

RESCOLL

Competitiveness through innovation

Electrically conductive coatings

An application example : Deicing in Windpower industry

An application example : Heating in building industry

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Conductive coatings for deicing
An application in windpower industry

In cold climates, DEICING represents one of the greatest CHALLENGE IN WINDPOWER INDUSTRY

ICING EFFECT ON WIND TURBINE BLADES

- Loss of production
- Mechanical and aerodynamic performances reduced
- Increased mechanical fatigue of blades
- Energy efficiency reduced
- Security problems: ice projection

Conductive coatings for deicing
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Current solutions for deicing of wind turbine blades

Solution	Technology	Advantages	Drawbacks
Passive	Hydrophobic coating	Easy installation Retrofitting possible	Limited efficiency Degradation of hydrophobic properties over time
Active	Hot air blowing	Do not modify blades aerodynamic Deicing of the entire blade when stopped	**Not suitable for retrofitting** Not suitable for anti-icing Low speed heating High energy consumption
	Carbon fibbers embedded in the resin of the blade (Joule heating)	Efficient deicing Do not modify blades aerodynamic	**Not suitable for retrofitting** Hard to repair

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ICE&WIND© project: deicing system for wind turbine blades

RESCOLL Société de Recherche — Engineering heating patches

VALOREM opérateur en énergies vertes — Wind park operator

PLASTEOL Groupe Carbomax — Installer Blades maintenance

- **MAIN FEATURES**

ICE DETECTION
DEICING
ANTIICING

RETROFITTING INSTALLATION

SYSTEM INDEPENDENT OF ANY TURBINE MODEL

TEMPERATURE REGULATION DEPENDING ON ICING CONDITION

ENERGY CONSUMPTION REDUCED

REMOTE MONITORING

EASY REPAIRS

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ICE&WIND© project: deicing system for wind turbine blades

Specifications for the conductive paint

- Flexible (strong deformation of blades)
- Tunable and repeatable electrical conductivity
- Good adhesion to substrate
- Stable under ageing condition (UV; humidity, temperature variation)
- Water-based

Key parameters for the formulator

- Choice of conductive filler
- Dispersion of conductive filler in water
- Stability of the dispersion
- Compatibility between conductive filler and paint resin

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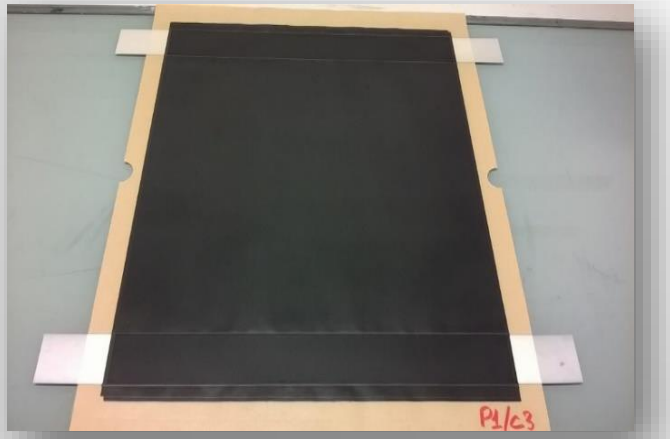
ICE&WIND© project: deicing system for wind turbine blades

Active solution : Joule heating patches ready for bonding on the leading edges of wind turbine blades



RESCOLL heating patches contain water based **electrically conductive paint**

Electrically conductive paint under voltage => Joule heating

$$P = U^2 / R$$

P : Heating power (Watt)
U : electrical voltage (Volt)
R : electrical resistance of the heating patch (Ohm)

