

Saving and Enhancing an Existing Scanner System

Refurbishing and upgrading a water jet probe scanner to provide improved performance and keep the unit in service for years to come

The Challenge

The Customer develops and manufactures a wide range of high-tech products and components that are used in leading aerospace and defense systems. The products are often termed “mission-critical elements” where defects and failures are unacceptable because of the vitally important function of these components.

For example, one of the Customer’s production lines manufactures aero structures for aircraft. Aero structures can include all or parts of the fuselage, wings and flight control surfaces of an aircraft, and are often made of reinforced lightweight carbon fiber. Because

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these components are so essential to aircraft function and safety, there is no margin of error for these constructions. Quality control protocols for production of aero structures require 100 percent inspection (meaning 100 percent of components must be inspected, not just a sampling).

Inspections are conducted using ultrasonic methods. To meet the 100 percent requirement, a high throughput ultrasonic scanning system is needed to avoid slowing production. The Customer previously had used a water jet probe scanner installation for ultrasonic inspection of aero structures.

A water jet probe scanner operates by directing two small streams of water onto either side of a part being tested. The water provides a medium for ultrasonic sound waves to travel and capture precision images of the component. Using a combination of mechanical and electronic control mechanisms, the part is manipulated and the water jets move to ensure that all surfaces pass through the scan to yield a series of inspection images. The automated control system ensures that scanning is complete yet efficient.

Industry: Aerospace / Defense / Manufacturing / Materials

Technology: Ultrasound

Products & Services: P-Scan

Customer Profile: A European high-tech firm that designs and manufactures components for aerospace and defense systems

Business Challenge: The water jet probe scanner the Customer used for critical component inspections needed to be upgraded to meet new inspection demands, but could no longer be serviced by its original manufacturer

Solution: A combination of replacements and upgrades to various system components provide enhanced inspection capabilities and allow maintenance to be handled in house

Benefits:

- Keeps a critical inspection system in service with cost-effective refurbishment, saving the Customer from having to buy entirely new equipment
- Better imaging and inspection quality meets the evolving demands of the company’s customers
- Efficiency and ease-of-use maintains production line throughput
- Enhanced quality assurance for essential fuselage, wing and flight control components ensures the structural safety of the commercial and military aircraft the company produces

As airplane design continued to advance, manufacturers were demanding a new, higher level of inspection performance. The water jet probe scanner would need to be upgraded to meet these new demands. However, the installation could no longer be serviced by its original manufacturer. The Customer faced the prospect of having to discard the existing scanner and purchase an entirely new one—a costly and time-consuming process—to meet the enhanced inspection requirements. They turned to Adaptive Energy for assistance to evaluate the current system and devise a refurbishment strategy, if possible.



Water jet probe scanner with integrated P-Scan 4 ultrasonic inspection system being used to scan a critical aero structure component

The Solution

Adaptive Energy's specialists analyzed the feasibility of refurbishing and upgrading the existing system. They determined that both the ultrasonic system and the motor control system needed to be replaced. The main parts of the mechanical construction as well as the jet probes could be reused.

To refurbish the mechanical control system Adaptive Energy:

- Installed a new motor for the longitudinal horizontal probe drive (Y-direction)
- Installed new motors for the horizontal aligned movement of jet probes (Z-direction)
- Constructed a new frame with motor and vertical drives for the two jet probes (X-direction) to ensure accurate positioning and alignment of probes

To replace the ultrasonic system and provide a higher level of scan precision, Adaptive Energy partnered with FORCE Technology to upgrade to a P-Scan System 4 (P-Scan 4) with integrated motor control system. The P-Scan 4 ultrasonic data acquisition unit is well known for its large dynamic range of 120 decibels (dB), which is very important for water jet scanning of fiber components where the attenuation of the ultrasound can exceed 100 dB.

The X- and Y-movements of the system were designed for a maximum speed of 700 mm/second, and the acceleration and deceleration could be controlled to minimize vibration. Adaptive Energy integrated the P-Scan 4 into the water jet unit along with a sophisticated software and controller package to complete the refurbishment of the scanner system.

Results

With the refurbished system, the Customer has been able to improve the precision and quality of its part inspections, while at the same time realizing increased efficiency and throughput. As a part is scanned by the water jet probe system, the ultrasonic data are analyzed with the P-Scan 4 software package and the data are saved on a central server in accordance with the Customer's quality documentation requirements. The system is easy to use so downtime for re-training operators was minimal, and is flexible to accommodate a range of different components.

The cost of refurbishing and upgrading the system was significantly less than it would have cost the Customer to invest in a new inspection system. The enhanced system was up and running quickly, without significant production downtime. Additional gains have also been realized in productivity and the minimal maintenance requirements that can now be addressed easily in house.

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.



CONTACT

+1.253.284.0825

Email info@adaptiveenergy.com

Mailing address

Adaptive Energy
1640 Marine View Drive, Suite B
Tacoma, WA 98422

www.adaptiveenergy.com