DELIVERING THE FUTURE OF COMPOSITE SOLUTIONS

COMPOSITE MATERIALS FOR WIND ENERGY
INTRODUCTION

The wind energy industry is one of Gurit’s long-standing, strategic target markets. Gurit serves wind turbine blade and component manufacturers with a complete offering - from Tooling (i.e. the design, production and supply of wind turbine blade moulds and related equipment), the development, production and supply of advanced Composite Materials to Technical Support and solutions for the repair of installed wind blades.

Composite material solutions developed by Gurit for manufacturers of wind turbine blades have continuously contributed to the increasing efficiency of wind power installations worldwide. New materials solutions were developed with the aim to keep the weight of the wind turbine blades as light as possible, yet maximising their strength, stiffness and durability. At the same time, Gurit has contributed to making wind energy a technical and also a commercial success story by helping to decrease manufacturing costs of wind turbine blades and enhancing the efficiency of wind power installations.

Gurit’s broad range of award-winning products and solutions is unique in covering both infusion and prepreg blade technology, with the capability to supply all the relevant materials needed for building a composite blade.

New for 2019: Spabond™ 840 – a low toxicity, long working time, rapid curing adhesive for the next generation of wind turbine blades.
### MATERIALS FOR WTG BLADE MANUFACTURE

#### STRUCTURAL CORE MATERIALS

- Kerdyn™
- Gurit PVC
- Corecell™
- Balsaflex™
- WE Prepreg
- WT SPRINT™
- SparPreg™

#### PREPREGS

- Spabond™ 5-Minute
- Spabond™ 730
- Spabond™ 840
- SA 80
- Ampreg™ 3X
- TPC
- S’Fill 15 min
- S-Fair 600

#### FILM ADHESIVE

- RENUVO™ PP
- RENUVO™ MPS

### MATERIALS FOR WTG BLADE SERVICING & MAINTENANCE

#### A Leading / Trailing Edge Erosion

1. Pinholes
2. Blisters
3. Superficial scratches

#### B Trailing Edge Split

- Gutters
- Vortex generators
- Lightning protection

#### C Lightning Strike

- Winglets
- Sensors

#### D Surface Defects

- Pinholes
- Blisters
- Superficial scratches

#### E Retrofitted parts

- Gutters
- Vortex generators
- Lightning protection

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### Gurit® Corecell™ T

**Structural Foam Core**

- Suitable for all PVC core applications
- Outstanding chemical resistance
- Ideal for resin infusion
- Excellent mechanical properties
- 120°C processing

**INTRODUCTION**

Gurit® Corecell™ T has been developed as a technological step-change from traditional PVC and Balsa structural core. Gurit® Corecell™ T is an outstanding core material in every application where balsa or cross-linked PVC is commonly used. High mechanical toughness and thermal stability give Gurit® Corecell™ T excellent fatigue characteristics. This reliability makes Gurit® Corecell™ T a natural replacement for cross-linked PVC or balsa in applications where a significant service life is required.

The high temperature stability of Gurit® Corecell™ T also means that it can be used in manufacturing processes to at least 120°C / 250°F with short durations during a cure cycle to over 150°C / 300°F. This makes it ideal for use with conventional prepregs and in some liquid infusion processes where high resin exotherms can often be seen. Gurit® Corecell™ T is available in every resin infusion format and is compatible with polyester, vinylester and epoxy resin systems. Low resin absorption characteristics of Gurit® Corecell™ and unique knife cut formats allow for higher performing infusions, lower resin cost and lower weight than any other structural core.

**TYPICAL APPLICATIONS**

Ideal for applications where loads are less dynamic in nature, such as wind turbines, above the waterline on yachts, and in mass transport.