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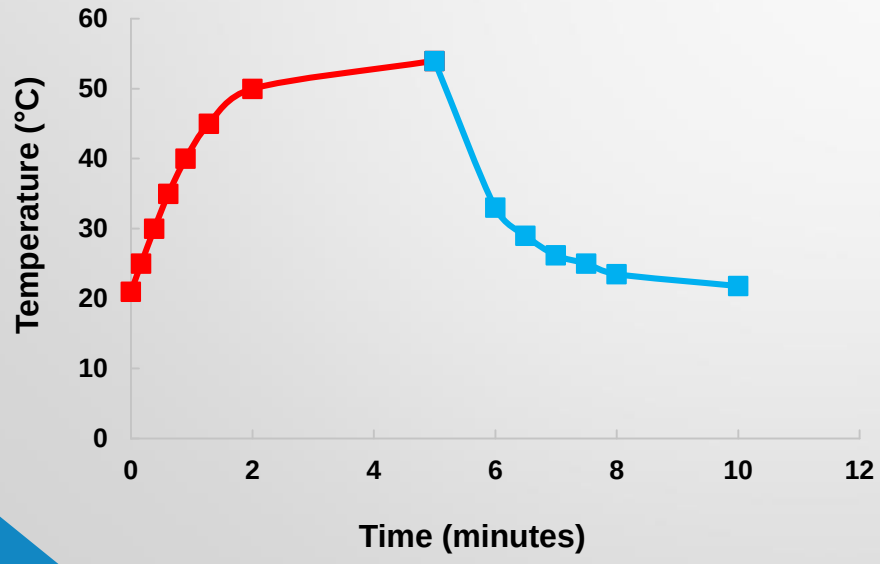
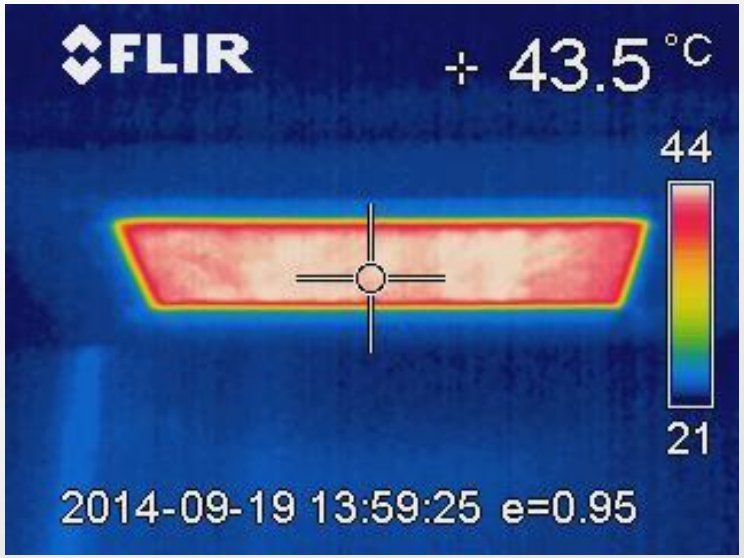
KEY FEATURES OF OUR ELECTRICALLY CONDUCTIVE COATINGS

Thickness ≤ 0,15 mm
Flexible
Tunable conductivity / power



Fast heating: 2 minutes



Infrared thermography of an heating element

Heating perfectly homogeneous

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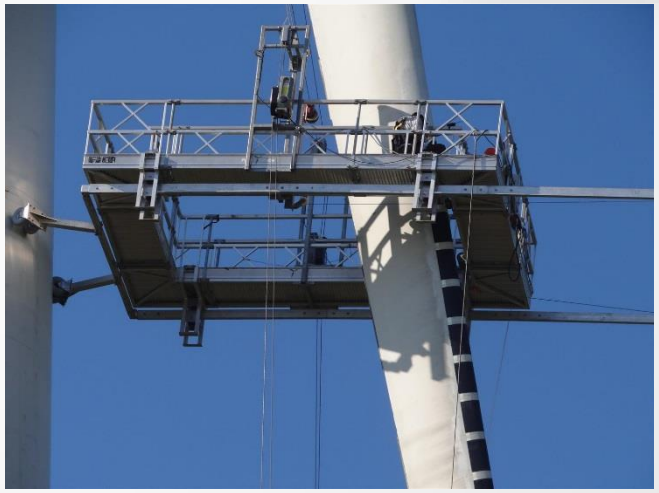
ICE&WIND© is a system specially developed for **retrofitting** wind turbines blades



