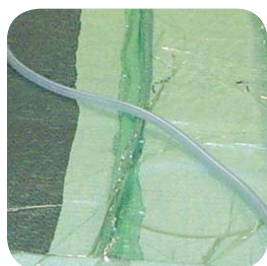


Infusion Products for Marine



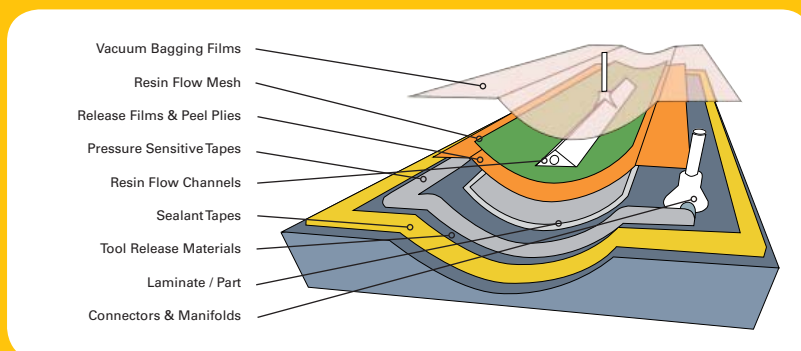
Introduction

SP-High Modulus, the marine business of Gurit, is a technical leader in the formulation of advanced epoxy resins.

SP-High Modulus' PRIME™ epoxy infusion systems have a 10 year track record, and remain at the forefront of the development of liquid epoxies for "under the bag" infusion processes, such as SCRIMP™, RIFT (resin infusion under flexible tooling), and VARTM (vacuum assisted resin transfer moulding).

Epoxies are stronger and have higher adhesive properties than other commonly used infusion matrices, such as vinylesters and polyesters. Epoxy based systems therefore require less resin to achieve greater physical properties, and their use can lead to lighter and more durable structures.

SP-High Modulus' experience with infusion systems gives a comprehensive understanding of the properties required to make an infusion product more effective, therefore SP-High Modulus' range is made up of products that process robustly, and have optimised wet-out, viscosity, cure, exotherm, and resin fuming properties.



SP-High Modulus' range of Infusion Systems

Product	Description	Typical Applications	Page no.
PRIME™ 20LV	Low viscosity epoxy infusion system (219cP @ 25°C) available in 3 hardener speeds. Germanischer Lloyds approved.	Good general purpose infusion system.	2
PRIME™ 27	Low initial mixed viscosity epoxy infusion system (190cP @ 25°C) with high mechanical and thermal properties.	Suitable for infusing structures that utilise carbon, aramid and glass.	2
PRIME™ ULV	Ultra low initial mixed viscosity epoxy infusion system (139cP @ 25°C) with high level of toughness and excellent adhesion to vinylester skincoats.	Ideal for lower permeability substrates such as carbon reinforced spars.	3



PRIME™ 20LV

Epoxy Infusion System

- Low initial mixed viscosity (219cP @25°C)
- Variable infusion times
- Very low exotherm even in thick sections
- Suitable for infusing very large structures
- Germanischer Lloyds approved
- Available in three hardener speeds

Introduction

PRIME™ 20LV is specifically designed for use in a variety of resin infusion processes including RTM, SCRIMP™ and RIFT.

PRIME™ 20LV has a much reduced viscosity resin and longer working time, which makes it ideal for infusing very large parts with complex reinforcements in one operation. It maintains the exceptionally low exotherm characteristic, which allows thick sections to be manufactured without risk of premature gelation due to the heat of exothermic reaction. This low exotherm will also help to extend the life of mould tools.

Typical Applications

Ideal for any composite infusion where high quality, low void content laminates are required. Among the more usual applications for marine would be boat hulls, decks and bulkheads.

Mixing and Application

Mix ratios are 100:26 by weight for all PRIME™ hardeners and can be weighed and mixed manually or with the aid of automated dosing and mixing machines.

