Reducing costs through precise and frequent inspection data

Words: Gray Byers, Chief Business Officer, Thread

Decreasing asset infrastructure maintenance costs, while improving frontline worker safety, is an often overlooked aspect of sustainability in the renewable energy industry. Wind portfolios continue to expand, and turbines increase in size every year, yet the industry has not reached a standard approach to the cadence of inspections and repairs needed to effectively optimize energy production.

The wind industry must grow at a rate of at least 18% compound annual growth rate (CAGR) over the next decade to reach net-zero goals by 2030. For the industry to meet this goal, it's important to ensure the speed of deployment for both existing, new, and larger blade designs do not compromise the longevity and operating economics of wind fleets.

The industry is limited on the use of a feedback loop from owner-operator/servicer to the design and manufacturing process. Manufacturers face pressure to meet production demands and fulfill orders, while design teams unknowingly approve flawed product designs and only become aware of this when met with costly warranty claims. For wind to reach global aspirations in energy contribution, the industry must develop a standard statistical and cost-effective approach to managing blade health through inspection.

The question arises as to how many inspections are required and what measures can be taken to facilitate them. Drone and other inspection activities are largely constrained by cost and the need for third party services, which have varying availability and lack access to wind sites.

As a result, each turbine is annually inspected to detect damage and defects, while there is little or no capacity to respond to ad hoc scenarios. By equipping workers at the wind site with the proper tools and utilizing the data to understand when to use them, two separate inspection cases can be addressed: operational response in the event of an incident and programmatic inspection related to damage progression.

Weather-related events, such as lightning strikes and hailstorms, necessitate the integration of additional data sources to provide situational awareness response. Unfortunately, many firms fail to carry out

the necessary follow-up activities after an operational event, which can lead to additional costs and labor. For example, some blade models are particularly vulnerable to off-receptor strikes from lightning and require an internal inspection to check the spar bond joint. This can be confirmed by drone before full inspection.

Such inspections are often unpredictable and thus come ad hoc. It is also difficult to coordinate and execute ad hoc inspections that provide operational oversight to evaluate the quality of repairs. Essentially, logging the performance of a repair requires more frequent imaging than an annual or biannual assessment. If this is not done, any early degradation of a repair could be concealed by the expected surface degradation, particularly at the leading edge. Without the ability to respond to these scenarios, companies face inefficiencies and/or compounding costs associated with monitoring and repairing turbines.

Damage and defect monitoring is a crucial focus of programmatic inspections of fleets, allowing us to understand how cracks, chips, and erosion progress due to normal wear and tear while the turbine operates.

The current approach of single inspections does not allow for adequate data organization, resulting in insufficient analysis tools for longitudinal tracking of damages which means companies are not able to access meaningful data points that can help inform their responses.

For instance, if damage shifts from class 3 to 4 or 5, it enters a higher risk category that could cost the company time and money in the long run. Severity 3 has a suggested repair window of 6 to 12 months, whereas a severity 4 requires a repair window of just 3 months. This creates uncertainty between inspections that can impact season planning and cause failures.

The question of how many inspections are necessary remains unanswered. To be able to predict the progression of damage and consequently inform maintenance plans and improve blade designs, it's important to first characterize the damage types, locations, conditions, blade type and other factors over time. The combining of an inspection tool and data platform, such as Thread's cloud-based solution UNITI, will ensure an objective view of predictive maintenance.

To achieve this future, Thread equips frontline workers with a standardized autonomous inspection tool to conduct professional-grade inspections using off-the-shelf components and highly resilient automation. By reducing the skill level required to collect data, enterprises obtain more consistent data flow and analytics, enabling them with the ability to inspect as many times as necessary without incurring additional costs.

By combining this tooling with the company's robust data platform, UNITI, customers receive season-over-season consistency to compare data across a range of attributes, enabling the industry to develop prescriptive responses to both repairs and inspection frequency.

In addition to increasing the number of inspections as a baseline for asset health data, developing data-sharing agreements as an industry is of great significance. All inspection technologies and associated quantitative asset health data must be shared across all industry stakeholders to provide better insight into Operations and Management (O&M) strategies and asset performance.

This includes sharing performance data back to manufacturers and unveiling the secretive nature of the industry to drive a more consistent approach, as is the case in the airline, automotive, and power production industries. So often, many parties hide behind intellectual property as an excuse to consistently secret data that is critical to an effective O&M approach and plan. This in turn impacts the collective progression within the wind industry.

Taking automotive as a prime example, consumers are accustomed to recall notices as part of the in-warranty and out-of-warranty approach to safety. These recall notices are a direct result of the National Highway Transportation Safety

Administration's mandate which led to a national database of all crash data resulting in manufacturers playing a key role in the accountability of their product and performance as it pertained to human safety.

Likewise, the National Transportation Board and the airline industry are accustomed to data sharing given the heavy government subsidies and the nature of their business. Similarly, data sharing within the wind industry seems more than possible without invalidating propriety design and intellectual property.

It's crucial to make informed design, operation, and maintenance decisions when it comes to asset inspections. Today's decisions are largely driven through a rudimentary break-fix approach instead of a proactive approach.

Thread's UNITI tracks inspection data across all asset types with robotic collection and automation at the center of turning consistent qualitative imagery into quantitative data. This data allows manufacturers, owners, and operators to meet industry goals of a proactive approach instead of reactive.

As the wind industry continues its expansion to reach net-zero goals by 2030, it's important to address the lack of maintenance specificity that is endangering that future. This growth can only be accomplished by developing a standard statistical and cost-effective approach to managing blade health through inspections. This will enable the industry to predict the progression of damage, and consequently inform maintenance plans and improve blade designs, resulting in more efficient and reliable wind fleets.

www.thread.one