Vinaltex™

Low Profile Additives for Composites

For unsaturated polyester or vinyl ester composites, ensuring excellent shrinkage control and a class-A finish - delivering smooth surfaces and strong, high-performance parts.

Index

Page

Global yet Local

All Synthomer Low-Profile Additives are manufactured on our UK site, situated in Harlow, just north of London which has access to an extensive global warehousing and distribution network.

- Market leading PVAc and PVOH manufacturing site
- UK-based, strict quality-controlled site
- 30 + years experience in manufacturing PVAc
- Global warehousing and distribution network
- Dedicated technical service team
- In-house R&D for continued innovation

Vinaltex™

Fibre-Reinforced Composites

In the modern world, fibre-reinforced composites find a role in most industries ranging from aviation and automotive through to building materials and infrastructure. Composites play a key part in building a sustainable future, driving towards net-zero, with the unique properties of being light-weight yet strong and durable. This allows products to be designed that last longer, generating less waste. The composite market is growing rapidly globally, with new applications in key decarbonisation technologies such as wind turbine blades, electric cars and hydrogen fuel tanks.

Fibre-reinforced composites typically consist of three key components:

Matrix

- Provides bulk properties of the composite
- Binds reinforcements
- Thermosetting (e.g., unsaturated polyester, vinyl ester, epoxy)
- Thermoplastic (e.g., PEEK, polyamides)

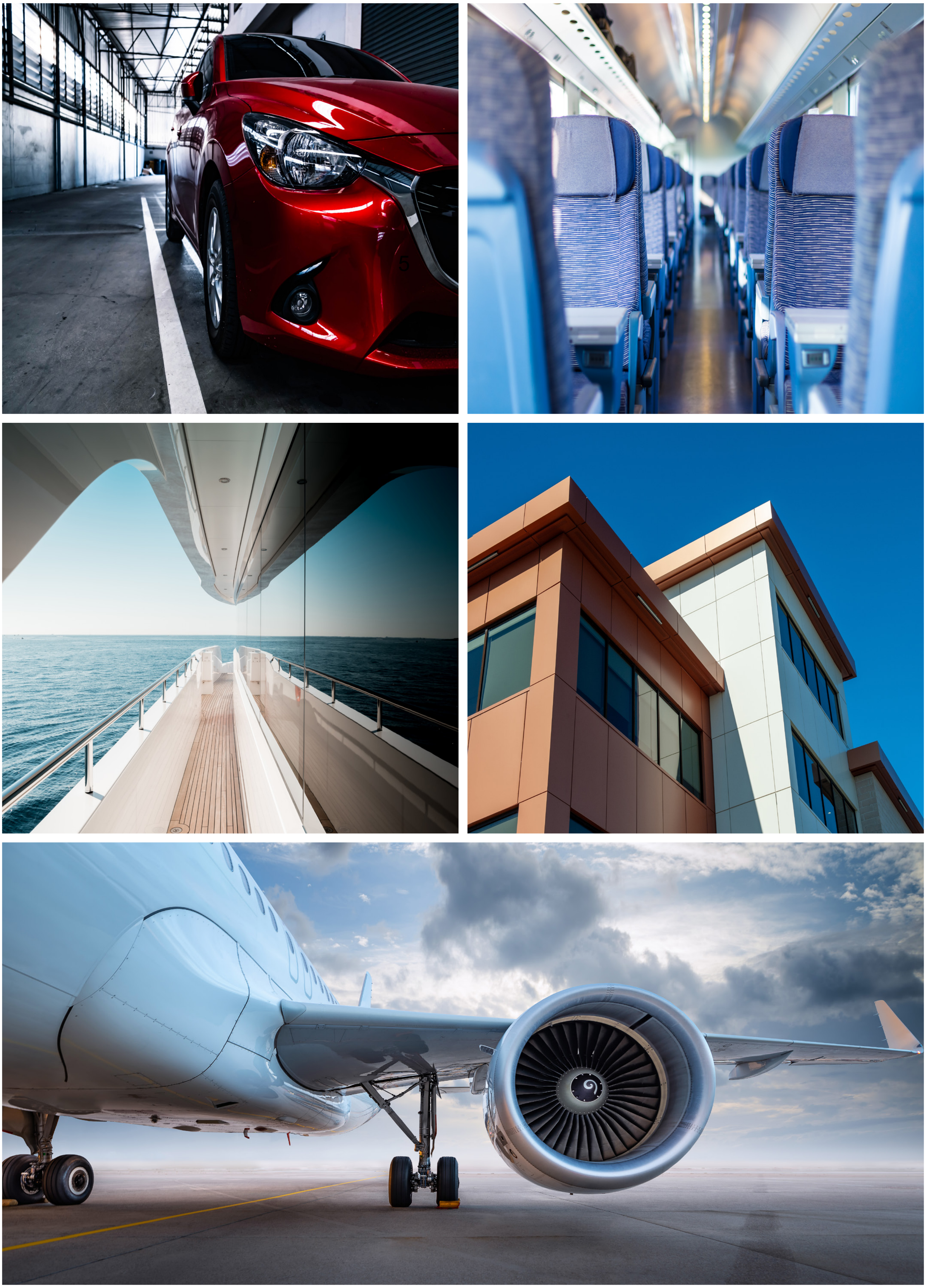
Reinforcement

- Fibres such as glass, carbon or aramid
- Axial reinforcements such as roving and tow provides linear strength
- Transverse reinforcements such as mats or wovens provide cross-sectional strength and impact resistance

Additives

- Added for property enhancement and optimisation of the composite material
- E.g., fillers, pigments, rheology modifiers, low profile additives, wetting agents, air release agents, flame retardants

synthomer



Vinaltex™

Manufacturing Processes

There are two broad classes of composite processes; open and closed moulding.

Closed Moulding

The resin cures inside a mould. Processes are typically more automated for higher volume production.

- SMC (Sheet Moulding Compound) for compression moulding
- BMC (Bulk Moulding Compound) for compression or injection moulding

Process	Speed	Cost per part	Volume capability	Typical use
Compression Moulding	↑	£	●●●	SMC/BMC into high volume production
Injection Moulding	↗	£	●●●	BMC into high volume production
Resin Transfer Moulding	↗	££	●●○	Low viscosity resins for high dimensionally accurate parts
Pultrusion	↗	£	●●●	2D profiles (negative shapes possible)
Pullwinding	↗	£	●●●	2D profiles (no negative shapes)
Additive Manufacturing	↗	££	●●○	Prototyping and small, complex parts

Open Moulding

The resin is exposed to the air during curing and production is typically more labour-intensive

Process	Speed	Cost per part	Volume capability	Typical use
Hand Lay-Up	↖	£££	●○○	Prototyping or large, complex parts
Spray-Up	↖	£££	●○○	Large components, less complex shapes
Filament Winding	↗	££	●●●	Tubular: pipelines and vessels

SMC (Sheet Moulding Compound)

To form the sheet, the resin paste transfers from a metering device onto a moving film carrier. Chopped fibres are dropped onto the paste and a second film carrier places another resin layer on top of the fibres. Rollers compact the sheet to ensure fibre wet-out in the resin, forming a sheet. The SMC is then left to mature, and the viscosity increases during maturation for easy handling, ready for moulding – typically in a compression moulding process.

