

The growing need for efficient in-field wind turbine blade repairs

Repairing a blade with Gurit's RENUVO UV curing in-field repair system



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The wind turbine repair industry continues to grow at pace, due to the high number of existing wind turbines approaching an advanced age in their service life and therefore in need of more frequent maintenance. Gurit, a leading supplier to the wind industry for over two decades, discusses its blade repair solutions designed to extend the service life of wind turbine blades.

Wind is gaining an increasing share of the world's energy market. Going forward, this growth will come about not only through more and larger turbines being installed, which have an expected lifespan of 20-25 years, but also through the continued and often extended use of current turbines. The Global Wind Energy Council (GWEC) Global Wind Report 2021 anticipates that over 469 GW of new capacity will be added in the next five years.

Over the life of a turbine, blade damage can occur in several ways: from handling, installation, weather conditions or environmental impacts. Deterioration during operation is most common, with lightning strikes, debris, wind and constant temperature changes battering the blades. This leads to surfaces eroding, critical bonding areas starting to separate, or sometimes more compromising damage to the composite structure.

It is critical that problems are detected and repaired as fast as possible to keep the downtime of the turbine to an absolute minimum. According to CompositesWorld.com, an out-of-service turbine can cost between USD 800 and 1600 per day, with most repairs taking one to three days. If a crane is required to repair or replace a blade, the cost can run up to USD 350,000 per week. An average blade repair can cost up to USD 30,000, and a new blade costs, on average, about USD 200,000. Many wind farm operators now carry out regular preventative

maintenance, which is a planned part of operations, ensuring that the turbines are kept in optimum working condition and that costs are streamlined. This preventative approach addresses blade wear-and-tear, such as leading-edge erosion which comes about through exposure to wind and temperature change, and has led to the increased demand for wind repair solutions for on and offshore wind farms around the world.

However, in some cases blade damage cannot be predicted, such as that caused by

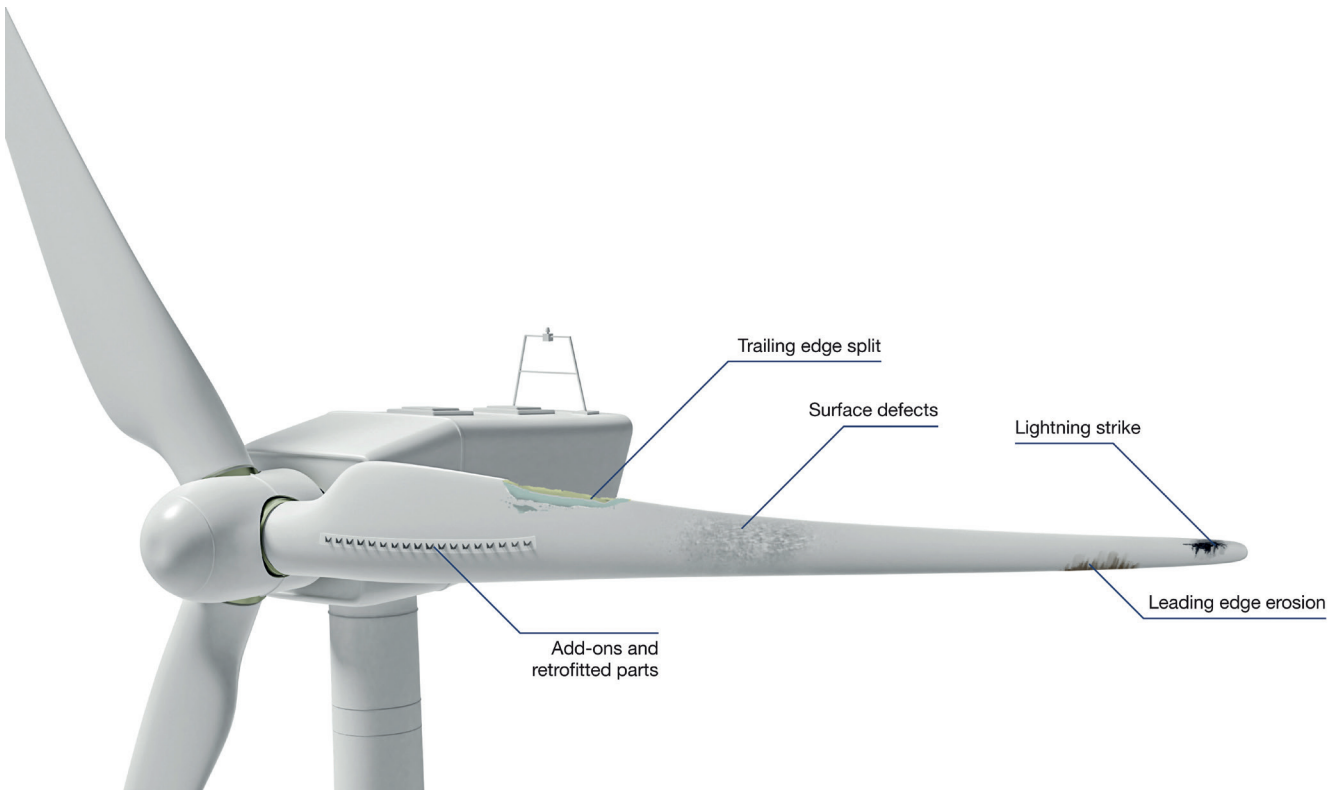
lightning or bird strikes. These events lead to unscheduled repairs and turbine downtime, and often coincide with inclement weather conditions.