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### Gurit® Balsaflex™

**Classic Wood Core**

- High quality composite core material made from end grain balsa
- Highest strength to weight ratio of any structural core
- Natural, sustainable and responsibly sourced
- LITE version available

**INTRODUCTION**

Gurit® Balsaflex™ is the classic end-grain balsa wood core, featuring very high strength to weight ratio. When an application requires high strength and stiffness and cost effectiveness, Gurit® Balsaflex™ is a suitable solution due to a good balance between cost, properties and weight. Gurit® Balsaflex™ is available in a range of densities, thicknesses, formats and finishes. Gurit® Balsaflex™, is DNV-GL approved. Gurit® Balsaflex™ LITE coating system is also available, to significantly reduce resin uptake.

**TYPICAL APPLICATIONS**

Gurit® Balsaflex™ is used for wind turbine blades and nacelles, marine, automotive, truck, rail and aircraft parts. Gurit® Balsaflex™ can be supplied in sheet form or kiln cut to customer’s desired shapes.

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### Gurit® Kerdyn™ Green

**Recycled Structural Foam**

- Up to 100% recycled PET content
- New Gurit PET product line
- Improved mechanical properties
- Reduced resin uptake
- Recyclable
- FR version available
- Compatible with all types of composite manufacturing techniques

**INTRODUCTION**

Gurit® Kerdyn™ Green is a new recyclable, thermoplastic foam with an improved balance of mechanical properties, enhanced resin uptake performance, and good temperature resistance for a wide range of applications and production processes.

**TYPICAL APPLICATIONS**

Gurit® Kerdyn™ Green is used extensively in wind turbine blades, civil and marine structures. Gurit® Kerdyn™ Green is available in plain sheet form. A fire retardant version is also available with certification under review.

### Gurit® PVC & Gurit® PVC HT

**All-Purpose Foam Core**

- Suitable for all composite sandwich applications
- Outstanding chemical resistance
- Superior strength and stiffness to weight ratio
- High temperature insulation capabilities
- Self extinguishing
- High temperature resistance up to 140°C with Gurit® PVC HT

**INTRODUCTION**

Gurit® PVC is a closed cell, cross-linked PVC foam. It provides superior strength to weight ratio for all composite applications. Other key features of Gurit® PVC include outstanding chemical resistance, negligible water absorption, and excellent thermal insulation capabilities. It is compatible with most common resin systems including epoxy, polyester and vinylester.

Gurit® PVC is available in a wide range of formats with all standard cut patterns and finishes possible.

**TYPICAL APPLICATIONS**

Gurit® PVC is an all-purpose core and can be used in wind turbine blade shells, boat decks, hull sides, bulkheads, floors.
**PREPREG & SPRINT™ MATERIALS**

**WE 91-1 / WE 91-2**

- High flow epoxy prepregs
- High (WE 91-1) and medium (WE 91-2) tack prepreg
- Long ambient shelf-life - up to 2 months

**INTRODUCTION**

Gurit’s WE 91 prepreg product range comprises of two tack variants; WE 91-1 high tack and WE 91-2 medium tack prepregs. WE 91 is a high flow epoxy prepreg ideally suited to structural composite component manufacture. It can be cured at temperatures as low as 85°C / 185°F, but can also be used for the rapid manufacture of components through its 45-minute cure at 120°C / 250°F. All of this can be achieved together with an out-life of 60 days at 21°C / 70°F. WE 91 is designed for vacuum bag processing and offers excellent mechanical performance on glass and carbon fibre reinforcements.

**TYPICAL APPLICATIONS**

Technically and commercially competitive engineering materials.

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**WT 93**

- Low tack epoxy SPRINT™
- Cure from 85°C to 120°C
- Ideal for thick UD sections
- Out of autoclave

**INTRODUCTION**

WT 93 is part of Gurit’s comprehensive offering of structural composite product solutions comprising of 3 main product groups; Prepreg, SPRINT™ and SparPreg™. This unique product range provides technically and commercially competitive engineering materials, ideal for use either solely, or in conjunction with other Gurit products from within the range. WT 93 can be cured at temperatures as low as 85°C / 185°F, but can also be used for the rapid manufacture of components through its 45-minute cure at 120°C / 250°F. All of this can be achieved together with an out-life of 21 days at 21°C / 70°F. WT 93 is designed for vacuum bag processing and offers excellent mechanical performance on glass and carbon fibre reinforcements.

