



How AI is shaping predictive blade maintenance

Is wind energy getting smarter and more efficient? The answer depends on whom you ask. Some companies still rely on traditional human labor, while others are fully embracing the latest technological developments, such as AI and robotics. Aerones belongs firmly in the latter group.

Following the successful closure of a \$62 million investment round earlier this year, Aerones has made substantial investments in AI-enhanced solutions and software capabilities. Today, the company not only provides the world's most advanced robotic systems for wind turbine inspection, maintenance, and repair, but also delivers a powerful software layer that significantly improves the speed, quality, and cost-efficiency of operations. These new tools aggregate and analyze terabytes of inspection data, enabling predictive maintenance and smarter asset management for wind farm operators.

As of September 2025, it has improved both the speed and accuracy of its leading-edge repair robots, raising the bar for how efficiently and accurately eroded blades can be restored to near-factory condition. The company has tripled the number of blades its human-operated robots can repair and potentially setting a new world record for repair speed. Equally remarkable is the consistency and repeatability of repair quality, something that remains difficult, if not impossible, to achieve with conventional manual methods.

Efficiency and quality

With many of the industry's top experts joining its ranks, Aerones has continuously improved its processes related to service quality, efficiency, and safety. Each project is carefully documented, and field technicians follow a detailed checklist of procedures to ensure full control and safe execution at every stage.

Recent developments include new generation robots that integrate multiple tool bases

previously used separately. This innovation eliminates the need for time-consuming equipment swaps in the field, streamlining operations and enhancing productivity.

In parallel, Aerones has launched a dedicated materials laboratory, where it tests and evaluates fillers and leading-edge protection materials for adhesion, wear resistance and durability. Through hundreds of hours of laboratory simulations, exposing materials to rain erosion, UV radiation, and extreme temperature fluctuations, the company has identified optimal material combinations for specific turbine types, climates, and operating environments.

Integrating AI across operations

Beyond robotics and materials science, Aerones is applying artificial intelligence extensively across its internal operations, field technology, and customer-facing software platforms.

AI, combined with Aerones' blade inspection experts, now enable rapid and reliable internal and external inspection reporting. Immediately after a drone or internal crawler inspection, all footage is uploaded to the cloud, where AI models detect anomalies and classify them by type and severity. Human specialists then verify each finding to ensure no issue is overlooked. This way, teams working jointly with the AI are getting a near-100% accuracy in anomaly detection.

To achieve this, Aerones uses advanced AI-powered computer vision systems that analyze visual data collected during wind turbine inspections. These machine learning models automatically detect, classify, and assess the severity of defects such as cracks,



erosion, or lightning damage. This process allows for faster data processing and higher accuracy, especially when paired with the expertise of Aeronex' blade specialists who review and confirm the AI's output.

All reports are made available to customers through a Customer Platform, accessible via the company's Visual Inspection Studio software. This allows users to view inspection data, compare results with historical inspections and even perform side-by-side analyses of the blade's exterior and interior.

The human + AI synergy

While AI handles the initial analysis of inspection data by rapidly scanning thousands of images for potential defects, human expertise remains central. Every AI-generated assessment is cross-checked by certified specialists who validate findings and finalize maintenance recommendations. This hybrid approach merges the speed, scalability, and consistency of AI with the critical reasoning and contextual understanding of human experts, ensuring both accuracy and safety.

Humans remain indispensable for oversight, strategic decision-making and complex scenario management that AI cannot yet perform independently. While automation accelerates repetitive or data-intensive tasks, human insight is essential for interpreting findings in broader operational contexts, weighing maintenance trade-offs and ensuring that safety-critical decisions remain sound. For the foreseeable future, the most

effective model combines AI's analytical power with human judgment and accountability.

Customers increasingly recognize AI and robotics not as replacements for human expertise, but as tools that augment human capabilities. They seek solutions that reduce costs and risks while enhancing reliability and control. The prevailing trend is toward hybrid systems that automate hazardous or repetitive tasks but preserve experienced professionals in decision-making and oversight roles.

Full automation is unlikely in the short term, especially for high-value infrastructure such as wind farms, where safety and reliability are paramount. While data collection and analysis can be largely automated, decisions related to maintenance scheduling, resource allocation, and long-term risk management still rely heavily on human expertise. The optimal path forward involves intelligent automation performing well-defined tasks, while people focus on complex problem-solving and strategic supervision.

The evolution of roles

As technology transforms the industry, technician roles are evolving from physically demanding fieldwork to analytical and supervisory positions. Today's wind technicians increasingly manage robotic systems, interpret AI-generated insights, and make data-driven maintenance decisions rather than performing manual high-risk

inspections. This transition makes the job safer, more technical and more intellectually engaging, requiring a blend of mechanical understanding and digital fluency.

Tasks that are repetitive, hazardous, or require high precision, such as high-altitude inspections or uniform material applications are ideally suited for robotic execution. Moreover, repair processes demanding millimeter-level accuracy and uniformity can now be automated to consistently exceed human capabilities. As technology advances, Aeronex anticipates robotic systems taking on even more complex maintenance functions, including autonomous repairs and real-time structural health monitoring.

Predictive and proactive maintenance

The industry is shifting from reactive to predictive maintenance, where potential failures can be identified and addressed in advance. Aeronex is pioneering this transformation by integrating automated blade repair, continuous data collection, and real-time monitoring systems that create digital twins of turbines. These digital models simulate and predict turbine behavior, helping operators optimize maintenance schedules, reduce downtime, and extend asset lifespans.

By merging robotics, AI and data intelligence, the company enables wind energy operators to unlock new levels of safety, speed and cost efficiency, turning maintenance into a proactive, data-driven process rather than a reactive one.

The wind industry stands at a turning point where the fusion of human expertise, robotics, and artificial intelligence is reshaping how turbines are maintained and operated. Aeronex' commitment to innovation has not only accelerated maintenance timelines and improved repair quality but has also elevated safety and intelligence across every stage of the process.

From advanced materials research to AI-powered analytics, it is setting new global standards for operational excellence in wind energy. As the sector moves toward a future of predictive, data-driven maintenance, Aeronex continues to lead the way in making wind turbine service smarter, safer, and more efficient than ever before.

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We are growing rapidly and are always looking for top talent in engineering, software development, field operations and more.

Let us know about your skills, and let's see if we have something to offer.

Send us an email to hr@aeronex.com, and let's build a sustainable future together.