LUNA

CASE STUDY

Wind Turbine Monitoring

ABOUT "SBLADE"

Industry: Energy
Location: Denver, Colorado

Luna Innovations participated in a project with Purdue University and Sandia National Laboratories to assess the performance throughout the lifespan of TPI Composites' 9m long, conventional fiberglass, carbon spar "SBlade" wind turbine blade.

The Challenge

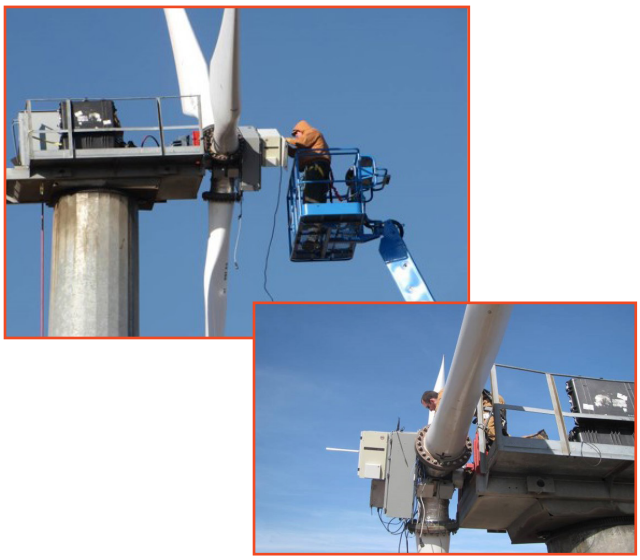
Wind turbine blades and towers are failing at high rates in the United States due to strains in composite materials and weather related factors such as high winds and lightening. While shutting the turbines down in events such as storms to safeguard the blades is an option, it reduces opportunities for energy generation. Monitoring the blades for defects and degredations will help reduce operating costs and increase production.

The Solution

Luna's HYPERION sensing system with Fiber Bragg Grating (FBG) technology presents signficant benefits for monitoring wind blades: the sensors are lightweight, unobtrusive to the structure, provide a significant reduction in cable harness and asociated handlin; and are impervious to electromagnetic interference (EMI). The data interrogator also features a small electronic footprint

Installation on the wind turbine took only four hours compared to the three-day time frame common with electronic sensors.

Ultimately, the fiber optic cable weight is a mere six percent of the electronic cables and require no calibration. This installation used 28 Fiber Bragg Grating (FBG) sensors, and leaves capacity for 200 more, should additional data need to be identified.



The Results

Data was collected in various time-windows to account for variations in the weather conditions to which wind blades are exposed over the course of time. Labview and other graphical user interfaces can be accessed through a web browser allowing for remote connections to the blade monitoring system to set up and adjust the data acquisition parameter, selection of trigger source, and controlling the data interrogator, as well as visualization of the FBG sensor layout, scaling data, setting up of data file storage, and remote real-time data monitoring.

INSTRUMENTS USED

Luna's sm125 Optical Sensing Interrogator, sm130-500 Optical Sensing Interrogator, and sp130 Optical Processing Module were used in conjunction with our sensors. Nine os3200 Non-Metallic Optical Strain Gages, four os4350 Armored Cable, Non-Metallic Temperature Sensors, and one os4100 Temperature Compensation Sensors were used to monitor the blade-low pressure skin. Ten os3200 Non-Metallic Optical Strain Gages, three os4350 Armored Cable, Non-Metallic Temperature Sensors and one os4100 Temperature Compensation Sensors were used to monitor the blade hi pressure skin.

Sensing system installed inside SBlade

+1 540.769.8400
solutions@lunainc.com
www.lunainc.com