Vibration inspection of wind turbine generator

Can vibration analysis be used to diagnose mechanical components in wind turbines?
Nevertheless,vibration analysis for the fault diagnosis of mechanical components in wind turbines is an arduous taskdue to the complex mechanical structures of drivetrains,varying operational conditions and large differences in rotational speeds among various parts in wind turbine gearboxes.

Do wind turbines have a vibration data acquisition system?
This paper analyzes the structure features of different drivetrains of mainstream wind turbines and introduces a vibration data acquisition system. Almost all the research on the vibration-based diagnosis algorithm for wind turbines in the past decade is reviewed,with its effects being discussed.

Why do wind turbine vibration control systems need to be tested?
However, they still require additional experimental tests, before extensive use for wind turbine vibration control. There is a significant concern about the considerable mass of this system, which adds an extra load over the whole structure, hence increasing fatigue and reducing the lifespan of the wind turbine. 3.4.2. Tuned Liquid Dampers (TLD)

Are vibration-related problems a problem in wind turbines?
Therefore, the challenge of vibration-related problems in wind turbines, including issues in the blade region, tower structure, nacelle components, operational noise, condition monitoring, and fault diagnosis models during energy generation, continues to pose economic hurdles for the wind energy industry.

What causes a wind turbine to vibrate?
The vibration of the wind turbine is a very complex,multi-coupling phenomenon. Several types of vibrations affect the wind turbine. Nevertheless,the most important ones are those of the blade that contribute and propagate to the other components as the mechanical transmission chain and the tower. Multiple loadsinduce blade vibrations [7]:

Does wind turbine vibration control extend the lifespan of wind energy generators?
Concluding remarks Extensive research in wind turbine vibration has facilitated advancements in wind energy generator technology and extended their lifespan. This paper reviews recent progress in dynamic and vibration control strategies,providing detailed insights into each turbine component,with a particular emphasis on developments since 2015.

In order to prevent wind turbines experiencing any unplanned stoppages or extended outages due to major mechanical component failure, non-destructive preventative maintenance techniques such as vibration analysis and endoscope (borescope) inspections can be utilised to clearly identify the source of the problem that detect the very earliest signs of mechanical component ...

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Modal properties of dynamically tested wind turbine blades (WTBs) of a utility-scale wind turbine are identified. A comprehensive experimental program including free vibration and short- and long-term forced vibrations representing resonance and simplified fatigue conditions was carried out to investigate vibration-based features for damage diagnosis and ...

A tuned liquid damper (TLD) is one of the most economically passive vibration control strategies for controlling the wind-induced vibrations of structures such as wind turbines (WT). The literature on fluid-structure interaction limits the scope of analysis to either the influence of wind on tower, or liquid on tank. Meanwhile, it does not consider the applicability ...

Wind Turbine Sensors Author: TE Connectivity Subject: Wind Turbine Sensors Keywords: wind turbine sensors, wind farm operators, vibration sensors, gear box monitoring, accelerometers, tower sway, blade monitoring, speed sensors, temperature sensors, wind turbines Created Date: 9/26/2020 12:09:52 AM

Optimal vibration sensor placement for jacket support structures of offshore wind turbines based on value of information analysis. ... (Malings and Pozzi, 2018) and generators (Hoseyni et al., 2022). In this paper, we adopt the VoI concept to optimize the vibration sensor setup for offshore jacket structures before the monitoring system is ...

The detection of sudden faults in wind turbine generator (WTG) is a complex task, especially in bearings. Usually, the evaluation of methodologies such as vibration, ultrasound, and bearing temperatures are widely used in predictive maintenance, an important aspect for the traditional approach, in wind turbine fault detection, is the limited analysis with a single variable ...

End-of-warranty (EoW) inspections for wind turbines are important for owners, serving as a crucial touchpoint before transitioning from OEM sales teams to Operations and Maintenance (O& M) teams. These inspections offer a comprehensive evaluation of turbine condition, identifying any potential issues before the warranty expires. By conducting thorough ...

The installation of wind energy increased in the last twenty years, as its cost decreased, and it contributes to reducing GHG emissions. A race toward gigantism characterizes wind turbine development, primarily ...

? an inspection of the wind turbine condition performed from an unmanned aerial vehicle (drone), in this case, a drone with a vision camera can be used, mounted in a specialized mount to eliminate vibrations of the aircraft, the acquired vision material containing images of selected elements of the turbine, in particular the blade surface, may be analyzed using ...

