NEXT-GENERATION QUALITY SYSTEMS

TO ENSURE FIRST-TIME QUALITY

EWI®

We Manufacture Innovation

NDE & QUALITY TESTING

BEST-IN-CLASS TRENDS

FOR HIGH QUALITY PRODUCTS

Ensuring first-time quality has become a crucial aspect of the production process across all manufacturing industries. Processes continue to shift away from destructive techniques and sample testing conducted after preliminary production, and move toward inline monitoring throughout the entire manufacturing process.

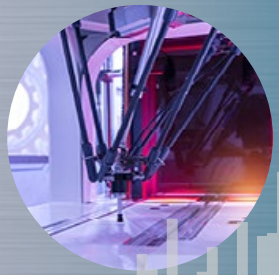
Today, best-in-class organizations are developing manufacturing and quality processes concurrently with product development, focusing on:

- Design for Inspection
- Quicker design acceptance
- Eliminating overdesign and time-wasting re-designs

This move from sampling and destructive testing to continuous, process monitoring with closed-loop feedback and control enables manufacturers to identify and correct production issues in real-time, facilitating 100% inspection of all parts. Results include reduced scrap, less rework, and lower volumes of work-in-process (WIP).

"Rising margin pressures, particularly in consumer-oriented industries such as fast-moving consumer goods and medical products, limit how much companies can spend on quality practices. Organizations therefore cannot just be good at quality—they need to be smart about it as well."[1]

- McKinsey & Company



REALIZING MULTIPLE BENEFITS
OF NEXT-GENERATION QUALITY SYSTEMS

Successful manufacturers know that quality is not a cost but an asset, and must be considered at each stage of the product lifecycle. Designing quality processes during product development, and assessing quality process during the more traditional stages of manufacturing and service have many beneficial results:

REDUCED COSTS

Inline process monitoring enables companies to cut costs by reducing field failure rates, avoiding destructive tests, and using real-time feedback to continuously improve the manufacturing process. In addition, many manual inspection techniques are now being replaced with automated systems to reduce cost and improve inspection accuracy.

DECREASED TIME TO MARKET

Companies can improve speed to market by incorporating design-for-manufacturing and nondestructive evaluation (NDE) modeling into the product development process and evaluating NDE methodologies during prototype builds. Preventing unwanted design revisions early can significantly reduce overall development time.

IMPROVED ASSET MANAGEMENT

In-service monitoring of products allows companies to more effectively manage assets, extend their useful life, and comply with national and international quality and safety regulations.

Other benefits include:

- Compliance with standards and regulations
- Reduction in warranty claims
- Improved plant reliability and customer satisfaction
- Improved user safety
- Asset value maximizations
- Qualification of new manufacturing processes and materials