When hand mixing, a drill operated helical mixer is ideal but care needs to be taken to keep mixing speeds low so as to prevent the inclusion of air by the mix head. On larger infusions, batches of resin should be mixed and prepared as required by the infusion to prevent any heat build up in the feed vessel.

PRIME™ 20LV can be readily infused by any of the standard methods employed in the process. The range of hardeners gives builders the choice of rapid curing for small parts or very long flow and potlife which are essential for large infusions.



40' Yacht Hull Infusion

PRIME™ 27

Epoxy Infusion System

- Low initial mixed viscosity (190cP @25°C)
- Higher mechanical and thermal properties
- Low exotherm in thick sections
- Suitable for infusing structures that utilise carbon, aramid and glass fibres

Introduction

PRIME™ 27 is suitable for the female moulding of large, complex components incorporating advanced fibres such as carbon and aramid. Typical projects include spars, hulls and reinforcing structures.

It is SP-High Modulus' premium infusion system, offering high mechanical and thermal properties, lower viscosity, improved wetting out and longer working time than PRIME™ 20LV. It achieves excellent mechanical and physical properties, including a high Tg from a moderate (50°C) postcure.

PRIME™ 27 resin uses PRIME™ hardeners to give a range of working times and cure speeds. This enables the gel time of the resin to be closely matched to the required infusion time for any particular size of moulded part.

Typical Applications

PRIME™ 27 is a premium quality infusion system offering slightly higher mechanical and thermal properties than PRIME™ 20LV along with a lower mixed viscosity. It is typically used for similar applications as PRIME™ 20LV where the builder is looking for premium properties.

Mixing and Application

Mix ratios are 100:27 by weight for all PRIME™ hardeners and can be weighed and mixed manually or with the aid of automated dosing and mixing machines.

When hand mixing, a drill operated helical mixer is ideal but care needs to be taken to keep mixing speeds low so as to prevent the inclusion of air by the mix head. On larger infusions, batches of resin should be mixed and prepared as required by the infusion to prevent any heat build up in the feed vessel.

PRIME™ 27 can be readily be infused by any of the standard methods employed in the process.



Carbon Deck Infusion

PRIME™ ULV

Epoxy Infusion System

- Very low initial mixed viscosity (139c@25°C)
- Excellent adhesion to vinylester skincoats - ideal for customers using polyester gelcoats with epoxy backing laminates
- High level of toughness
- Ideal for lower permeability substrates

Introduction

PRIME™ ULV hardener can be used with either PRIME™ 20LV or PRIME™ 27 resin systems to produce an extremely low viscosity mixed system. This low viscosity (<140cP) has the benefit of increasing infusion speeds in regular laminates as well as facilitating the infusion of lower permeability reinforcements such as high thickness glass and unidirectional carbon. The cured laminates also show improved levels of toughness and have been shown to perform extremely well when used with certain Vinylester tie-coat methods.

The combination of PRIME™ 27 with ULV hardener provides the ultimate low viscosity, high property combination.

Typical Applications

The advantages of these systems make them ideal where rapid infusion times are required and for the one-hit manufacture of items such as carbon reinforced spars and high thickness components that can be extremely difficult to infuse with higher viscosity resins.

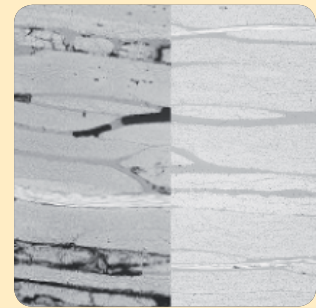
Mixing and Application

The correct mix ratio by weight is: 100:19 with PRIME™ 20LV, 100:20 with PRIME™ 27

These need to be weighed accurately and mixed thoroughly; this can be done manually or with the aid of automated dosing and mixing machines.

