

# NONDESTRUCTIVE EVALUATION:

*USING BREAKTHROUGH TECHNOLOGY  
TO ENSURE FIRST-TIME QUALITY*



# THE EVOLUTION OF NONDESTRUCTIVE EVALUATION

Over the years, nondestructive evaluation (NDE) has played a crucial role in manufacturing, evolving from early nondestructive techniques like the oil and whiting method, magnetic particle testing, and radiographic testing (RT) to today's advanced NDE technologies.



As manufacturers strive to increase first-time quality and the lifetime of their products, advanced NDE technologies are in high demand, including:

- Ultrasonic testing
- Eddy current testing
- Thermography
- Electromagnetic testing
- X-ray computed tomography
- Microwave testing
- Computed modeling

More importantly, companies are realizing how implementing these nondestructive technologies earlier in the manufacturing development timeline can save time and money during production.

The nondestructive testing market is projected to reach **\$24.23 billion** by 2022<sup>1</sup>



# WHAT'S DRIVING THE GROWTH OF NDE?



Companies in every industry employ NDE to save costs primarily to increase quality, improve yield, reduce scrap, decrease field failure rates, and optimize cycle times. Other trends contributing to the current growth of NDE include:

- The shift to continuous monitoring
- Predictive maintenance
- Cloud computing
- Robotic automated inspection
- Industrial Internet of Things

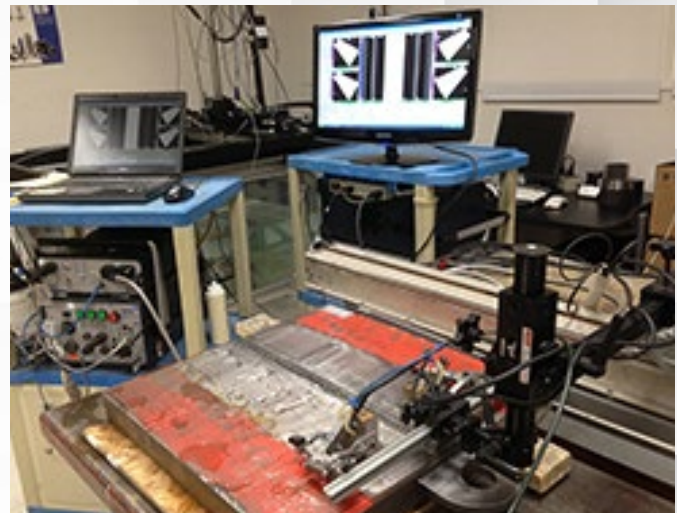


# FROM CONCEPT TO SERVICE: THE BENEFITS OF NDE

The most successful manufacturers know that quality is not a cost but an asset. By incorporating NDE during new product development, throughout all stages of manufacturing, and in service, companies gain long-term cost savings from improved quality across the product lifecycle.

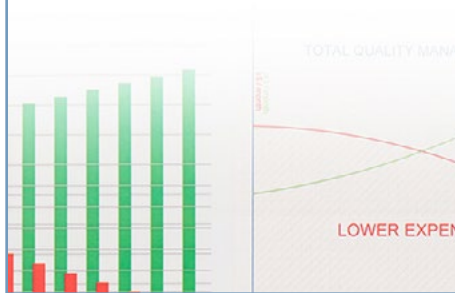
*MORE SPECIFICALLY,  
THIS VALUE IS REALIZED THROUGH:*

- compliance with legal regulations
- reduction in warranty claims
- improved plant reliability and customer satisfaction
- increased user safety
- asset value maximization
- qualification of new manufacturing processes and materials