Repair solutions must in this case be carried out to the required standard in the shortest time possible and be workable in a large weather window, both for efficacy and cost minimisation.





Gurit has a range of OEM-qualified and certified, low toxicity epoxy materials for all







Gurit's Amprog 3X low toxicity laminating system includes a range of resins and hardeners for different repair conditions



HEAT CURED

 LAMINATING	Ampreg 30 Ampreg 31	 1-5 HOUR CURE
 FILLER	S'Fill 15 Min S'Fair 600	
 ADHESIVE	Spabond 730 Spabond 340 Spabond 5-Minute	

UV CURED

 PREPREG	RENUVO PP	 5 MINUTE CURE
 PRIMER	RENUVO MPS	 5 MINUTE CURE

Gurit's 20+ year experience of supplying epoxy laminating systems for wind blade manufacture has led to award winning complete repair systems including laminating, filling, fairing and adhesives

in-factory blade manufacture, finishing and repair, including laminating and infusion resins, fillers, adhesives and gelcoats. Building on this depth of knowledge and to provide continued support to its customers, their installers and repairers, the company has developed new technologies and dedicated solutions for in-field maintenance, including laminating systems to suit two curing techniques: thermal & UV light.

Putting health and safety first

Gurit is committed to improving the health and safety as well as the environmental footprint of its formulated product ranges,

and as a member of the United Nations Global Compact, which aims to drive change across all areas of corporate sustainability, has made and will continue to make significant investments into a strong and sustainable material offering. This includes continually monitoring the chemicals it uses and where feasible, the most harmful substances are removed from the product portfolio, going further than the requirements set out by regulatory bodies where appropriate.

'To date, two-thirds of the formulated portfolio have been replaced with safer,

higher performing products and this will increase to over 90% by the end of 2021,' explains Kevin Cadd, Gurit's Formulated Product Manager. 'Our ecological approach to formulations is unique in our industry and something we are extremely proud of.'

Gurit's Ampreg™ 3X is a great illustration of this: developed from an established and proven system, it is a low toxicity thermally-curing laminating system which meets the challenges faced during in-field lamination or in-factory infusion repairs in a safer and more sustainable way.

The system includes a range of resins to



Gurit's blade repair systems are OEM and DNV-GL qualified and available from the company's numerous sites around the world

target viscosity, drainage resistance, and fabric impregnation, all of which can be combined with the common range of Ampreg 3X slow, standard or fast hardeners. The award-winning system has built-in UV stability for emergency repairs which don't have the time for a topcoat and is suitable for extreme weather conditions (including 5-10°C and high humidity).

Supplied in a variety of dispensing and packaging options, the format of Ampreg 3X is continually being developed to minimise the hazardous waste and remove the difficulty of dispensing, weighing and mixing during rope access repairs.

In addition, the Ampreg 3X resins contain Gurit Light Reflective Technology (LRT) as standard, which causes the resin and mixed system to fluoresce under UV light, facilitating safer working practices and reducing the risk of user skin sensitization.

Repair time reduced from days to hours

Gurit's RENUVO™ system moves in-field repairs from a two-day operation using a thermal solution, to a four-hour operation using a new generation UV lamp. Modern UV lights have become compact and lightweight, so UV curing is an attractive option today for both in-field and in-factory repairs. This breakthrough system saves on up-tower

trips, allows for completing several repairs in a shorter time and reduces the cure time from hours to minutes. Supplied as either mono-component resin or a prepreg based system, RENUVO™ offers additional health and safety benefits including reduced handling and reduced risk of spillage. With both systems suitable for use at +5°C to +30°C, they allow the user to perform repairs quickly in both hot and cold environments.

'With an increasing share of wind rotor parks now reaching an advanced age, the industry is looking at solutions targeting increased average operation efficiencies as well as extending equipment life,' says Mathieu Cariou, Director of Corporate Development & Strategy at Gurit. 'Our experience across all aspects of blade manufacture makes Gurit the prime partner for OEMs and wind park operators for the development and delivery of solutions during the whole blade life.'

Partnering for success

Gurit supplies its Ampreg 3X epoxy resin systems to the Global Wind Organisation Basic Technical Training program at Energy Innovation AS (now WindCo AS) in Egersund, Norway. This centre offers training, certification, education, business development, innovation and R&D, with a focus on renewable energy and

environmental technology.

The programme is facilitated through UK-based global insight and software solution advisory, Renewable Strategy, who have reported that the participants have been impressed with Gurit's commitment to wind blade repair solutions and have found the products easy to work with.

'Gurit is pleased to support the GWO wind blade repair training course with Ampreg 3X epoxy laminating systems,' says Klavs Weis-Fogh, Gurit Sales Manager – Wind EMEA. 'The Ampreg 3X systems offer approvals for use on major OEM manufactured blades, as well as best in class health and safety labelling.'

Extending the life of wind turbine blades

Utilising in-field repair solutions are an effective way of extending the life of wind turbine blades, significantly reducing replacement costs and further enhancing the sustainability performance of wind energy. It's an area where Gurit has been and continues to be active in developing leading solutions that are both practicable and cost effective for wind farm operators and their contractors, whilst meeting, and exceeding, the highest health and safety standards.

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