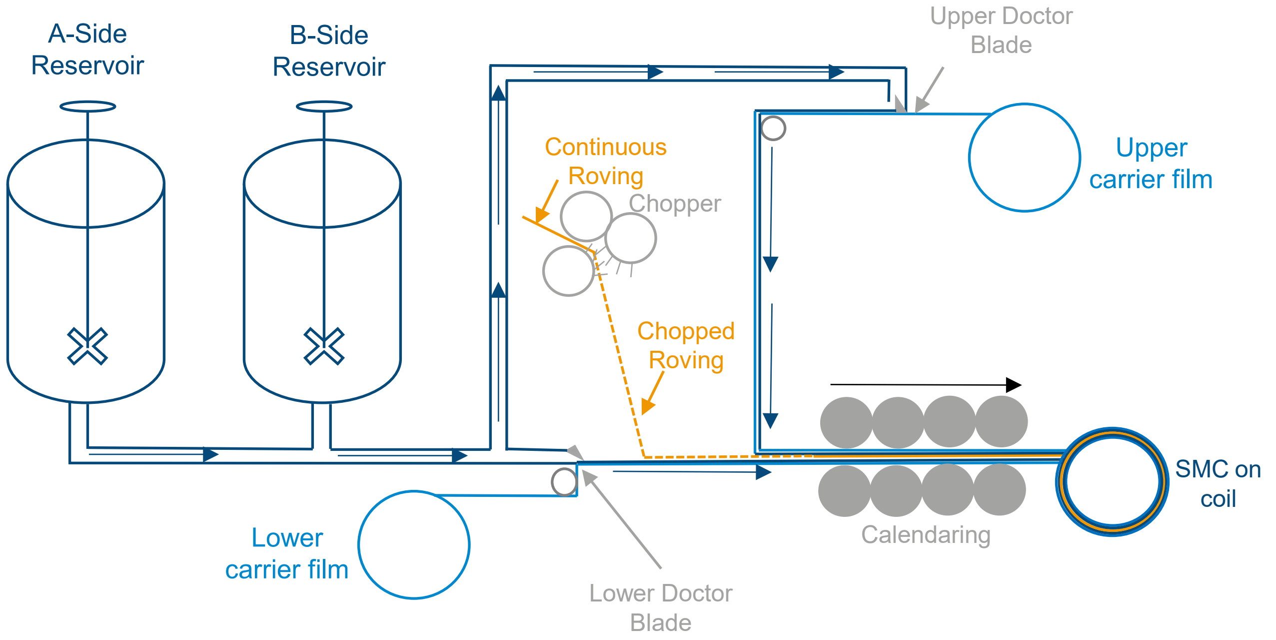


Illustration of Sheet Moulding Compound Process

BMC (Bulk Moulding Compound)

Fibre strands are mixed with the resin at room temperature and then stored at low temperatures to prevent curing prior to moulding. BMC is typically provided in bulk logs, ready for either injection or compression moulding.

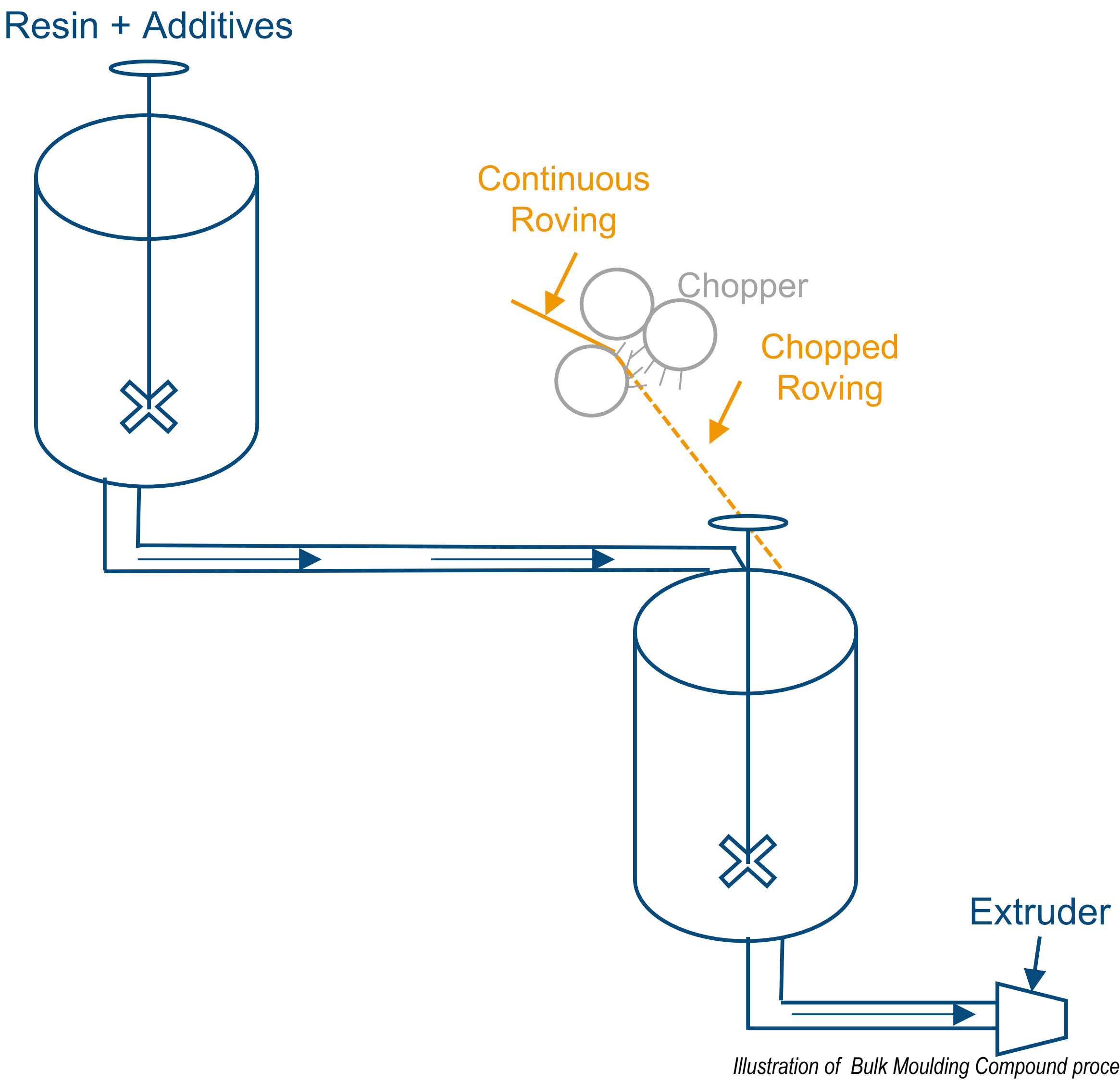


Illustration of Bulk Moulding Compound process

Compression Moulding

The mould is placed in a hydraulic press and heated. The material (SMC or BMC) is charged, and the press is closed. Pressure is applied and moulding occurs. The press is then opened, and part removed. This is typically an automated, high through-put process.