Installation of the system

1 – Surface preparation

2 – Bonding of heating patchs

3 – Protection of heating patches with anti-erosion paint

Summer 2015 : equipment of a complete wind turbine

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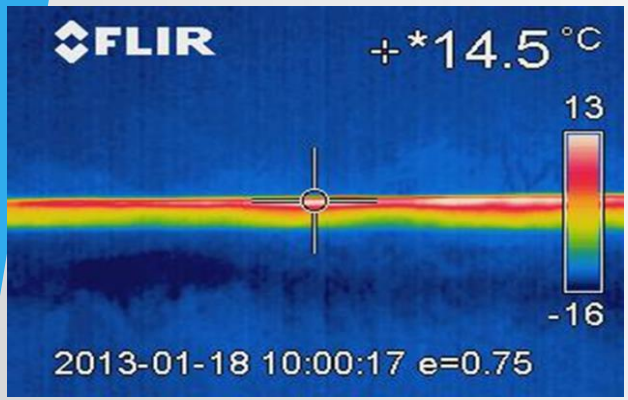
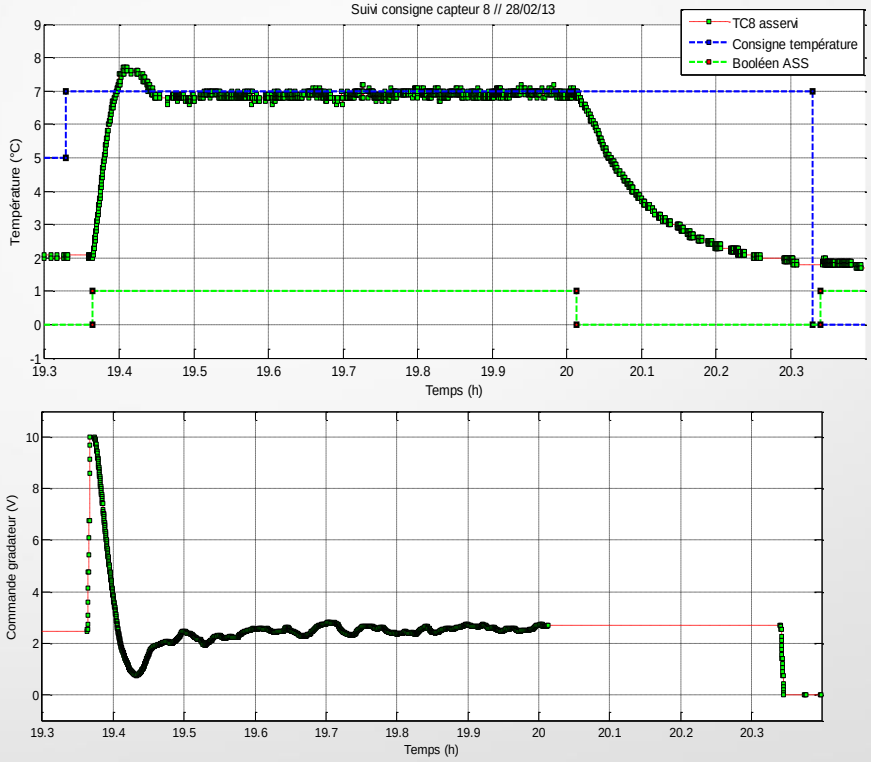
ICE&WIND© project: field test in winter



Infrared photography of a wind turbine blade during a deicing operation



Measurement of blade temperature during a deicing operation

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ICE&WIND© project: field test in winter

FEEDBACK :

- Easy installation : 2/3 days by blade
- 70-80% of production gain during icing episode
- Fast heating
- Deicing efficient until -30°C
- Excellent adhesion of heating patches on the blades
- Low impact on aerodynamic

Technological readiness level (TRL) scale of Ice&Wind technology

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JOULE HEATING: invisible radiant heating system for construction industry

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JOULE HEATING: invisible radiant heating system for building industry

Advantages of our technology:

- Radiant heat: excellent thermal comfort
- Energy saving: *up to 40% less energy than conventional radiator / convectors systems*
- Invisible
- Low weight (< 150 g/m²) and very thin (< 0,15 mm)
- Safety: works at very low voltages : 24 or 48 Volts
- Easy installation
- Space saving
- Reduced pollution (dust and pollen circulation reduced)
- Specially suitable for buildings retrofitting: floor, plasterboard or celling

Conductive coatings for deicing

- **Available products**

Product name	Binder	Application	Resistivity level
JHP ASRC 101	1K acrylic resin, water based	Joule heating Deicing	0,2 Ω.cm
JHP ASRC 210	2K polyurethane resin, water based	Joule heating, Deicing	0,2 Ω.cm

- **Applications overview**

Heating : building industry, electrical vehicles, professional cooking equipment

Deicing : wind turbine blades, aircraft leading edge

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For further information:

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