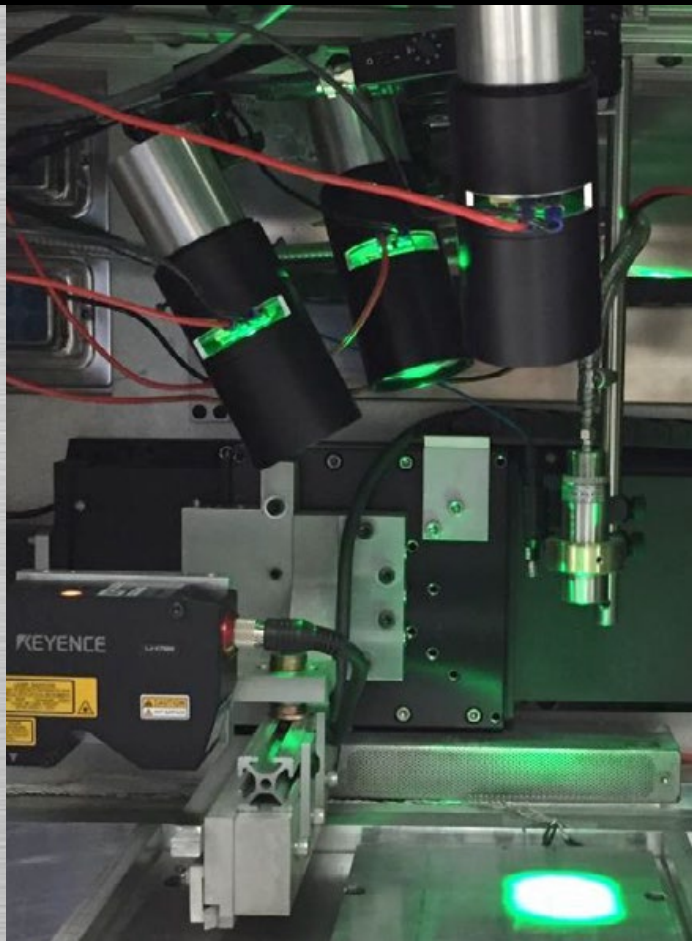
NEXT-GENERATION QUALITY SYSTEMS IN ACTION

CASE 1 — ADDITIVE MANUFACTURING

The Challenge Closed laser powder bed fusion (L-PBF) additive manufacturing systems prevented continuous tracking of lengthy 3D printing "build" quality and detection of build flaws, potentially compromising overall utility of components.

EWI Solution A multi-sensor approach to continuous, inline monitoring of the metal 3D printing process in was developed for the L-PBF machine. The solution incorporated a range of sensing technologies including thermal melt pool imaging, laser profilometry, three-dimensional structured light macroscopes, eddy current, and more.

Results Real-time quality monitoring and identification of build flaws produced significant cost-savings associated with metal powder usage and machine time.



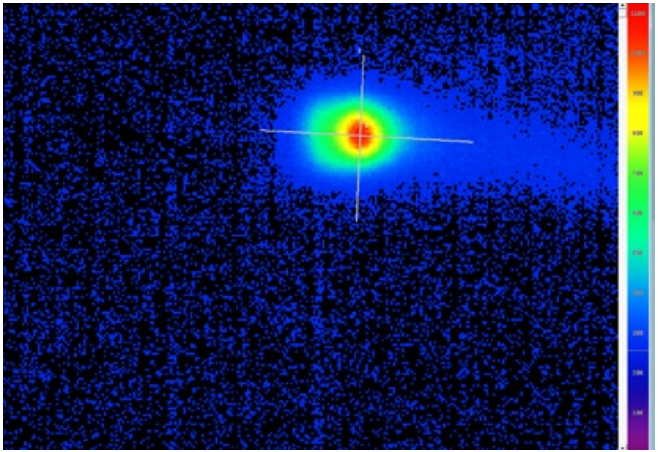
NEXT-GENERATION QUALITY SYSTEMS IN ACTION

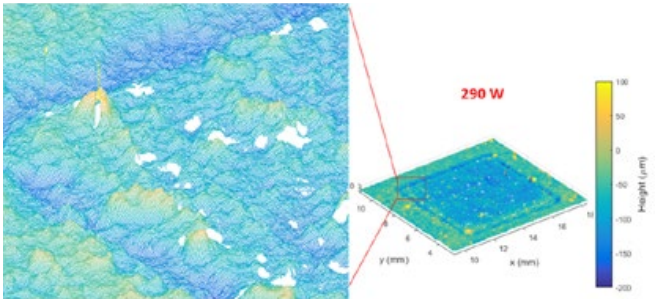
CASE 2—CONSUMER ELECTRONICS

The Challenge A high speed production setting added a layer of difficulty to this customer's challenge of achieving the quality standards necessary to exceed pass/fail assessments, avoid laser welding flaws, and retain customer loyalty.

EWI Solution A unique quality measurement method was designed using automated vision technology to collect optical data through the laser plume and correlate to weld quality metrics.

Results The EWI-designed system was integrated into full-scale production, bolstering product quality assurance and securing manufacturer's significant market share.





NEXT-GENERATION QUALITY SYSTEMS IN ACTION

CASE 3—AEROSPACE

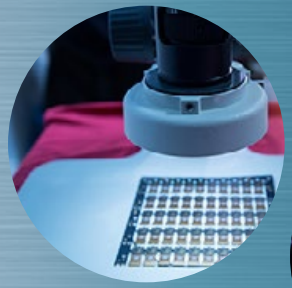
The Challenge Manual quality inspections required significant labor expense and increased operator fatigue levels, potentially compromising inspection and quality certifications.

EWI Solution A fully automated inspection system of precision machined parts—including automated part handling and fixturing as well as a collaborative robot—was developed. The system utilized non-contact, optical surface metrology equipment, along with associated image analysis software to provide usable quality data.

Results The automated system increased consistency of quality certification and overall component characteristics, plus a substantial reduction in component manufacturing costs.

WHAT'S ENABLING THE TRANSITION?