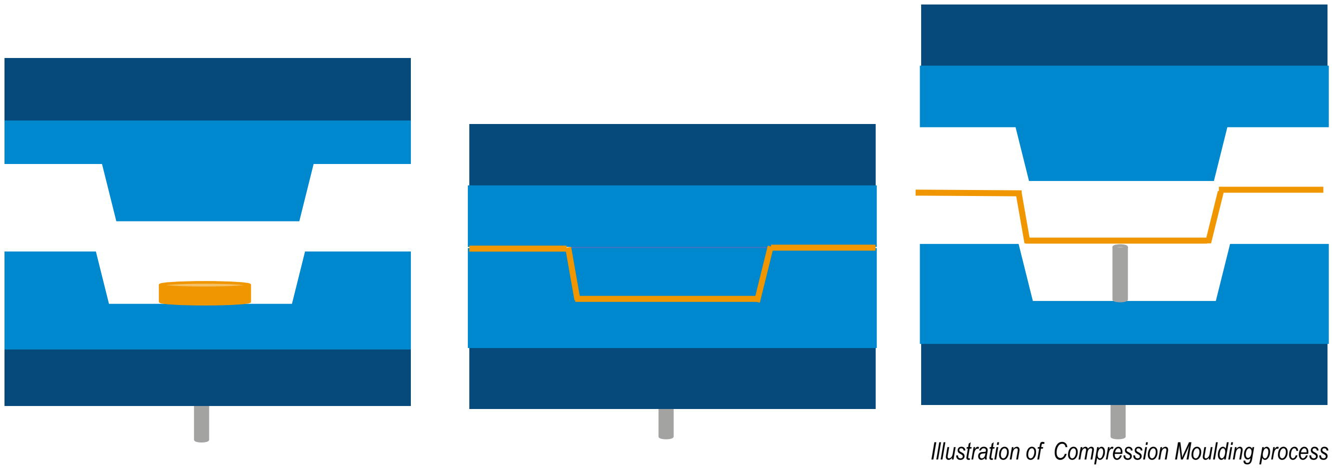


Illustration of Compression Moulding process

Injection Moulding

The mould is placed in a hydraulic press and heated. The material (SMC or BMC) is charged, and the press is closed. Pressure is applied and moulding occurs. The press is then opened, and part removed. This is typically an automated, high through-put process.

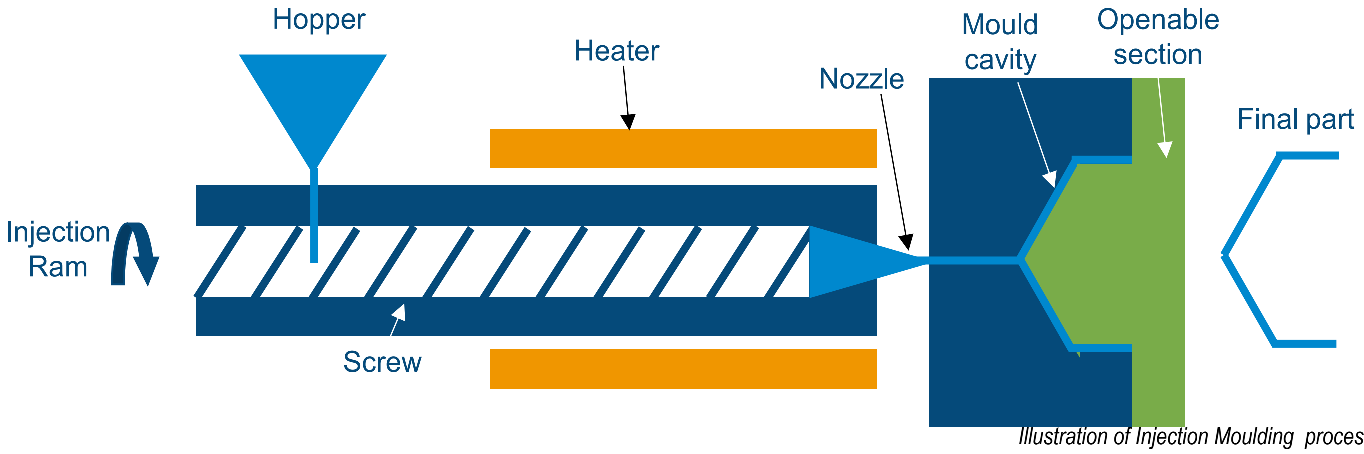


Illustration of Injection Moulding process

Resin Transfer Moulding (RTM)

The reinforcements (typically preforms) are placed in the mould, which is then closed. Under pressure (and at various curing temperatures), the matrix is injected into the mould and cured. The lay-up of dry reinforcements inside the mould allows for any combination of axial and transverse fibres, including 3D preforms. As this is a closed moulding, parts are produced with two finishing surfaces. This is typically a low viscosity system.

