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# Detection Of Blade Damage And Ice Accretion For Health Monitoring Of Wind Turbines Using Integrated Blade Sensors

*A tale of 2 Blades..... The Killer  
Klingspor Combination Blade*

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~~*Damage And*~~

~~Blade crack and blade damage~~

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detection is an important component of monitoring the health of turbomachinery. Blade

Cracks. Cracked blades eventually lead to blade failures, with shrapnel running through the turbomachine and damaging other blades in downstream stages. Results can be catastrophic and lead to extensive repair.

### *Blade Crack and Blade Damage Detection - Prime Photonics*

The conclusion from the above papers are that Strain gauges are used for damage location near blade surface only, ultrasonic is expensive and used

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for only lab purpose, infrared thermography is also lab used, TFRF based SHM method is most reliable for both damage detection and fault localization.

### *Detection of Cracks and damage in wind turbine blades*

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Therefore, damage detection for WTBs is of great importance for failure avoidance, maintenance planning, and operation sustainability of wind turbines. This paper provides a comprehensive review of state-of-the-art damage detection techniques for WTBs, including most of those updated methods

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based on strain measurement, acoustic emission, ultrasound, vibration, thermography and machine vision.

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A variety of methods has been developed to detect and monitor damage. There is a consensus on the fact that early detection of a problem mean usually lower maintenance costs. The “perfect”, ideal method should be able to assess the full scale of the blade without contact, allowing for continuous remote monitoring.

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*Wind turbine blade damage detection systems | Wind farms*

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The detection algorithm is based on a signal model of the specific impulse-like signals that represent audible rotor blade damage sounds in airborne sound recordings. A similar model was first developed by us in 16 based on the audio recordings during a certification test of a 55-m wind turbine blade.

*Damage detection for wind turbine rotor blades using ...*  
spectrogram representation to detect damages and to estimate

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*Damage detection for wind turbine rotor blades using ...*

In addition, numerical and analytical models predicted the blade damage based on mean stress correction, Strain-life, Morrow and Smith Watson Topper (SWT). The results showed that centrifugal load caused damage in blades and likely, it transforms into crack initiation due to low cycles



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Hyperspectral imaging or imaging spectroscopy is a non-destructive and fast monitoring technique in remote sensing. It is widely used in various classification, and detection fields. In this study, the potential of the use of hyperspectral imaging system in the detection of wind turbine blade damage and icing incident is introduced.

*Hyperspectral imaging applied*

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characterized the sound radiation using a microphone array. Their observation in the end was that the faults would change the radiated sound energy from the object.

### *Listening for damage and flaws in wind turbines blades*

Damage detection of wind turbine blades is difficult due to their large sizes and complex geometries. Additionally, economic restraints limit the viability of high-cost monitoring methods. While it is possible to monitor certain global signatures through modal analysis, obtaining useful

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*Passive acoustic damage  
detection of structural cavities*

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Damage detection in a  
composite wind turbine blade  
using 3D scanning laser  
vibrometry Ryan Marks, Clare  
Gillam, Alastair Clarke, Joe  
Armstrong, and Rhys Pullin  
Proceedings of the Institution of  
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This technique has been used by Sarrafi et al. for damage detection in wind turbine blades. Because of its non-contacting capabilities, the DIC system can be readily

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*(PDF) Wind Turbine Blade  
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This paper presents a case study in the use of ultrasonic NDE/SHM techniques for detecting and locating damage in a real (but small) wind turbine blade. Two techniques are considered: (1) non-linear acoustics, and (2) guided-wave “pitch-catch” SHM.

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*Damage And*

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*detection of structural cavities*

Damage detection in a  
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