



Developing Tooling Solutions Across all Market Sectors

ACG's Tooling Experience

Catering for all Industries

In pursuit of excellence in all aspects of composites technology, ACG has positioned itself at the forefront of materials development and process methodology, delivering technologically advanced prepregs and high quality, robust tooling for all markets.

Composite tooling designed and manufactured by ACG and its approved partners has a reputation of withstanding repeated process cycling.

ACG also offers a complete technology transfer and support package encompassing tooling design philosophy, and pattern and tooling construction.

ACG's tooling and prepregs are used in the following markets:

- Aerospace
- Rail transport
- Automotive
- Alternative energy
- Motorsport
- Space exploration

A Range of Products to Meet Our Client's Needs

LTM® Systems

LTM® (Low Temperature Moulding) prepregs offer low temperature initial curing, allowing the use of low cost, low temperature master models. After an additional free-standing post-cure, LTM prepregs can produce high temperature capable tooling.

LTM10 and LTM210 Series Tooling Prepregs

LTM10 Series prepregs have been used to produce high quality, high accuracy tooling for over 20 years.

LTM210 Series prepregs have been specifically formulated to provide improved handling properties, especially in hot ambient manufacturing environments.

LTM317 and LTM318 Out-of-Autoclave Tooling Prepregs

Composite components getting larger by the day, Original Equipment Manufacturers (OEMs) and tooling manufacturers are experiencing serious issues with autoclave availability and capacities.

Realising the problems facing industry, ACG has responded by supplying true Out-of-Autoclave (OoA) vacuum-only curing tooling

prepregs that provide pit-free surface profiles and autoclave quality tool skin laminates with high end use temperatures and extended tooling life.

LTM205 Caul Plate Prepreg

LTM205, ACG's new OoA prepreg, has been specifically developed for the manufacture of large caul plates. After a suitable post-cure, LTM205 can operate at elevated in-service temperatures.

LTM205 offers an excellent balance of toughness and surface quality with minimal debulking required during processing. LTM205 can generate very high surface quality through a combination of low temperature cure formats and selective impregnation surface ply for a broad range of curing options.

While primarily for OoA processing, LTM205 can also be autoclave cured.

LTF318B ZPREG® Surface Film

Used in conjunction with a range of epoxy prepregs, LTF318B ZPREG® selective impregnation technology surface film can produce a very high quality surface finish. This low pressure, vacuum bag processing system offers an OoA route to high grade composite tooling.

HTM® Bismaleimide Systems

HTM® (High Temperature Moulding) bismaleimide (BMI) prepregs have been specifically formulated for the manufacture of high temperature capable tooling used in aerospace and motorsport applications.

HTM515-1 BMI Prepreg

HTM515-1 is a controlled flow, high temperature BMI resin tooling prepreg offering improved handling characteristics and, after an appropriate post-cure, high thermal cycling capability.

HTM515-1 is supplied in a range of standard prepreg formats for the manufacture of high temperature composite tooling.

DForm® Prepreg

ACG's DForm® Deformable Composite System (DCS) is a new concept in tooling technology. This labour and cost-saving prepreg technology combines the conformability of a short fibre moulding compound with the directional characteristics of a high performance, long fibre composite.

DForm DCS has undergone extensive market testing and is particularly suited to the manufacture of composite tooling. It offers a number of advantages over

standard long fibre woven fabric prepreg, and random short fibre and infusion tooling systems:

- Savings in lay-up time up to 50% can be achieved.
- Its unidirectional fibre structure maintains dimensional accuracy and performance predictability.
- It creates an extremely flat, print-through-free surface profile with no local thinning, no loss of fibre orientation or variation in resin content.

CB1100 Ceramic Tooling Block

CB1100 is a very low co-efficient of thermal expansion (CTE) ceramic tooling material. In its natural form, it can be used as a very high accuracy master model or as tooling for low volume or prototype production.

CB1100 can be machined to form a core for high temperature tooling. The blocks are wrapped in an epoxy or BMI carbon prepreg skin which, once cured, is machined to the final tool profile. This practice requires no master model, consequently reducing lead time and cost. The tool skin, which is fully supported on the core, does not require a backing structure, contributing to further reductions in lead time and costs.

CB1100, which can be bonded using a proprietary adhesive, does not absorb water. Therefore, unlike some high temperature tooling cores, it does not require extensive drying or the provision of venting in the tool structure.

CB1100 offers savings in time and cost. When compared to other tooling routes, machining times are shorter and blocks can be readily used to produce accurate components. BMI components and tooling can be produced direct from the block with no need for a high temperature capable intermediate.



Product Summary

TOOLING PREPREGS											
Resin System	LTM®				HTM®			LTM®		LTF	LTM®
	10 Series	202	210 Series	13	512	512-1	515-1	317-1B	318-1B	318B	205
Resin Type	Epoxy				Bismaleimide (BMI)			Epoxy			
Out Life (days) at Room Temperature	10 = 2 to 3 12 = 3 to 4 16 = 6 to 7	Prepreg = 4 DForm = 2	212 = 1.5 to 2.5 213 = 6 to 7 217 = 10	2 to 3	21		30	21	30	7	10
Minimum Initial Cure °C (°F) for duration (hours)	10 = 22 (72) 144 12 = 30 (86) 70 16 = 40 (104) 48	45 (113) 16	212 = 35 (95) 40 213 = 45 (113) 34 217 = 55 (131) 20	30 (86) 70	190 (374) 6			65 (150) 16			Various options: please refer to the ACG Technical Data Sheet
Maximum Initial Cure °C (°F) for duration (hours)	10 = 60 (140) 3 12 = 70 (158) 3 16 = 60 (140) 12	60 (140) 8	212 = 35 (95) 8 213 = 65 (149) 9 217 = 80 (176) 5	70 (158) 3	190 (374) 6			80 (176) 5			
Post-Cure °C (°F) for duration (hours)	200 (392) 0.25 plus 190 (374) 8				240 (464) 8	230 (440) 6		140 (284) 2 or 180 (356) 2	200 (392) 0.25 plus 190 (374) 8		
End Use °C (°F)	All: 200 (392)	180 (356)	All: 210 (410)	180 (356)	250 (482)			150 (302)	180 (356)		
Maximum Tg °C (°F) (TMA Onset)	All: 205 to 210 (400 to 410)	210 (410)	All: 210 (410)	180 (356)	280 (536)	290 (554)	260 (500)	170 (338)	220 (428)		190 (374)
Shelf Life at -18°C (0°F) (months)	10 = 12 12 = 6 16 = 12	12			6			12			
Processing Options	Autoclave							Out-of-Autoclave			
								Bulk Ply		Surface Ply	Caul Plates
Data given above relates to carbon reinforcement; refer to the relevant data sheets for glass reinforcement data.											

Advanced Composites Group Ltd

Composites House, Sinclair Close,
Heanor, Derbyshire, DE75 7SP, UK
Tel: +44 (0)1773 766200
Fax: +44 (0)1773 530245
e-mail: sales@acg.co.uk

www.acg.co.uk



Advanced Composites Group Inc

5350 South, 129th East Avenue,
Tulsa, Oklahoma 74134, USA
Tel: +1 918 252 3922
Fax: +1 918 252 7371
e-mail: sales@acg-us.com

www.acg-us.com