## NEW PRODUCT DEVELOPMENT

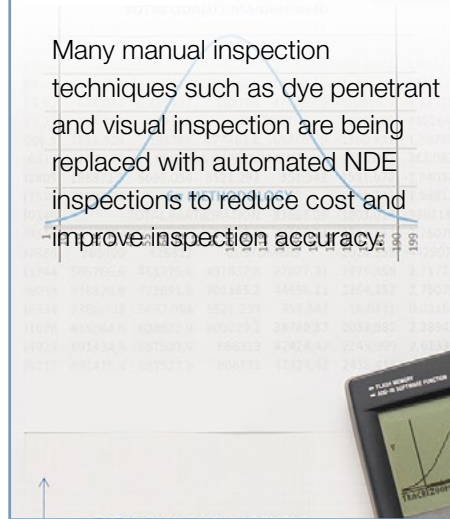
Incorporating design-for-manufacturing and NDE modeling into the product development process and utilizing NDE during prototype builds helps companies decrease time to market, increase first-time quality, and enable downstream value in manufacturing and in-service inspection.



## MANUFACTURING

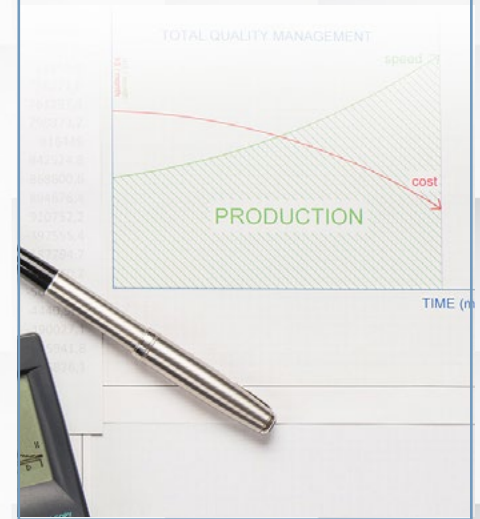
Nondestructive quality measurement during the manufacture of new or existing product lines enables companies to reduce costs by increasing speed, precision, and accuracy while reducing field failure rates, improving processes, and avoiding destructive tests.

Many manual inspection techniques such as dye penetrant and visual inspection are being replaced with automated NDE inspections to reduce cost and improve inspection accuracy.



## IN SERVICE

NDE of in-service equipment and infrastructure allows companies to more effectively manage assets, extend their useful life, and comply with national and international standards and regulations.



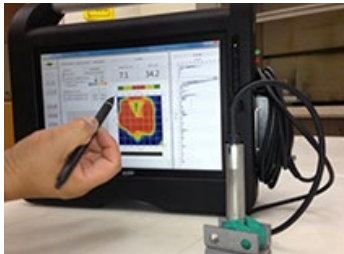


# NDE SOLUTIONS ACROSS INDUSTRIES

## AUTOMOTIVE

**The Challenge:** Testing of high-strength steel spot welds is unreliable, expensive, and destructive.

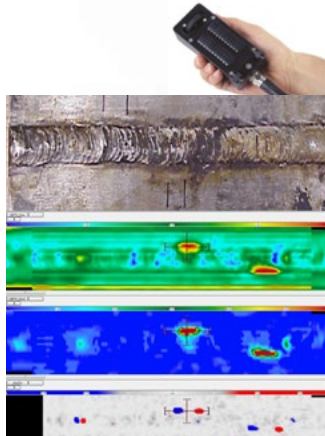
**EWI NDE Solution:** High-resolution matrix phased array (MPA) for fast and reliable evaluation of spot weld quality and size.



## HEAVY MANUFACTURING

**The Challenge:** Undetected defects in friction stir welds lead to service failures.

**EWI NDE Solution:** Phased-array ultrasound and array eddy current techniques developed and validated for NDE of aluminum alloy friction stir welds for ships.



## TRANSPORTATION & RAIL

**The Challenge:** Conventional NDE techniques are unreliable in detection of critical flaws.

**EWI NDE Solution:** High resolution MPA technique for fast rail inspection developed and validated in field conditions.

