5126	D300	RC3000-10	FT	SILHOSER	VBUF
	HS6262	A6000	SM5142	6001	AB10HA	LETAPE	93S	
<b>BMI tooling prepreg processing</b>	HB6262	A5000	SM5126	6001	AB40N (Nylon66) RC-3000-20	FT LETAPE	SILHOSER 93S	VBUF

## Design

Solvay offers a confidential design and engineering service that benefits from 30 years' knowledge in tooling and significant experience in CATIA CAD, dimensional distortion software and FE analysis. This takes tooling projects from initial concept through all stages, including design, evaluation, prototyping and final manufacture.



# Tooling Hardware

Solvay tooling knowledge and innovation capabilities is based upon many years of practical experience in tool building. This expertise has allowed us to continuously innovate and improve the knowledge and ability to service the broadest of customer challenges for tooling requirements. Our extensive tooling design and manufacturing capabilities are concentrated within our French facilities.

## Silicone Tools

Our reusable vacuum systems, manufacturing techniques and sealing systems are amongst the most advanced in the industry.

### Reusable membranes for high temperature autoclave applications, offering:

- Increased productivity and reduced operating costs and minimal product waste.
- Simplicity of use – membranes can be applied to the most complex forms, allowing high volume production of good quality parts.
- Reliability – robust membranes eliminate the risk of tearing during curing.

### Heated membranes (flat mats and vacuuming membranes) for on-site repairs:

- Can be molded to the shape of the work piece.
- Fitted with a frame or a ceiling skirt, they provide vacuum integrity without the need for consumables.

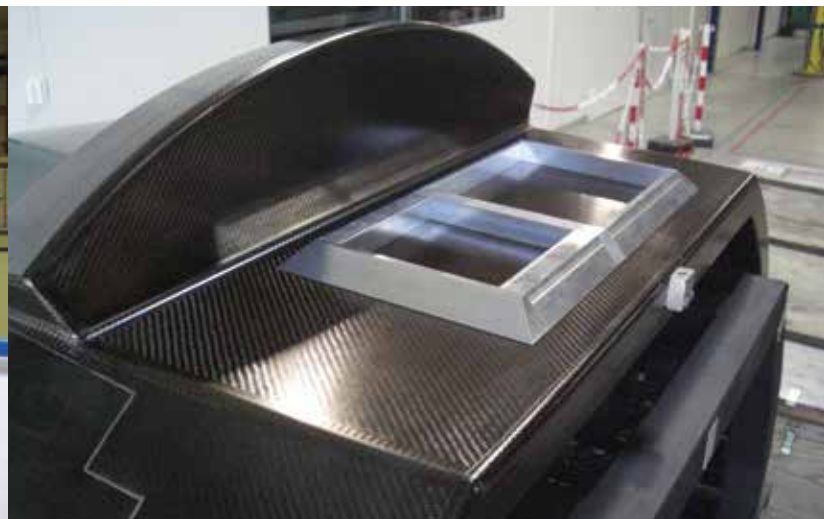
### IMS (Infusion Membrane Silicone) membranes. Flexible, elastic and molded to the precise form of the part, they incorporate the required resin feed networks, thus improving the infusion process.

#### Benefits are:

- No need for films, i.e. savings in purchasing, cutting and recycling.
- Instant sealing so no resin leakage during infusion.
- Smooth interior surface to the infused part.
- Suitable for counter-tools.
- Easy to implement.
- Readily repaired and/or modified.



Reusable membrane



Carbon fiber tool with aluminum window frame

**Intensifiers used for compaction problems on parts with complex angular or concave features, where resin accumulation is prevalent:**

- Transmit vacuum bag pressure to localized, detailed areas on the part.
- Manufactured from silicone and fibrous carbon/epoxy reinforcements, intensifiers provide a high level of rigidity and dimensional stability.
- Seal systems are fitted on the elastomeric tools for vacuum integrity. These accommodate complex shapes.

**Why Silicone Tools?**

- Increase efficiency & reliability
- Savings labor hours
- Optimizing material flow
- Improve process consistency
- Improve part quality
- Cost saving

**Composite Tools**

With its large range of autoclave equipment, Solvay specialists in the manufacture of composites tools (glass/epoxy fiber, carbon epoxy fiber, BMI carbon fiber) for tight geometrical tolerances and large sizes. These molds are created from relatively inexpensive masters, allowing duplication at a minimal cost. These tools can be mounted on adjustable frames or on carbon couplings.

**Why Composite Tooling?**

- Light
- Reusable
- Low CTE
- Good for complex geometries
- Can be processed at low temperature
- Combination of good mechanical performance, toughness, leading to the manufacture of robust tooling
- Provide excellent surface finish





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