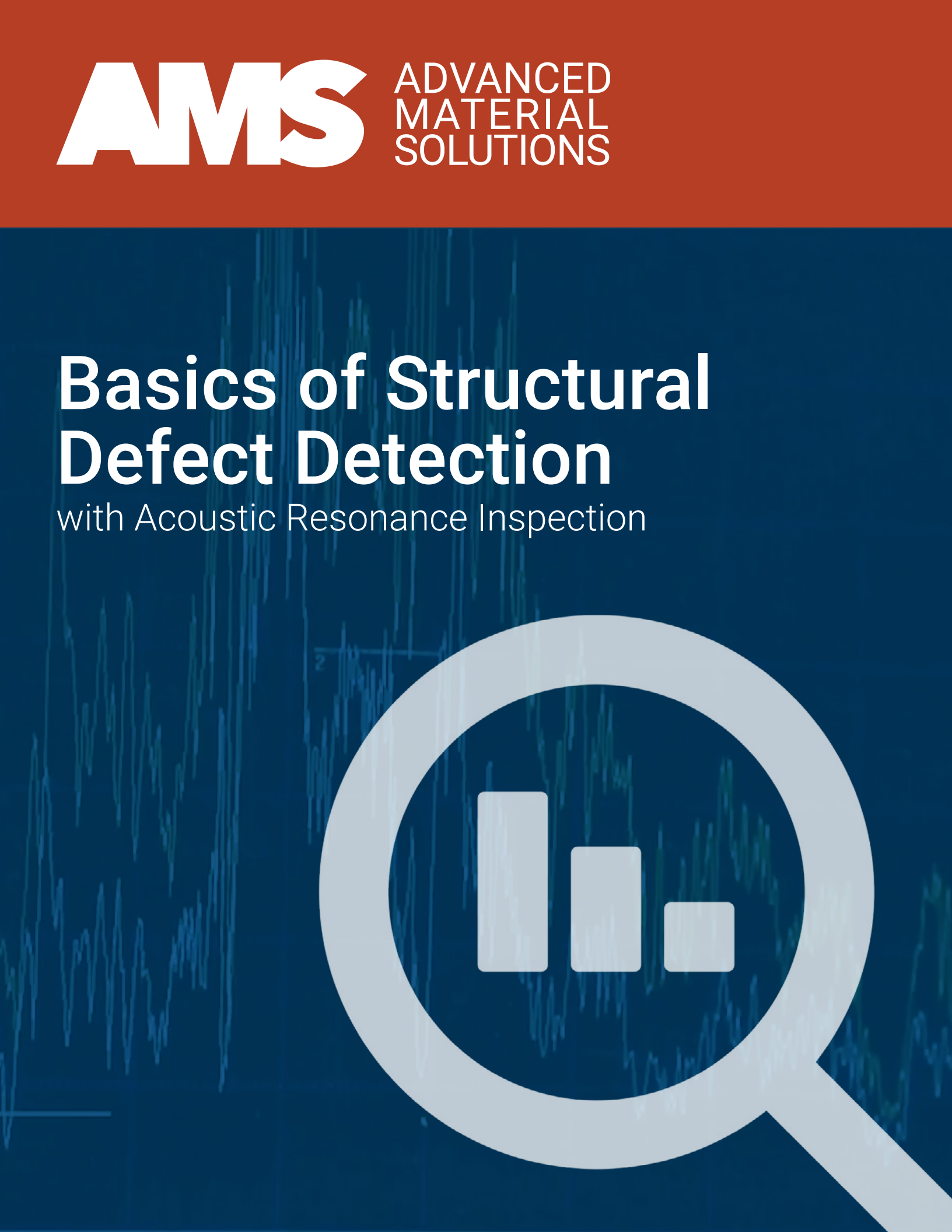
AMS ADVANCED MATERIAL SOLUTIONS

Basics of Structural Defect Detection

with Acoustic Resonance Inspection



NDT: WHAT IS IT?

Non-destructive testing (NDT), also sometimes referred to as non-destructive evaluation (NDE) or non-destructive inspection (NDI), is a manner of testing products in a way that leaves them fully functional afterward. Contrast this with destructive testing, for example a strength test, in which a product is taken to an ultimate failure load to determine its ultimate breaking strength. If we need to test 100% of, or even a large portion of, a group of products we want to have the parts remain functional after the test is completed. We need a non-destructive test method. Fortunately, the NDT industry provides us many non-destructive test methods that each provide various types of information about a product being tested.