When hand mixing, a drill operated helical mixer is ideal, but care needs to be taken to keep mixing speeds low so as to prevent the inclusion of air by the mix head. On larger infusions, batches of resin should be mixed and prepared as required by the infusion to prevent any heat build up in the feed vessel.

PRIME™ ULV systems can be readily be infused by any of the standard methods employed in the process.



Identical carbon laminates – improved quality of PRIME™ 20ULV on right (Voids show black)

Infusion Pros and Cons

As a process, infusion offers many advantages:

- High quality laminates
- Low void content high Fibre Volume Fraction
- Rapid one hit construction
- Minimal physical contact with resins and hardeners
- Repeatable component quality

However it is not always suitable for every application:

- Moulds need to be perfectly air tight
- Extra cost of consumable items required
- Potential risk if poorly carried out
- Higher resin absorbance in certain core types e.g. PVC

PRIME™ series infusion systems offer real advantages:

- Low mixed viscosity
- Range of blendable hardeners for short to very long working times
- Good mechanical properties from moderate cures
- Good adhesion to many Vinylester tie-coat systems

Mixing Machines

Introduction

The PRIME™ series of infusion resins are easy to mix by hand. However, many large infusions can be made a lot simpler and more reliable with the use of automated mixing and metering machines.

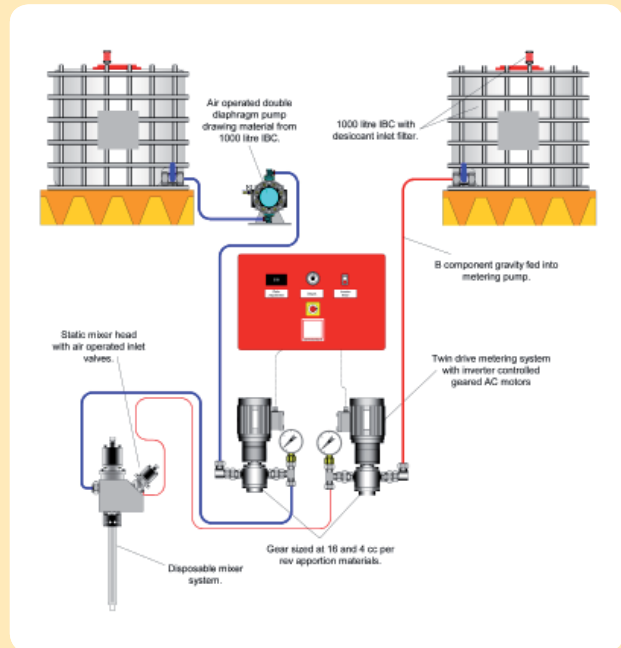
In larger infusions, weighing out resin and hardener by hand presents a potential for errors and demand is sometimes higher than can be easily mixed by hand.

In addition, the use of hand held paddle mixers can whisk a lot of air bubbles into the mixed product.

Machines can vary in complexity and design but may offer the following advantages:

- Accurate control of mixing ratios with perfect mixing
- Air free mixing (a potential weakness with hand mixing)
- Demand fed supply of resin no matter how fast or slow the fill is, minimising waste
- Virtually zero contact with resins and hardeners

SP-High Modulus' Infusion products can be used with a range of mixing machines from manufacturers such as 2KM, Graco, Meter Mix Systems, Dekumed, Dopag.



2KM PGM 2K701 compact system to meter and mix epoxy resins used in the infusion of production boats utilising PRIME™ 20 ULV

Vacuum Consumables

Introduction

Vacuum Infusion processes can vary considerably along with the type of consumables and equipment required. SP-High Modulus' can supply products to cover virtually every requirement from adhesive tape to vacuum pumps.

Amongst the range are high perforation release films and peel plies which facilitate easy removal and which provide perfect secondary bonding surfaces. To assist flow under the bag there is Knitflow40 distribution mesh and 12.5mm spiral tube in convenient sizes.