**TYPICAL APPLICATIONS**

Gurit’s innovative WT 93 SPRINT™ product range uses a high flow, low tack epoxy prepreg ideally suited to the manufacture of thick sections such as turbine blade roots or spars.

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**SparPreg™**

Unidirectional epoxy prepreg

- UD prepreg ideal for use in thick sections
- Available with glass or carbon fibre
- Excellent mechanical properties
- Out-of-autoclave curing
- Excellent handling & processing properties during lamination
- Recommended cure between 85°C / 185°F and 120°C / 250°F

**INTRODUCTION**

SparPreg™ was developed to benefit the lay-up of thick UD sections, such as wind turbine blade spars. The material can produce thick laminates of exceptional quality with low void content, without the need for an intermediary debulking process or additional dry fabric reinforcement to aid air removal. The net result enables blade manufacturers to eliminate production steps and redundant materials and increase capacity.

SparPreg™ has been specially formulated to achieve the outstanding in-cure and mechanical performance of the WE 91 prepreg and WT 93 SPRINT™ resin systems. SparPreg™ can be cured at temperatures as low as 85°C / 185°F, but can also be used for the rapid manufacture of components at 120°C / 250°F.

**TYPICAL APPLICATIONS**

SparPreg™ is an advanced UD prepreg, developed to enable the economic manufacture of unidirectional spar caps for more demanding blade designs, ideal for use in conjunction with other Gurit products.
ADHESIVE SYSTEMS

**SPABOND™ 5-MINUTE**
Tacking and Secondary Bonding

- 5 minute adhesive
- Available in cartridges
- Can be used alongside other Spabond™ products
- Ideal when used as an "extra hand" in assembly

**INTRODUCTION**
Spabond™ 5-Minute uses Gurit’s fast-setting technology. It combines outstanding bonding speed with a simple 1:1 by weight and volume mix ratio. This thixotropic system is ideal for general bonding and repair work on a wide range of materials. Components bonded with Spabond™ 5 Minute demonstrate high bond strengths and can be handled after a very short period of time. Spabond™ 5-Minute can be used in conjunction with other Spabond™ products as a “spot weld” system in situations where the use of conventional clamps is not possible.

**TYPICAL APPLICATIONS**
Used for in-field & component bonding (gutters, lightning protection).

**PACK SIZES & AVAILABILITY**
Used for fit-out, finishing and repair.

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**SPABOND™ 730**
Rapid Structural Bonding

- Reduced clamp time structural adhesive
- High strength and toughness
- Gels in 10 minutes, touch-dry in 2 hours
- Full properties after an overnight cure at ambient

**INTRODUCTION**
Spabond™ 730 is a fast curing structural adhesive designed for applications where reduced clamp times are important. It has a simple 1:1 by weight and volume mix ratio. It can be used to bond together a wide variety of dissimilar materials and has been designed to give a durable high strength bond.

**TYPICAL APPLICATIONS**
Fit-out, finishing and repair.

**PACK SIZES & AVAILABILITY**
Spabond™ 730 is available in 400ml cartridges with mix-heads. Cartridge guns and additional mix heads are also available.

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**SPABOND™ 840**
Fast Curing Structural Epoxy Adhesive

- DNV-GL Certified
- Long working time – for manufacture of large components
- Rapid cure in 2 hours at 70°C – allows reduced cycle time
- High strength and next-generation high toughness & impact strength
- Formulated with Gurit LRT (Light Reflective Technology) as standard to allow easy inspection of hard to reach bond lines
- Low Toxicity Formulation: Improved Hazard Labelling, CMR, SVHC & AEP** Free

**INTRODUCTION**
Spabond 840 is a high performance, cost-effective toughened adhesive system with good thermal, mechanical properties with a long working time for adhesive application yet incorporates Gurit’s chemistry to allow a rapid 2 hour cure time at elevated temperature. This unique formulation offers improved health & safety through the use of selection of low toxicity raw materials as well as Light Reflective Technology which in conjunction with a UV light-source can detect droplets as small as 1mm for easy identification of contamination to improve industrial hygiene or for the inspection of bondlines to ensure constant quality and reliability of components.