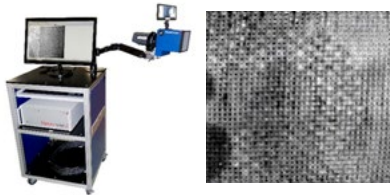


# NDE SOLUTIONS ACROSS INDUSTRIES

## SPACE & AEROSPACE

**The Challenge:** Demanding structural designs and use applications require advanced material systems such as polymer and ceramic matrix composites which present significant test, quality validation, and technology adoption challenges.

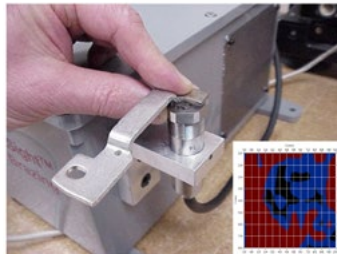
**EWI NDE Solution:** Advanced thermography, ultrasound, and eddy current methods in combination with model based sensor optimization and POD (probability of detection) statistics for rapid development and validation.



## CONSUMER AND INDUSTRIAL PRODUCTS

**The Challenge:** The destructive test for lack of braze (LOB) is slow and expensive.

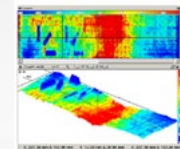
**EWI NDE Solution:** High resolution Matrix Phased Array (MPA) technique developed for inspection of brazed joints.



## ADDITIVE MANUFACTURING (AM)

**The Challenge:** Post-process NDE is expensive, time consuming, and cannot detect all flaws in complex structures.

**EWI NDE Solutions:** Developed array eddy current technology for fast examination inside AM chamber layer by layer.



# EWI'S NDE CAPABILITIES

EWI is a leader in advanced NDE techniques with a broad range of multidisciplinary capabilities and technical expertise. With state-of-the-art equipment, innovative methods, and advanced mathematical modeling, we help companies tackle their toughest inspection challenges and reduce costs to stay competitive. EWI's innovative developments and capabilities in advanced NDE include:



- Feasibility studies in NDE and industrial metrology
- Development of advanced NDE and quality measurement techniques
- Technique optimization to meet and exceed client requirements

- Field and laboratory inspections not possible with conventional techniques
- Process validation and quantification
- Probability-of-detection (POD) and accuracy-of-sizing studies for highly critical components and structures

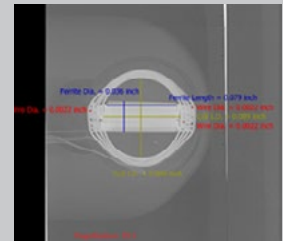
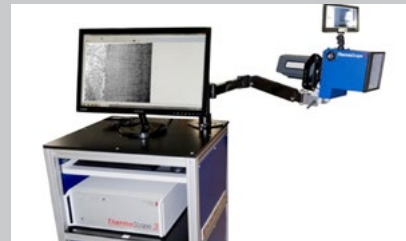
- Replacement of manual and visual inspection techniques with automated NDE techniques
- Real-time monitoring during manufacturing and in service
- Industrial metrology and first-time quality



# EWI'S NDE CAPABILITIES



- 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 filed 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 NDE technologies across all manufacturing sectors at our center in Loveland, CO. We continually update our capabilities to include state-of-the-art NDE techniques, and work closely with our other technology groups to assure the highest standards of quality. To learn more, contact Evgueni Todorov, NDE Technology Leader, at [etodorov@ewi.org](mailto:etodorov@ewi.org).



**EWI**<sup>®</sup>

*We Manufacture Innovation*

\*Non-Destructive Testing (NDT) Market by Component (Equipment, Services) Method (Ultrasonic, Radiography, Liquid Penetrant, Magnetic) End-User (Oil & Gas, Aerospace & Defense, Automotive, Infra) Techni (2017, January). In Markets and Markets. Retrieved from <http://www.marketsandmarkets.com/Market-Reports/nondestructive-testing-market-257342201.html>