This paper aims to present in detail the problems associated with wind turbine vibration and a thorough literature review of the different mitigation solutions. We explore the advantages, drawbacks, and challenges

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...

The implementation of machine learning techniques allows to prevent in advance the degeneration of any component present in a wind turbine, as well as the detection and diagnosis of sudden failures. This methodology allows automatic and autonomous learning to predict, detect and diagnose electrical and mechanical failures in wind turbines. Four different ...

Size increase of wind turbines results in higher structural vibrations that reduce the lifetime of the components (blades, main shaft, bearings, generator, gearbox, etc.) and might lead to failure ...

Given these inherent dangers and challenges, more wind farms see the value of land-based wind turbine drone inspection and offshore wind turbine drone inspection. Reducing safety hazards while simultaneously increasing ...

Vertical turbines, that harness wind energy to generate power are typically called air turbines or modern air mills. These devices create turbulence through a series of feathers, or streamlines ...

--Calvin Luther Martin, PhD. A new study by a team of earthquake scientists (seismologists) in Italy has made a signal contribution to our understanding of wind turbine noise & vibration and, by extension, Wind Turbine Syndrome (WTS).

Wind energy is one of the most important sustainable and renewable energy sources [1], [2], [3], which can be converted into electrical energy for industrial power supplies and household electricity consumptions [4]. In 2012, wind energy amounts to 11% of the total renewable energy generation, and is an indication of national competitiveness [5].

PDF | On Jan 1, 2020, Biswajit Basu and others published Vibration control of wind turbines: recent advances and emerging trends | Find, read and cite all the research you need on ResearchGate

Jun W proposes a new simple and effective vibration order tracking method with the aid of a generator stator current signal for generator bearing fault diagnosis of variable-speed direct-drive wind turbines. First, the ...

Wind turbines capture wind energy and greatly influence the capital cost of wind farms [11].To extract more energy from wind, turbines tend to have a larger rotor (the combination of blades and the hub), but at the same time heavier loads will be induced, as presented in Fig. 2.The maximum wind energy extraction is also tried by innovative extreme-scale rotors [12], ...

The condition monitoring of wind turbines is characterized by the difficulties associated with the lack of measured data and the nonstationary, stochastic, and complicated nature of vibration ...

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Yet with each and every new wind turbine that is erected, there becomes a growing demand for inspection and maintenance services for the ever increasing number of these wind turbines. We provide a wide range of services to onshore and offshore wind industries and are a preferred supplier of industrial rope access services for wind turbine manufacturers and owners.

Renewable energy sources immediately remedy fossil fuel"s resource-constrained and environmentally harmful effects (Olabi et al., 2022) (Said et al., 2022).Wind energy is one of the renewable energy sources that has effectively replaced fossil fuels in various applications (Yang et al., 2022a).Globally, wind energy output is rapidly increasing and becoming increasingly ...

Wind Turbines (WT) are one of the fastest growing sources of power production in the world today and there is a constant need to reduce the costs of operating and maintaining them. ... Generator Bearings Tower; Vibration [56], a [134], f [135] ... Inspection techniques for wind turbine bladesusing ultrasound and sound waves. Proceedings of non ...

Given these inherent dangers and challenges, more wind farms see the value of land-based wind turbine drone inspection and offshore wind turbine drone inspection. Reducing safety hazards while simultaneously increasing inspection speed and accuracy is more important than ever, as some wind farms have several hundred wind turbines that must be inspected two to three ...

Rotor imbalance is a common fault in wind turbines, which may enhance radial loads that induce faults on the main bearing and gearbox. It usually results from the asymmetry of the air dynamics caused by blade crack, icing, etc.

Why wind turbines need regular inspections. Wind turbine gearboxes, generators and blades require intensive maintenance because wind turbines face significant stress and wear. ... SCADA or CMS equipment can ...

Despite its importance and influence on the wind turbines, there is limited study published on wind turbine vibration testing in cold and remote areas; most previous wind turbine vibration research projects have mainly focused on computer models based on the first principles, simulation, and verification, and the computer models are validated by field testing. 12-25

The increased construction of wind turbines (WTG) and wind farms and the maintenance required for them raises the question of maintenance intervals and damage detection. The non-contact vibration measurement of wind turbine ...

Wind turbine inspection is an indispensable service to ensure the reliability, safety, and performance of wind farms. All wind turbine generator operations require regular maintenance and periodical inspections as over the years, all main components, from mechanical, civil, or electrical, suffer considerable wear that can affect the performance of the wind tower.

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