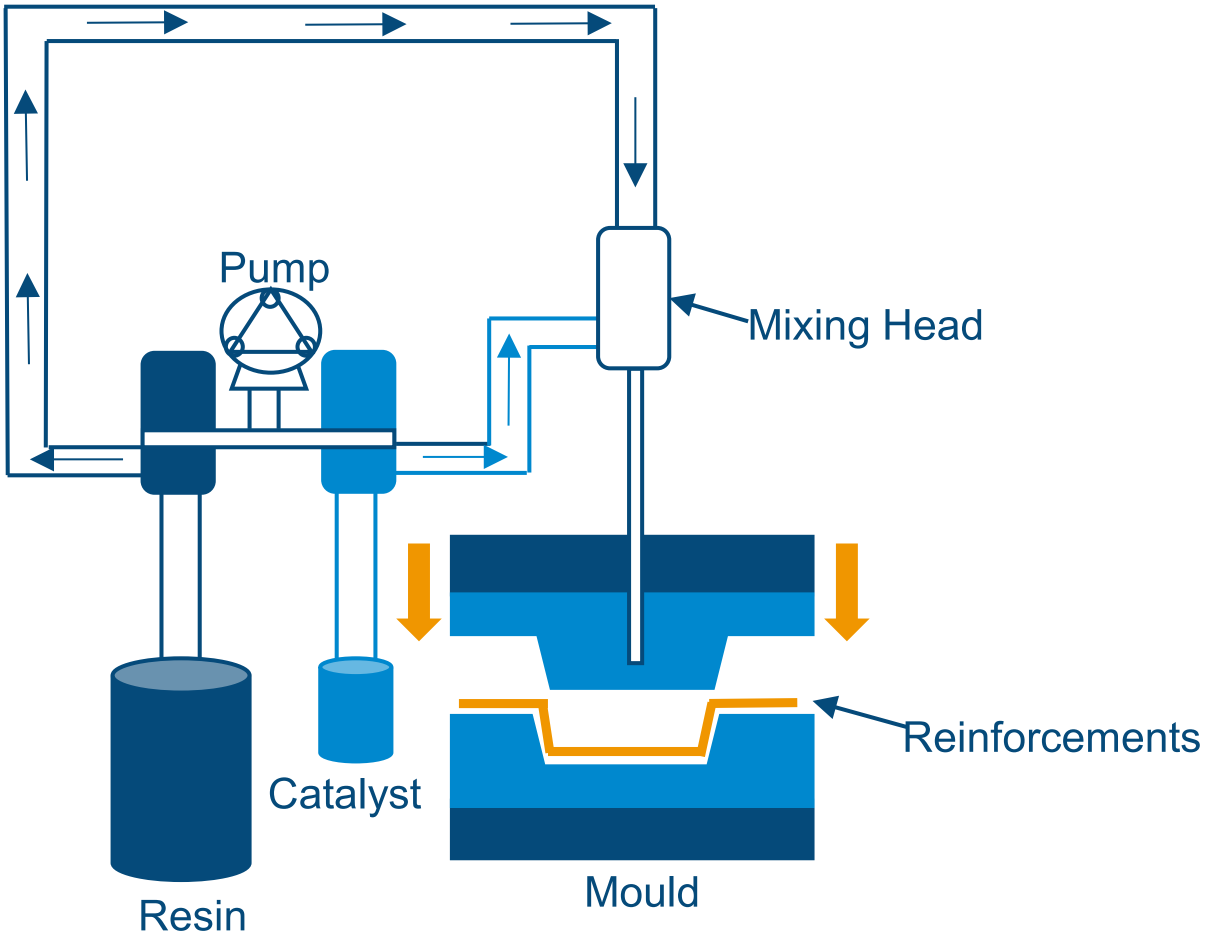


Illustration of Resin Transfer Moulding process

Pultrusion

Axial and/or transverse reinforcement are pulled through a resin bath, which is heated. The impregnated resin is then pulled through a heated die. The part takes its shape, is cooled, then cut to length. This is a continuous process, mostly automated, for high volume processes. Using a coil at the end of the process, up to 5 km of sheet can be stored. Pultrusion is typically restricted to composites with 2D shapes. Large fibre contents can be impregnated with this process, allowing for very high strength parts.

Pull-Winding

Pull-winding is a similar process to pultrusion, with an additional step at the start of the process involving a cross-winding unit. This helically winds axial fibres around a profile to create a thin layer (<1.5 mm). This step avoids the needs for transverse reinforcements such as mats, which have a significantly higher thickness. This allows for even higher fibre content, for high strength parts. As with pultrusion, this process is limited to 2D shapes. In addition, parts with negative shapes can't be used in Pullwinding due to the cross-winding unit.

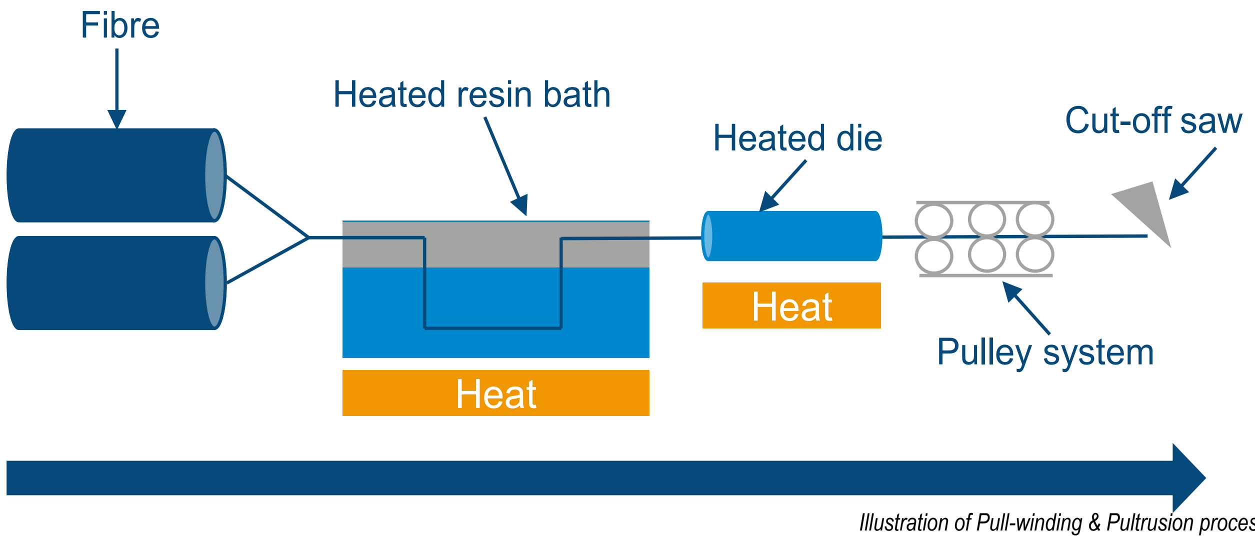


Illustration of Pull-winding & Pultrusion process

Hand Lay-Up

Layers (piles) of dry reinforcements or prepregs are laid by hand to form a laminate stack along the open mould profile. Resin is then infused into the dry piles after lay-up and rollers are used to consolidate the laminate. Curing of the resin is either at room temperature with a catalyst/hardener or under heat and vacuum. Optionally, a gel coat can be applied to the mould prior to the lay-up process. Hand lay-up is typically used for prototyping or for large, complex parts.

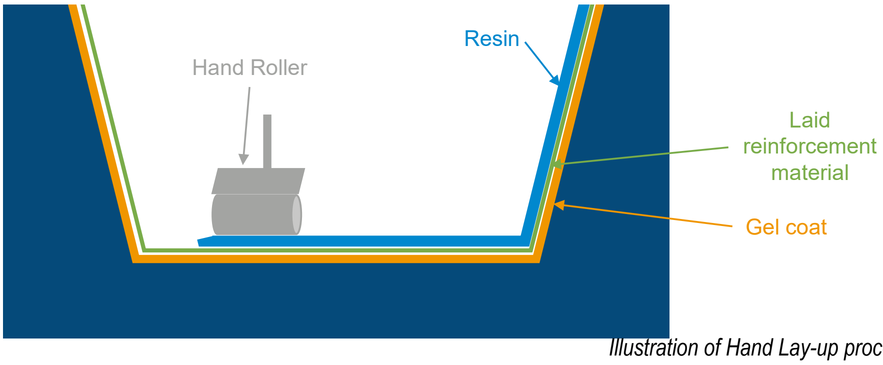


Illustration of Hand Lay-up process

Spray-Up

Catalysed resin and continuous strand reinforcements are sprayed into the mould using a chopper gun, which slices the continuous fibre reinforcement into short lengths, blowing the short fibres directly into the sprayed resin stream, giving simultaneous application of the resin and fibres. The laminate is then compacted with rollers, as with hand lay-up. In addition, a gel coat can be applied before spray-up and a core can easily be added post lay-up. As with hand lay-up, production volume per mould is low.

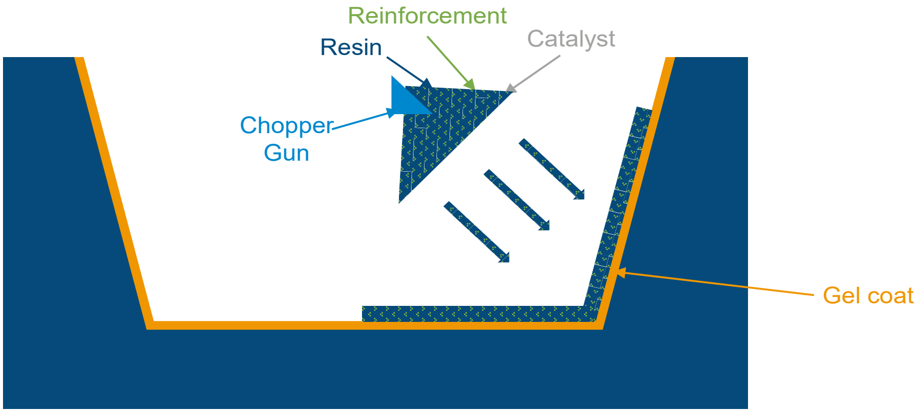


Illustration of Spray-Up process

Filament Winding

Continuous strands of fibre and submerged and wetted in a resin bath and wound onto the mould, which is a rotating cylindrical mandrel. The rotation pattern of the mandrel can be adjusted to provide a high degree of control over fibre placement. Once the desired amount of layers have been applied to the mandrel, the laminate is open-cured and the composite part is stripped. This process is often automated and the excellent control over fibre placement allows for precisely engineered composite parts. Typically, this process is restricted to tubular products such as pipes. However, the use of CAD (Computer Aided Design) is beginning to allow for more complex-shaped parts to be manufactured.

