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Could you tell us a little about the history of Complete Wind?

Complete Wind Corporation is currently in its fifth year of business. The origins of the company's core management experience comes from 10-plus years of rotor blade manufacturing (600kW to 1.5MW), before it transitioned to rotor blade maintenance, inspection, and repair. CWC provides its services to wind farm owners and operators.

Geographically speaking, what is Complete Wind's service area?

CWC is incorporated in both Canada and the United States; employing citizens in their respective countries while allowing our customers operating assets in both countries consistent services.

What is the most pressing issue pertaining to blade maintenance today?

Awareness. The CWC wind industry experience has been that the trends of rotor blade maintenance fall under reactionary measures, rather than preventative. Increasing rotor blade

inspection scope and developing a regular inspection frequency platform will allow owners and operators to identify rotor blades issues and schedule repairs as a part of a preventative maintenance program, thus managing greater control of repair expenses. Unfortunately, it has been the experience of CWC that there is little budget set aside for rotor blade maintenance at the planning stage of a wind farm. Thus, owners and operators find themselves in an undesirable position when it comes to paying for blade repairs and maintenance.

How are emerging technologies changing the way maintenance is performed on blades and other components? How do you adapt to those changes?

The larger rotors and material composition selection, such as carbon fiber, are creating challenges for inspection and repair and how it is performed. Effective data base management of the inspection findings has been aiding CWC to cope with the increase in rotor blade sizes. Drone inspection methods are supplying cost effective inspection alternatives. Also, advances in NDT technology will eventually provide the means to look for anomalies not visible to the naked eye, but there is no substitute for a hands on inspection when a potentially serious issue is found.

Looking forward, what are your expectations for blade maintenance needs?

As the industry matures, I expect there to be more emphasis placed on preventative blade maintenance as the costs associated with reactionary

maintenance cannot be controlled or budgeted for. Many of the operators will increase the scope of their technicians to encompass blade inspections at the site level and employ third party companies, like CWC, as specialists to handle out-of-scope maintenance and repair of the composite rotor blades.

Could you tell us a little about Complete Wind's inspection services, the need for inspection, and the benefits?

At a wind farm, there are 3 basic rotor blade inspection scopes that CWC employs: Visual from-ground exterior; visual from-ground exterior and up-tower exterior; and visual from-ground exterior and up-tower interior and exterior.

Aside from identifying early stage wear-and-tear items (e.g. leading edge erosion) and force majeure issues (such as lightning strike damage), the need for inspections early in the life of a rotor blade will identify manufacturing anomalies that could lead to costly repairs later in the service life. CWC's extensive experience has established that 75 percent of the blades inspected have such manufacturing anomalies.

Establishing an inspection program allows owners and operators the ability to plan maintenance and budget for repairs. Effective management of inspection findings keeps the maintenance in a preventative mode.

What other services does Complete Wind provide to its clients within the industry?

We perform rotor blade inspections, remediation, and composite repairs — both on- and off-turbine. We also do quality audits of rotor blade manufacturing facilities, technical consulta-

tion, and on-turbine dynamic rotor balancing and vibration analysis.

How often should blade maintenance or inspection be performed?

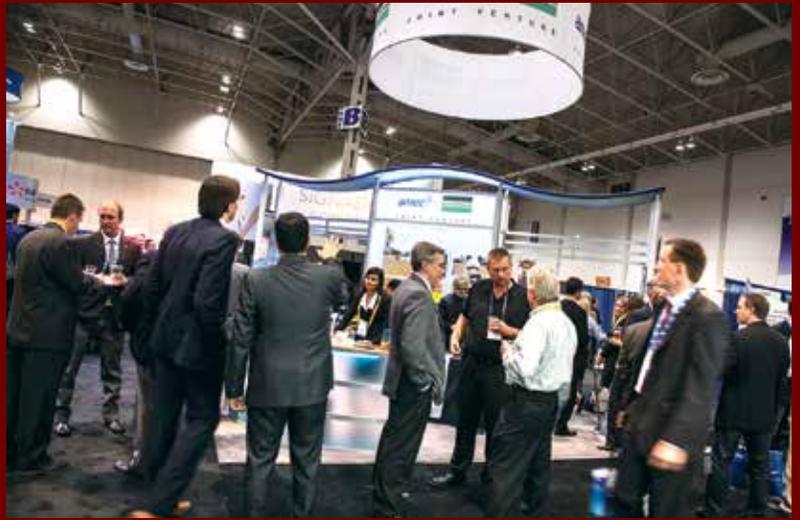
CWC has developed detailed inspection platforms for the different types of blades in the industry, but generally speaking:

- Exterior, from-ground inspections should be performed annually. This inspection looks for damage from exterior wear, operational defects, lightning strikes, and serious manufacturing anomalies.
- Up-tower inspections (both interior and exterior) should be performed at the end of warranty, and every two to three years thereafter. Here, inspectors again look for operational defects, wear, and manufacturing anomalies, but broaden the inspection to include both exterior and interior components.
- The lightning protection system should be inspected according to OEM or IEC61400-24 recommendations. Primary findings commonly includes a down conductor connection, as well as inspection of down conductor connection, as well as a receptor inspection.
- A dynamic rotor balancing inspection, testing for mass and aerodynamic imbalance, should take place when the turbine is commissioned, as well as every two to three years going forward.

What is the best advice you could give to a wind farm owner or operator regarding blade maintenance?

My advice to owners and operators is to begin planning blade maintenance and repair in January, seek out and select a blade maintenance vendor by March, so that preparations are made for the start of the warmer and typically the lower wind summer months. ↴

MARKET GROWTH, WIND INTEGRATION, AND INVESTMENT AMONG TOPICS SLATED FOR CANWEA 2014



The conference program for the Canadian Wind Energy Association's annual exhibition, to be held from October 27-29, in Montreal, Quebec, will focus on a wide range of topics of interest to Canadian and international wind energy investors, wind farm owners and operators, and many other parties within the wind industry. Topics on the conference bill include: from Canadian market growth and investment opportunities, wind energy project development and operations, wind energy integration and storage, and wind energy as a solution to climate change, among others.

Often called the one-stop shop to learn everything about the Canadian wind energy market, the CanWEA 2014 conference is the country's largest annual wind energy educational and networking event. It brings together approximately 1,500 industry experts and 150 exhibitors in Canada's wind energy market to discuss growth opportunities, policy and technology developments and to facilitate networking.

"Canada is one of the world's leading wind energy markets and has installed, on average, more than 1,000 MW of new wind energy capacity annually over the last five years," said CanWEA President Robert Hornung. "Visitors to CanWEA 2014 will gain insights into the new investment opportunities that are now emerging in provinces across Canada."

This year's conference will include a celebration of the association's 30th anniversary and multiple educational sessions.

Operations and maintenance will have a dedicated session track, responding to the growing service market. Senior leaders from Suzlon, Boralex, and Kruger Energy will provide key operational insights along with owners, OEM and third party service providers.

Another key focus will be advances in energy storage capacity, which is critical to scaling up worldwide renewables by integrating remote generation sites into the grid. Senior representatives of Energy Storage Ontario, the Wind Energy Institute of Canada, and Hatch Consulting will provide their perspectives on storage, as well as battery technology developments and utility scale applications. ↴