- **Continuous manufacturing process monitoring—** enabling inline process monitoring and control resulting in improved final product quality and elimination of destructive testing.
- **Cloud computing—**increasing rollout speeds and enabling manufacturers to quickly customize, scale and adopt new technological developments.
- **Industrial Internet of Things—**taking advantage of "smart machines" that can seamlessly and consistently capture, analyze and communicate data, helping drive faster, smarter manufacturing decisions.
- **Artificial intelligence—**establishing collaborative working relationships between intelligent machines and humans, maximizing technological effectiveness, performance and service.
- **Predictive maintenance—**facilitating constant tracking of performance data and generating predictive analytics that help manufacturers understand failure conditions, track anomalies, and regulate production based on real-time demand.



Across every industry, Industry 4.0 technologies are helping organizations achieve improved quality, enhanced yield, reduced scrap rates, decreased field failure rates and optimized cycle times.

A FULL RANGE OF ADVANCED QUALITY CAPABILITIES . . .

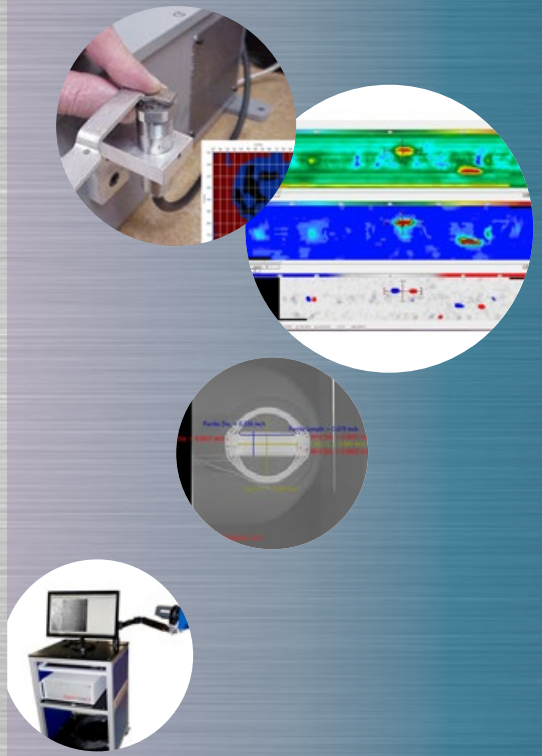
EWI is a leader in advanced quality systems with a broad range of multidisciplinary capabilities and technical expertise. With state-of-the-art equipment, innovative methods, and advanced mathematical modeling expertise, we are able to help companies tackle the toughest inspection challenges, reduce costs, and stay competitive. Some of our innovative work includes:

- Development of advanced NDE and quality measurement techniques
- Design of systems to facilitate manufacturing compliance with standards and regulations
- Technique optimization to meet and exceed customer requirements
- Field and laboratory inspections not available with conventional techniques
- Process validation and qualification
- Probability-of-detection (POD) and accuracy of sizing studies for highly critical components and structures
- Replacement of manual and visual inspection techniques with automated NDE techniques
- Real-time monitoring of the manufacturing process
- In-service structural health monitoring to prevent catastrophic failures and unplanned maintenance
- Industry metrology and feasibility studies

. . . AND A BROAD SUITE OF QUALITY TECHNOLOGIES

EWI's onsite laboratories include:

- Full matrix capture/total focusing method (FMC/TFM) advanced and conventional phased array ultrasound with 2D and 3D matrix phased array sensors
- Electromagnetic-acoustic transducer (EMAT) and inter-digitized transducer (IDT) ultrasound generating sensors
- Array eddy current, magnetic flux leakage, and remote field technologies
- Radiography and computed tomography (CT) enabling high-tech, 3D visualization of components and flaws
- Microwave-based NDE for nonmetallic materials
- Continuous, pulse, and ultrasonically induced thermography
- Computed modeling software for ultrasound, electromagnetic, radiography, and X-ray CT
- Precision, wide-frequency range equipment for electromagnetic and acoustic material-property measurements
- Inspection-process automation and robotics



ABOUT EWI

EWI supports development and implementation of advanced quality systems across all manufacturing sectors at our center in Loveland, CO. We continually update our capabilities to include state-of-the-art nondestructive evaluation techniques, and work closely with our other technology groups to assure the highest standards of quality.

To learn more, contact **Shaun Freed** at **sfreed@ewi.org.**

[1]Aragon, A., Makarova, E., Ragani, A. F., & Rutten, P. (2017, September). Manufacturing quality today: Higher quality output, lower cost of quality. In McKinsey&Company. Retrieved from https://www.mckinsey.com/business-functions/operations/our-insights/manufacturing-quality-today-higher-quality-output-lower-cost-of-quality

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