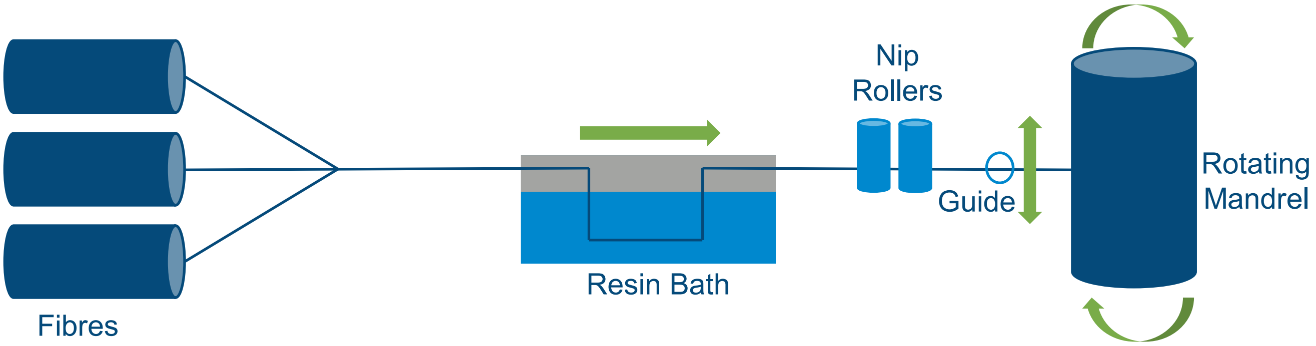


Illustration of Filament Winding process

Additive Manufacturing

AM (Additive Manufacturing) is an increasingly popular option to produce composite parts. Discrete, low-volume parts cam be produced without the usual associated tooling costs. Typically, AM for composites is for thermoplastic matrixes due to the temperature limitations with curing thermosets. In-situ fusion or deposition of pre-impregnated fibre are two common methods for thermoplastic composite AM. However, recent technology has begun to allow dry fibre impregnated in situ with thermoset resins, delivered by an end effector.

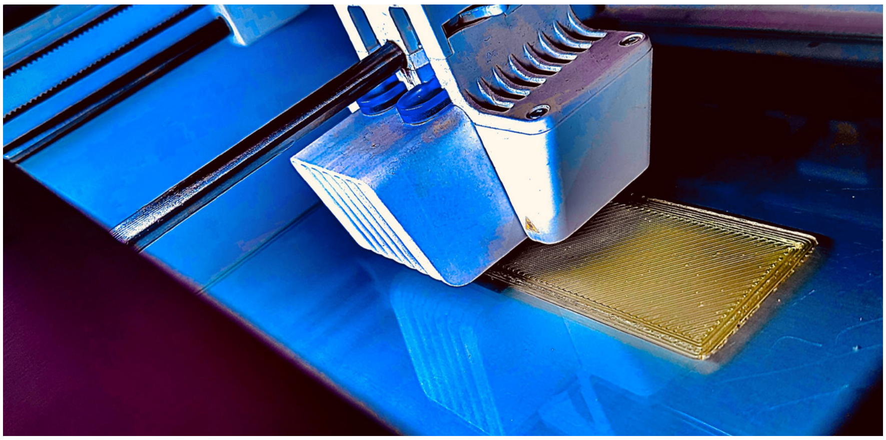
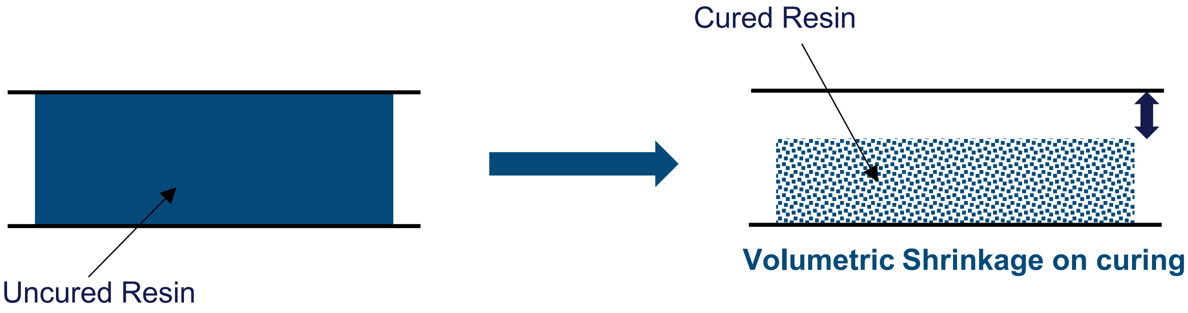


Image of 3D Printing

Vinaltex™

Shrinkage Problem



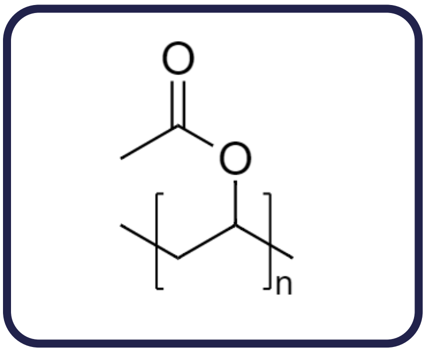
- On curing, thermosets such as UPRs (unsaturated polyester resins) and vinyl esters (VEs) undergo cross-linking reactions with styrene. This reaction causes a volumetric shrinkage.
- Shrinkage is associated with built-in stresses which weaken the composite materials mechanical properties.
- In addition, print-through of fibres is common, producing poor surface appearance.
- UPRs and VEs without a **Vinaltex™ Low-Profile Additives (LPAs)** typically shrink by 7-9% during curing and exhibit poor surface quality.
- Addition of a **Vinaltex™ Low-Profile Additives (LPAs)** allows for a no-shrink system with excellent surface appearance and retains mechanical properties of the resin.

Low-Shrink Additives	Reduce shrinkage and improves surface appearance
Vinaltex™ Low-Profile Additives	**Excellent shrinkage control producing Class-A surfaces with excellent surface appearance**

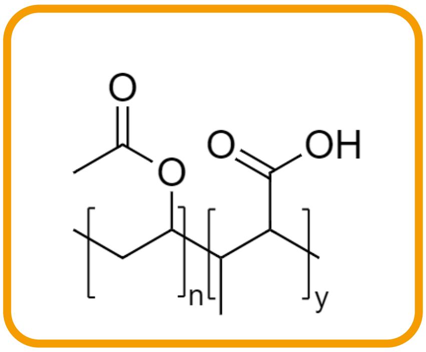
Vinaltex™

Grade Selector

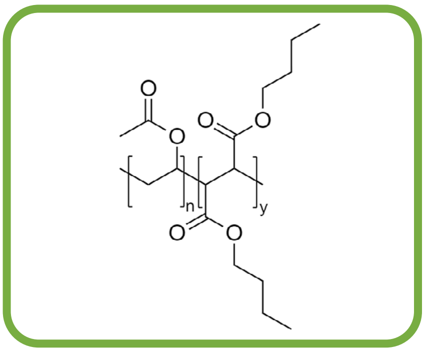
Synthomer offer a range of **low-profile additives** based on Polyvinyl Acetate (PVAc). Vinaltex™ PVAc is available as both solid and pre-dissolved in styrene.