The components are contrasting colours to give a visual indication of mix quality, which is a useful feature when mixing by hand or with a machine. The system has a simple 3:1 mix ratio by weight.

**TYPICAL APPLICATIONS**
Used for bonding large structures such as wind turbine blades and yacht hulls.

**PACK SIZES & AVAILABILITY**
Spabond 840 is available in 20 kg straight-sided pails and 180kg drums for machine mixing and dispense.

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**SA 80**
Toughened Epoxy Film Adhesive

- Low temperature cure
- Designed for bonding prepreg skins to honeycomb and certain foam cores
- Controlled flow for maximum bond integrity
- Toughened for impact resistance and peel strength

**INTRODUCTION**
SA 80 is a film adhesive that is designed for secondary bonding, core-bonding and for co-curing with the range of Gurit prepregs. It can be cured at temperatures as low as 80°C, or can be more quickly cured at temperatures above 120°C. It has an out-life of 56 days at room temperature.

**TYPICAL APPLICATIONS**
Suitable for bonding aluminium, foam and honeycomb cores in conjunction with Gurit’s range of Prepreg or Ampreg laminating systems. See individual Technical Datasheets for further information.

**PACK SIZES & AVAILABILITY**
SA 80 is available in weights up to 300g resin films with or without a glass carrier.

*150, 250 and 300g only
### LAMINATING SYSTEMS

**AMPREG™ 30**  
Low Toxicity Epoxy  
Wet Laminating System

- DNV-GL certified formats available  
- Low initial mixed viscosity & good cure progression from ambient only cures  
- With Gurit LRT (Light Reflective Technology) as standard  
- Same 100:26 resin to hardener mix ratio by weight across range of hardener speeds  

**INTRODUCTION**  
Ampreg™ 30 has been optimised for the manufacture of large composite structures using hand layup and vacuum bagging techniques whilst offering improved health and safety through the careful selection of low toxicity raw materials.  
The relatively low initial mixed viscosity of Ampreg™ 30 allows easy wetout of lightweight reinforcements.  
Ampreg™ 30 has been designed to give excellent mechanical and thermal properties from both ambient temperature cures, and moderate temperature postcures (50°C).  
This system is available with a range of hardener speeds, from Fast to Extra Slow.  
The unique formulation offers improved health & safety through the careful selection of low toxicity raw materials as well as Light Reflective Technology which in conjunction with a UV light-source can detect droplets as small as 1mm for easy identification of contamination to improve industrial hygiene.

**PACK SIZES & AVAILABILITY**  
Available in a wide range of formats from small pack sizes to drums and IBCs.

### AMPREG™ 31**  
Low Toxicity Epoxy  
Wet Laminating System

- DNV-GL certified formats available  
- Viscosity optimised for good fabric wet-out and drainage resistance  
- With Gurit LRT (Light Reflective Technology) as standard  
- Same 100:26 resin to hardener mix ratio by weight across range of hardener speeds  

**INTRODUCTION**  
Ampreg™ 31 has been optimised for the manufacture of large composite structures using hand layup and vacuum bagging techniques whilst offering improved health and safety.  
The viscosity of Ampreg™ 31 has been optimised for good fabric wet-out whilst maintaining good drainage resistance for application on vertical surfaces.  
Ampreg™ 31 has been designed to give excellent mechanical and thermal properties from both ambient temperature cures and moderate temperature postures (50°C).  
This system is available with the full range of Ampreg 30 hardener speeds, from Fast to Extra Slow.  
The unique formulation offers improved health & safety through the careful selection of low toxicity raw materials as well as Light Reflective Technology which in conjunction with a UV light-source can detect droplets as small as 1mm for easy identification of contamination to improve industrial hygiene.

