

On-Site Wind Turbine Blade Repair

Customer:

Major Wind Turbine Blade Manufacturer

Contact:

Engineering Manager/Field Service Manager

Issue:

Stress fracture repair in Blades/Turbines
Safe, reliable repairs must be done in the field
to reduce down time and revenue loss.

Customer Requirements:

Solution requires a combination of heat and
vacuum to cure "prepreg" composite material.

System Requirements:

- User moves from turbine to turbine for repairs
- Set-up capacity in a tented structure at the base of the turbine to perform the repair and cure
- Safely protect people and processes from adverse weather conditions
- Remote power

BriskHeat® was contacted by a customer to analyze their challenges involving stress fracture repair procedures performed in the field. BriskHeat engineers identified key methods to resolve the issue and worked with existing BriskHeat® products to successfully correct the damage.

The BriskHeat® team, with customer guidance, evaluated and determined an ACR® Hot Bonder with customer specific must-haves would solve the problem and restore fully functioning blades in a timely and safe manner.

BriskHeat® went to the customer's wind farm field in Iowa during wintertime to test the proposed solution.

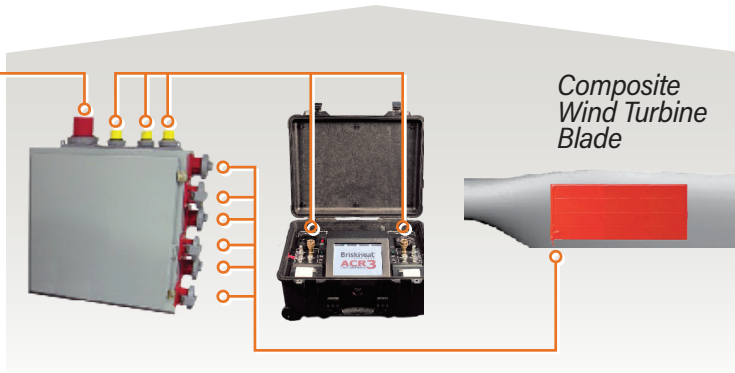
The field testing team was challenged to determine the safest method to perform the repair. To accelerate the repairs, the team chose to work in a tent at the base of the tower in adverse, cold conditions. The composite repair was performed and successfully repeated.

The ramp rate was set to increase 1°C per minute up to 70°C then increased to 100°C at the same 1°C per minute rate. The process, using the BriskHeat ACR® Hot Bonder, successfully performed as designed.





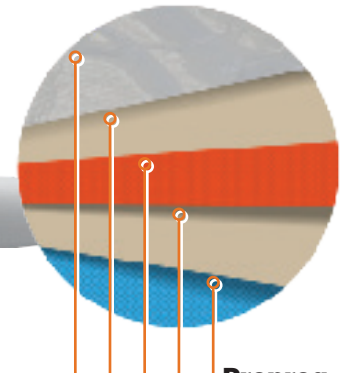
Mobile Generator



Booster Box

ACR® Hot Bonder

Heating Blanket



Prepreg
Release Film
Heater
Vacuum Bag
Cloth Insulator

Tools, Connections, and Configurations for On-Site Repairs of Composite Wind Turbine Blades

Solution Process

1. Set-up the ACR® Hot Bonder Wind Turbine Blade Repair Kit in the base tent. The diesel-powered generator power source and the UPS are connected between the generator and the ACR® to ensure clean and consistent power.
2. Prepreg material is cut to the size of the repair and placed on the blade repair area.
3. The system is double-vacuum bagged. A layer of vacuum bagging is between the heater and the prepreg material and another vacuum bag layer covers the entire heating system. This method ensures that the heater does not stick to the cured prepreg material.
4. The power cords and sensors are connected and confirmed operational via the ACR® display.
5. Insulators are placed on top of the vacuum bags to improve heating efficiency.
6. Once the system is in place and connected, a heating program is input and run.
7. The process completes in approximately 4 to 8 hours which includes two ramp-soaks and a top temperature of 100°C. The process must be closely monitored because at a certain point during the cure, the process will generate an exothermic reaction, and no longer need the insulators to avoid overheating. The remainder of the program is run to complete the cure.

BriskHeat® engineers worked with the Blade manufacturer to assemble the ACR® Hot Bonder Kit, then field tested the kit under winter conditions in Iowa in a tented structure at ground level. The process using the ACR® Hot Bonder successfully performed as designed, after which the customer ordered additional kits.

BriskHeat® Supplied Products

- (1) Dual-zone ACR® Hot Bonder
- (2) 48 in x 120 in (1219 mm x 3048 mm), 480 VAC, 3-phase SR-style silicone rubber composite repair blankets with 10 built-in thermocouples
- (1) 480 VAC, 3-phase, 100-amp, dual-zone booster box with watertight connections
- (2) J-type 10-thermocouple harnesses. Each of the 10 thermocouple plugs will connect to a built-in heating blanket thermocouple receptacle
- (2) 120 VAC, 5-amp, ACR® Hot Bonder input power cords
- (2) ACR® Hot Bonder power cords connecting ACR® and booster box
- (2) 60 in x 132 in (1524 mm x 3353 mm), 1/4 in (6.35 mm)-thick silicone cloth insulators
- (1) UPS (uninterruptible power source)
- (1) Large storage/transportation case



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