PVAc Homopolymers



PVAc-co-Crotonic Acid (PVAc/CA)



PVAc-co-Dibutyl Maleate (PVAc/DBM)

Vinaltex™

Grade Selector (Solid Form)

Product Name	Function		Applications								Produ
	Shrinkage Control	Thickening ability in combination with MgO	SMC	BMC	RTM	Pultrusion and Pull-Winding	Hand Lay-Up and Spray-Up	Filament Winding	Additive Manafacturing	B-Side Carrier	
Vinaltex™ Polyvinyl Acetate Homopolymers											
M30	●			○	●	●	●	●	●	○	VA
M40	●			●		●			○	●	VA
M45	●			●		●				●	VA
M50	●			●		●					VA
M60	●			●							VA
Vinaltex™ Polyvinyl Acetate Acid/Crotonic Acid Copolymers											
H301	●	●	●	○	●				●	○	VAc
H302	●	●	●	○						○	VAc
Vinaltex™ Polyvinyl Acetate/Dibutyl Maleate Copolymers											
H356	●				●				●		VAc/

● Main applications/ good performance

○ Can be used in this applications

Composition	Solid Content	EtOAc Viscosity at 20% solids [mPa.s] 1)	Styrene Viscosity at 40% solids [mPa.S] 2)	Acid Value [mg KOH/g]	Glass Transition Temperature [°C] 3)	Complex Viscosity at 100 °C at 1.59 Hz [x10^3 Pa.s]	Molecular Weight [Mw]	Youngs Modulus [MPa]	Peak Stress at Break [MPa]	
ct Properties *										Product Name
		Vinaltex™ Polyvinyl Acetate Homopolymers								
Ac	≥ 99	17 - 25	600 - 1,800	-	36 ± 2	100	~85,000	1,200	8	**M30**
Ac	≥ 99	30 - 50	2,100 - 4,000	-	40 ± 2	180	~120,000	1,300	13	**M40**
Ac	≥ 99	50 - 70	4,000 - 6,800	-	40 ± 2	240	~150,000	1,900	25	**M45**
Ac	≥ 99	80 - 140	7,800 - 20,000	-	42 ± 2	230	~176,000	2,100	26	**M50**
Ac	≥ 99	150 - 220	23,000 - 42,500		42 ± 2	260	~245,000	2,300	29	**M60**
		Vinaltex™ Polyvinyl Acetate Acid/Crotonic Acid Copolymers								
/CA	≥ 99	18 - 30	750 - 2,500	5 - 7	38 ± 2	150	~100,00	900	14	**H301**
/CA	≥ 99	45 - 65	4,500 - 7,500	5 - 7	39 ± 2	250	~ 150,000	1,700	21	**H302**
		Vinaltex™ Polyvinyl Acetate/Dibutyl Maleate Copolymers								
DBM	≥ 97.5	14 - 26	400 - 600	-	16 ± 2	110	~ 90,000	-	1	**H356**

Abbreviations:

VAc	Vinyl Acetate
CA	Crotonic Acid
DBM	Dibutyl Maleate
EtOAc	Ethyl Acetate

* Data describes typical properties – not product specifications
Detailed test methods are available upon request

1) 20% solid content in Ethyl Acetate @ 20°C

2) 40% solid content in Styrene @ 23°C

Vinaltex™

Grade Selector (Pre-dissolved in Styrene)

Product Name	Function		Applications Recommendation								Produ
	Shrinkage Control	Thickening ability in combination with MgO	SMC	BMC	RTM	Pultrusion and Pull-Winding	Hand Lay-Up and Spray-Up	Filament Winding	Additive Manafacturing	B-Side Carrier	
Vinaltex™ Polyvinyl Acetate Homopolymers in Styrene											
T85	●			○	●	●	●	●	●	○	
T120	●			●		●			○	●	
T150	●			●		●				●	
T175	●			●		●					
T250	●			●							
Vinaltex™ Polyvinyl Acetate Acid/Crotonic Acid Copolymers in Styrene											
T100	●	●	●	○	●				●	○	
T160	●	●	●	○						○	

● Main applications/ good performance

○ Can be used in this applications

Form	Solid Content	Styrene Viscosity at 40% solids [mPa.S] 1)	Acid Value [mg KOH/g]	Molecular Weight [Mw]	
ct Properties *					**Product Name**
		Vinaltex™ Polyvinyl Acetate Homopolymers in Styrene			
VAc Polymer in STY	39.0 - 42.0	600 - 1,800	-	~85,000	**T85**
VAc Polymer in STY	39.0 - 42.0	2,100 - 4,000	-	~120,000	**T120**
VAc Polymer in STY	39.0 - 42.0	4,000 - 6,800	-	~150,000	**T150**
VAc Polymer in STY	39.0 - 42.0	7,800 - 20,000	-	~176,000	**T175**
VAc Polymer in STY	39.0 - 42.0	23,000 - 42,500	-	~245,000	**T250**
		Vinaltex™ Polyvinyl Acetate Acid/Crotonic Acid Copolymers in Styrene			
VAc/CA Polymer in STY	39.0 - 42.0	750 - 2,500	5 - 7	~100,00	**T100**
VAc/CA Polymer in STY	39.0 - 42.0	4,500 - 7,500	5 - 7	~ 150,000	**T160**

Abbreviations:

VAc	Vinyl Acetate
CA	Crotonic Acid
STY	Styrene

* Data describes typical properties – not product specifications
Detailed test methods are available upon request

1) 40% solid content in Styrene @ 23°C

Guideline SMC Formulation

Component	Function	Quantity / wt.%
Unsaturated Polyester Resin	Matrix	18.6 %
Vinaltex™ PVAc LPA in 60% Styrene	**Shrinkage Reduction**	**12.4 %**
Calcium Carbonate	Filler	54.8 %
Zinc Stearate	Lubricant	1.4 %
Zinc Sulphide	Optical Pigment	1.4 %
Magnesium Oxide	Thickener	0.9 %
Luperox	Initiator	0.5 %
Glass Fibres	Reinforcement	10.0 %
	TOTAL	**100%**

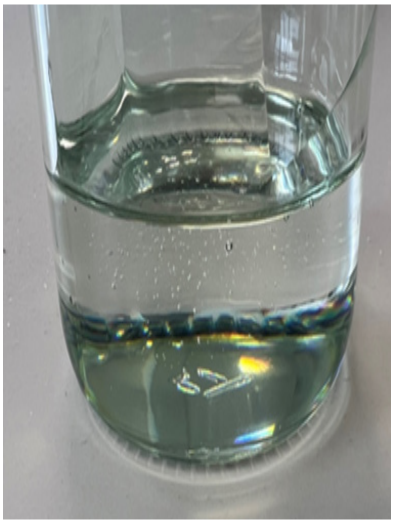
Dissolving PVAc LPA in Styrene

- Dissolve the PVAc in Styrene at 20-25 °C (do not exceed 40 °C)
- Maintain agitation to keep in a suspension until dissolved
- Add the PVAc solid gradually
- Higher molecular weight grades typically have a longer dissolution time
- The final solution should be clear and free from particulates