**PACK SIZES & AVAILABILITY**  
Available in a wide range of formats from small pack sizes to drums and IBCs.

### IN-MOULD PROCESS COAT

**TRANSLUCENT PROCESS COAT (TPC)**  
Epoxy In-mould Process Coat

- Suitable for all blade manufacturing techniques  
- Easy to sand  
- Easy to sand  
- Mix ratio (by weight) 100 25  
- Long over-coating window  
- 30 minute tack off at 50°C, 90 minutes at 25°C  
- Easy to sand  
- Semi - Translucent  
- Provides high quality, pin hole free, toughened surface for PU paint application  
- Can be applied up to 750 microns on a vertical surface without drainage  
- Excellent adhesion to SPRINT™, prepreg and infused laminate  

**INTRODUCTION**  
Gurit TPC is a translucent in-mould process coat designed to give a pin-hole free surface on composite laminates for subsequent PU paint application. It tacks off in 30 minutes at 50°C and 90 minutes at 25°C.

**TYPICAL APPLICATIONS**  
Excellent adhesion to infusion, SPRINT™ and prepreg material can be achieved. Process Coat is easy to sand and is compatible with a wide range of PU paints typically used to finish wind turbine blades.

**PACK SIZES & AVAILABILITY**  
Process Coat is available in 28 / 220 kg resin and 7 / 25 kg hardener quantities.
FILLING AND FAIRING

S-Fair™ 600 is available in 10 / 2.5 L resin and 10 / 2.5 L hardener quantities.

PACK SIZES & AVAILABILITY

Designed for filling and fairing large composite and metal structures.

TYPICAL APPLICATIONS

- of yachts. It is available with two hardeners; Fast and Standard, which enables the customer to tailor the working/cure time to the is easy to sand and is compatible with a wide range of primers and top coats typically used in the marine market for the finishing of yachts. It is available with two hardeners; Fast and Standard, which enables the customer to tailor the working/cure time to the ambient workshop temperature.

TYPICAL APPLICATIONS

- Designed for filling and fairing large composite and metal structures.

PACK SIZES & AVAILABILITY

S-Fair™ 600 is available in 10 / 3.5 L resin and 10 / 2.5 L hardener quantities.

REPAIR SYSTEMS

GREEN™ MP

Mono-component resin technology
- Compatible with current topcoat solutions

INTRODUCTION

RENUVO™ Multi-Purpose System (MPS), is a breakthrough UV curing resin system, developed by Gurit as a repair system for turbine blades. The system can be used either as a standalone spot repair or in combination with RENUVO™ Prepreg for a structural repair. RENUVO™ MPS offers a step change in materials for the repair market. With working temperatures as low as +5°C (+41°F), MPS has demonstrated a practical solution to an engineering problem, how to perform repairs quickly at these temperatures. For this reason, the material has been formulated to give the operator the right material for both hot and cold environments.

TYPICAL APPLICATIONS

- Repair system for turbine blades.

PACK SIZES & AVAILABILITY

RENUVO™ MPS is available in 310ml (10.9floz) cartridge format.

RENUVO™ PP

UV Curing Prepreg
- Excellent mechanical properties

INTRODUCTION

RENUVO™ Prepreg (PP) is a breakthrough UV curing Prepreg system, developed by Gurit as a repair system for turbine blades. The system is used in combination with RENUVO™ Multi-Purpose System (MPS) to complete structural repairs. RENUVO™ PP offers a step change in materials for the repair market. With working temperatures as low as +5°C (+41°F), RENUVO™ PP has demonstrated a practical solution to an engineering problem, how to perform repairs, quickly, at these temperatures. For this reason, the material has been formulated for both hot and cold environments, and is available in unidirectional (UD) and biaxial (IX) formats.

The RENUVO™ PP system eliminates the human error of mixing, dispensing and working with traditional 2 component repair systems.

Using a dedicated UV source, RENUVO™ MPS is cured in 90 seconds for a simple spot filler type repair, up to 3mm (0.12”) thickness. Used in combination with RENUVO™ Prepreg the MPS product acts as the ideal primer to give the perfect air free bond surface.

TYPICAL APPLICATIONS

- Repair system for turbine blades.

PACK SIZES & AVAILABILITY

RENUVO™ MPS is available in 310ml (10.9floz) cartridge format.