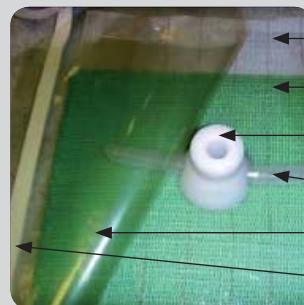
Over the top there is a range of high strength yet flexible bagging films in widths of up to 12m and economical polyethylene tubes for resin feed and vacuum pipes. Re-useable through-bag fittings are available for connecting feed pipes securely to the part along with a range of 'T' pieces elbows and taps for easy fitment and control.



Resin Trap



Knitflow 40



- ← Stitchply A peel ply
- ← Knitflow 40 mesh
- ← ½" through bag connector
- ← Spiral Distribution pipe
- ← WL7400 Bag Film
- ← AT140 Tacky Tape

Corecell™ for Infusion

Introduction

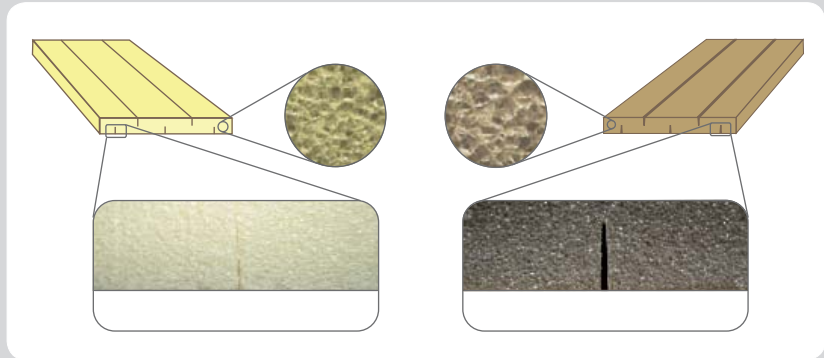
Corecell™ is the perfect partner for the PRIME™ series of infusion resins. In addition to the normal benefits and structural advantages of Corecell™ the tight cell structure results in low resin absorption whilst the variety of available cut patterns result in easy placement, low weight and reliable infusions.

Corecell™ M-Foam is the perfect choice for the majority of boatbuilding applications having excellent shear strength combined with high elongation and energy absorbing properties. Available in densities from 65kg/m³ to 200kg/m³ M-Foam is the perfect choice for the whole boat from slamming areas to superstructure and bulkheads.

Cut Patterns

One of the advantages of Corecell™ lies in the ability to knife cut grooves into the surfaces, this allows easy conformation to mould shape and greatly assists resin flow during the infusion process. Because the cuts are very narrow, resin uptake is lower than saw cut formats and has the added benefit of low or zero surface print.

Knife cut Corecell™ is available in single, double and triple cut depending on the degree of flexibility that is required, the cuts are 60% of the thickness, therefore the cuts from each face overlap allowing through thickness resin flow without additional drilling. As the knife cuts are very narrow and the cell size is relatively small the overall resin uptake is lower than most other types of infusion core with saw cut grooves.



Corecell vs Crosslinked PVC smaller cell size and narrow knife cuts

In addition to the knife cut formats, Corecell is also available with saw cut grooves which are ideal for fast infusions even when no distribution mesh is used. There are two standard groove patterns specifically designed for infusion named VIC1 and VIC2 although bespoke versions can be produced if required.

Technical Information and Pricing

For more detailed information on SP-High Modulus Infusion products and the complete SP-High Modulus product portfolio, please visit:

www.gurit.com/marine to view the following:

- Product Data Sheets
- News/Case Studies
- Events Schedules
- Product Brochures
- 'How to' Videos
- Composite Guides
- Representatives Contact Details
- Corporate videos

For pricing or other enquiries, please contact marine@gurit.com



www.gurit.com/marine



Infusion Guide



Product datasheets



Case Studies



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