Component	Quantity / wt.%
Styrene	**60 %**
Vinaltex™ PVAc Solid Polymer	**40 %**
Inhibitor (eg. Hydroquinone)	**0.1 %**

Formulation Tips

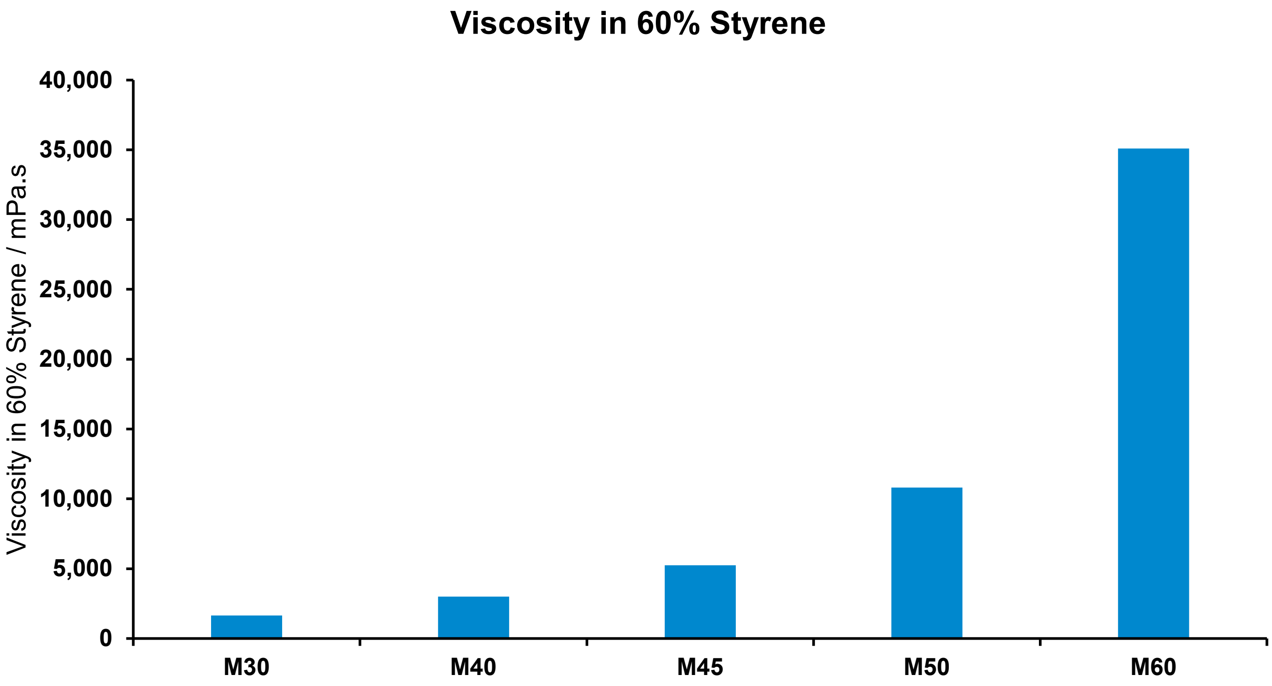
- Vinaltex™ LPAs are typically used at 2-10% loadings in PE resin formulations.
- LPA loading in resin formulation, application and cure type dependent.
- The LPA should be fully miscible before cure with no haze or cloudiness.
- Addition of an LPA may slow down redox initiation but can be compensated by an increased in initiator and accelerator.
- For atmospheric pressure systems, if negative shrinkage occurs, causing an internal foam-like appearance, a reduction in the concentration of initiating system is advised.

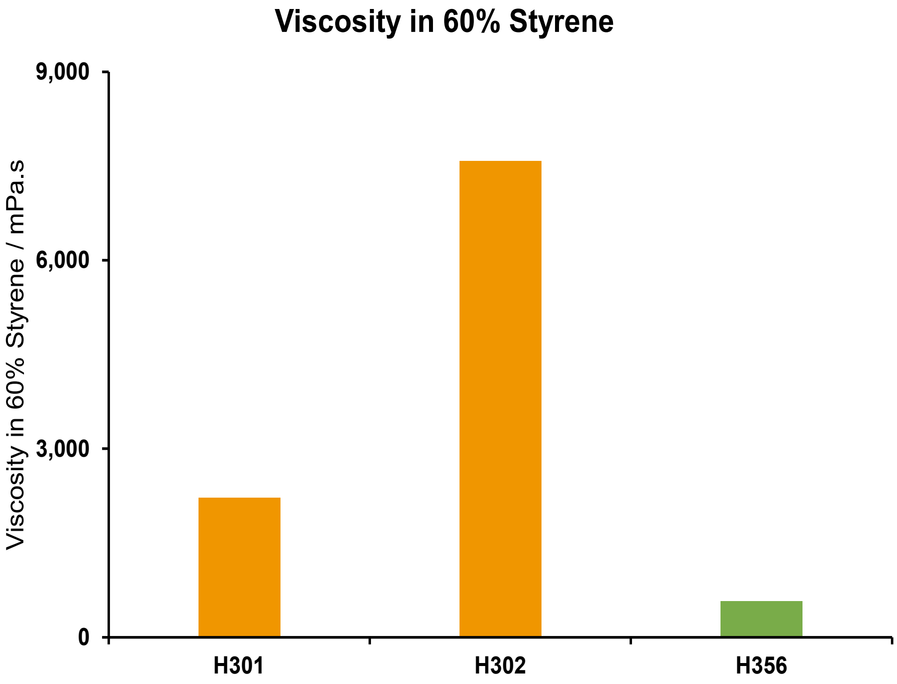


Viscosity in Styrene

Formulators typically dissolve Synthomer Low Profile Additives into a styrene solution, targeting 40% solids content. With all grades, solutions are stable. Molecular weight has an impact on the viscosity of the solution; higher molecular weight grades typically produce higher viscosity solutions. The viscosity required will be process dependent.

