

Speeding Up Wind Turbine Blade Inspections

A custom-built, self-propelled mobile scanner vehicle integrated with a P-Scan ultrasonic imaging system allows a wind turbine company to increase its inspection rate to meet growing market demand

The Challenge

As the market for wind power has expanded worldwide, demand for windmills—or wind turbines, as the modern versions are called—is also growing. Improvements in wind turbine technology have helped lower the cost of wind-generated electricity.

The Customer designs and manufactures large wind turbines that are used by “wind farms” and other wind power generation installations. To meet the growing demand for wind turbines, the company needed to increase production rates, which meant increasing the inspection rate for the components it manufactured, including the large turbine rotor blades.

The blades must be strong, light and durable for decades of use under all weather and wind conditions. The blades are made of a composite material: carbon-fiber reinforced plastics, in sheets, bonded with a resin. For strength and durability, it’s critical to verify that there is no delamination in the layers, no dry fiber areas, wrinkles or porosity (air gaps), that fibers are all oriented in the same direction and that there is proper joint adhesion.

The blades are inspected using ultrasound scanning to detect any of these issues. Due to the size of each turbine blade (industrial



Mobile scanning unit traversing a large turbine blade

Industry: Energy / Power Generation

Technology: Ultrasound

Products & Services: P-Scan / Composite delamination / Material evaluation to detect porosity, dry fiber areas, wrinkles and fiber orientation, and to inspect the integrity of adhesive joints

Customer Profile: A U.S. company that designs and manufactures industrial wind turbines for generating wind power

Business Challenge: Responding to growing demand for wind power, the Customer was increasing production volumes of its turbine blades and needed an inspection scanner solution that could perform with speed and accuracy

Solution: A mobile scanner vehicle that can travel along the length of each wind turbine blade at the rate of 20 feet per minute, rotating to capture ultrasound images from multiple angles using advanced P-Scan technology

Benefits:

- Automated scanning along the full length of the turbine blades with real-time imaging enables the Customer to maintain inspection speeds as production volumes increase
- Viewing screen and easy-to-use system allows a single operator to assess the results of a preliminary scan and identify areas for more in-depth inspection
- Meeting increased production demands while ensuring effective product quality control helped the Customer secure a leading position in this growth industry

turbines can be as much 50 meters long), there is a very large area to inspect, requiring a unique, integrated mechanical and imaging system that can combine both speed and accuracy.

The Adaptive Energy Solution

The solution was to design and construct a mobile scanner vehicle that can traverse the full length of each blade. The mobile scanner is self-propelled along the blade; this automated movement ensures that no area is missed in the inspection process.

The scanner vehicle moves at a velocity of up to 20 feet (6 meters) per minute. The unit is constructed with its own power supply, pumps and water supply so it can be operated independently for long periods throughout a large facility. The vehicle carries an AMS-20 scanner equipped with 26 probes in flexible holders, integrated with the P-Scan 4 Flex ultrasonic imaging system.

The scanner unit is set up to perform an initial line scanning of a 51-inch (130 centimeter) wide sector along the turbine blade. When this preliminary scan indicates possible deviations from production quality requirements, the scanner can then perform more detailed inspection of any suspect sectors of the blade. The probe holder frame can be rotated 90-degrees to do close scanning across the suspicious-looking sectors.

The scanner unit offers easy operation, and can be run by a single technician. The operator can perform an on-line evaluation of the scan data, which is displayed on a screen in front of him in real time as the probes moves along the blade. The mobile scanner unit is also very efficient, since it can move itself quickly from one turbine blade to the next one in line to be inspected.

To deploy this solution, Adaptive Energy worked in partnership with FORCE Technology, a leading research institute that designed and developed the P-Scan 4 Flex system. The P-Scan 4 Flex is capable of both ultrasound and eddy current inspection techniques, providing the Customer with flexible, precision testing combined with real-time data visualization.

Results

Using the mobile scanner unit, the Customer is able to perform thorough ultrasonic inspection of its wind turbine blades without slowing the production process. The system is able to rapidly detect any issues in the integrity of the adhesive joints, any delamination, dry fiber areas, porosity, fiber orientation issues or wrinkles.

This system allowed the Customer to increase its production volume, taking advantage of a rapid market growth opportunity while enhancing the effectiveness of its inspection program. By delivering high-quality wind turbines to the market, the Customer has been able to build its reputation and secure its leading place in this growing industry.

About Adaptive Energy

Adaptive Energy creates customized, non-destructive material evaluation solutions to address mission-critical, time-sensitive testing needs. By combining the latest digital radiography, computed tomography, and ultrasonic imaging technologies with innovative mechanical and robotic assemblies, Adaptive Energy's integrated systems offer rapid deployment, are easy to learn and maintain, and perform reliably under pressure.

Working collaboratively with organizations in the aerospace, automotive, energy, petro-chemical, defense, infrastructure, and materials industries, our experts develop optimized solutions for flaw and crack detection, composite delamination, weld inspection, hardness testing, custom radiation enclosures and overhead gantry systems, and more.

Adaptive Energy is also the exclusive distributor in the U.S. and Canada of FORCE Technology's P-Scan ultrasonic scanners, including the P-Scan Stack with Phased Array, a next generation automated inspection system.



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