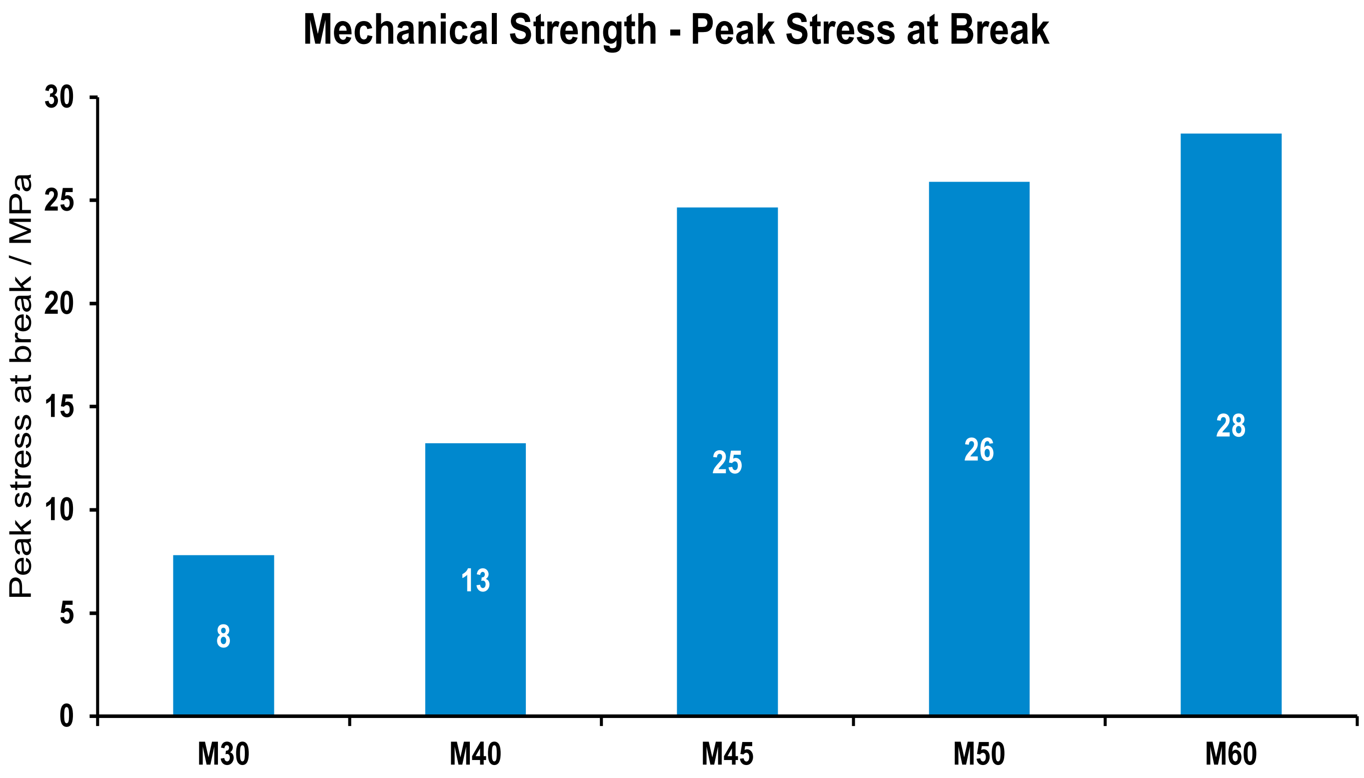
Grades such as Vinaltex™ **M30**, **H301** and **H356** provide low viscosity solutions. For higher viscosity requirements, grades such as Vinaltex™ **M50**, **M60** and **H302** are recommended.

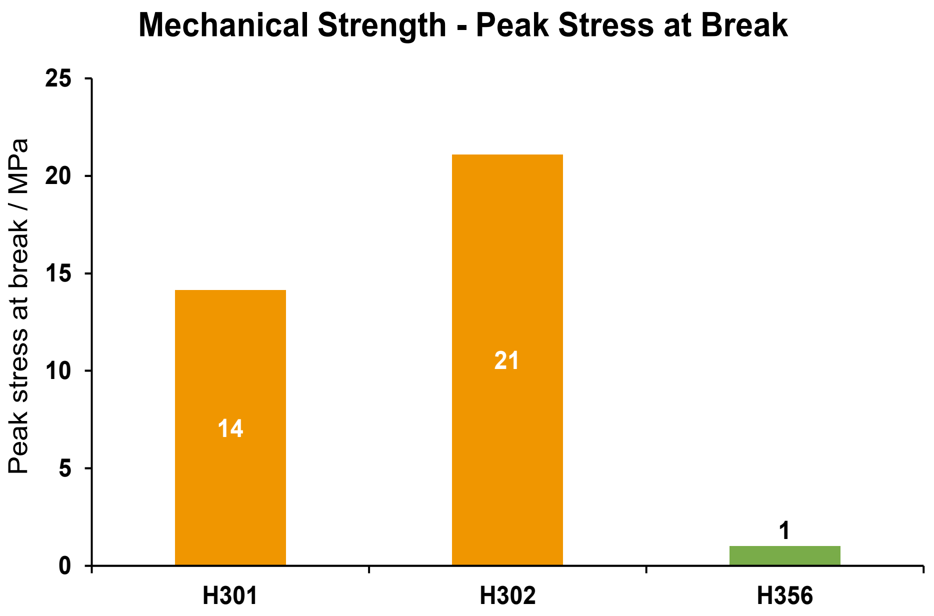




Mechanical Strength

Break stress is defined as the maximum force the polymer can withstand before breaking when a force is applied. Higher molecular weight polymers typically give a higher break stress value.





Key Benefits

- Excellent Shrinkage Control with Class-A finish possible
- Wide range of molecular weight grades available
- Grades with intrinsic thickening properties
- Complete solubility in styrene

Contact Us!

All Vinaltex™ PVAc grades are manufactured on a dedicated production plant to strict quality standards at our Harlow site in the UK. Each product is available in 25 kg paper sacks with 1000 kg stretch wrapped on a pallet (40 bags). 500 kg bags are also available on request.

vinaltex@synthomer.com

Group Head Office
Synthomer plc
10 Greycoat Place
Victoria, London SW1
United Kingdom

Synthomer Trading Limited
Central Road, Temple Fields
Harlow, Essex CM20 2BH
United Kingdom
Phone: +44 1279 436 211

vinaltex@synthomer.com

www.synthomer.com

Our business at a glance

Synthomer is one of the world’s foremost suppliers of aqueous polymers with a strong presence in key industries such synthetic latex gloves, coatings, construction, textiles, paper, adhesives and many more. We are driven by innovation to better enhance our customers’ products and processes with sustainability as the ultimate aim.

Revision date 27 June 2025

This information or data, including any advice or recommendation(s) (collectively, “Information”), provided by Synthomer plc and/or its affiliates (collectively, “Synthomer”) are not intended to, nor do they, constitute professional advice or services. INFORMATION IS PROVIDED ONLY AS OF THE DATE HEREOF ON AN “AS IS” AND “AS AVAILABLE” BASIS AND SYNTHOMER DOES NOT WARRANT THE ACCURACY, TIMELINESS, OR COMPLETENESS OF THE INFORMATION. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, SYNTHOMER DISCLAIMS (I) ALL IMPLIED WARRANTIES, INCLUDING AS TO CONTINUED PRODUCTION, FITNESS FOR PARTICULAR PURPOSE, NON-INFRINGEMENT AND MERCHANTABILITY; (II) ALL LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT, OR THE RELIANCE BY ANY PARTY ON THE INFORMATION (INCLUDING INFRINGEMENT OF THIRD-PARTY INTELLECTUAL PROPERTY RIGHTS); AND (III) ALL LIABILITY, INCLUDING WITHOUT LIMITATION, FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL LOSSES. Any Information concerning any possible use or application of Synthomer products is given by us in good faith and it is entirely for the recipient to satisfy itself fully as to the suitability of Synthomer products for any particular purpose. Synthomer products are sold subject to Synthomer’s standard terms and conditions of sale which are available from www.synthomer.com/tc. Unless otherwise noted, Synthomer owns all right, title and interest in the Information and all other intellectual property rights and data associated with this Information without limitation. All trademarks and logos are the property of Synthomer. Copyright © 2024 Synthomer, all rights reserved.