What Is ARI (Acoustic Resonance Inspection)?

An acoustic resonance inspection (ARI) is a single non-destructive test that measures a part's resonances to determine its structural characteristics. The inspection examines the internal and external structure of the entire part for flaws.

A part's resonances are determined by its structural stiffness, mass, and structural damping. Any significant structural flaws in the part, whether caused by material or process-related issues, will affect the stiffness, mass, or damping, resulting in detectable shifts in the part's resonances. Once measured, the resonance data of the subject part is compared to a control set of data from conforming parts to determine if the part is non-conforming (NOK) or conforming (OK).

Historically, these tests were performed by hitting parts with a mallet and listening for tonal differences. At Advanced Material Solutions (AMS), we offer acoustic resonance inspections using our SmartTest™ Advanced Resonance System. Through the use of more sophisticated instrumentation, our SmartTest™ ARI system provides a completely controlled and reproducible test process, delivering accurate results all with a single measurement with test speeds as fast as one part per second.

Our SmartTest™ system performs the ARI process following four key steps:

STEP 1

EXCITE THE PART STRUCTURE

The process begins by using mechanical impact to induce vibration throughout the entire part.

STEP 2

MEASURE THE RESPONSE

A microphone measures the part's vibrational response to the impact.

STEP 3

PROCESS THE DATA

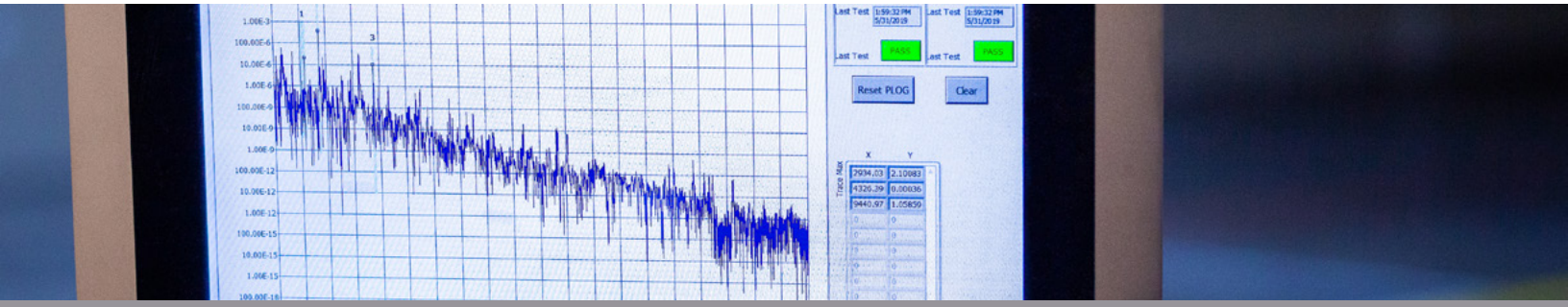
The SmartTest™ analyzer transforms the microphone's signal into the frequency domain, providing the structural response (or spectrum) for the tested part.

STEP 4

DETERMINE PASS/FAIL

The SmartTest™ Advanced Resonance Software assesses the waveform to determine if the part is OK or NOK.

ARI-based techniques are becoming more commonly used as an applied NDT tool in the manufacture of numerous types of parts. Our SmartTest™ Acoustic Resonance Inspection system offers an innovative solution for detecting defects in sintered metal, cast, forged, stamped, machined, and many other types of components.



CAPABILITIES & SPECS

The SmartTest™ ARI system offers industry-leading defect detection, throughput, and productivity. Its key capabilities and specifications include:

DEFECT DETECTION

Because of its more advanced hardware and software, our SmartTest™ system can provide a more accurate waveform, meaning it offers improved OK/NOK separation and fewer false rejects. Unique-to-us statistical tools facilitate quick and easy criteria adjustment from lot to lot, allowing for much more aggressive defect detection while at the same time providing a much higher yield.

THROUGHPUT

Even at higher data acquisition settings, the SmartTest™ system leverages both PC and analyzer resources to achieve much faster cycle times than other systems. While other ARI systems are forced to slow down in the face of rising data loads, the SmartTest™ ARI system does not have this limitation.

Because we operate in a manufacturing context, we're able to address every aspect of daily system use and reduce non-productive time via unique software and hardware features. While most systems running weight compensation see a 50% throughput reduction, we can maintain optimal throughput with weight compensation by weighing parts in motion. Additionally, our software and hardware can reduce human error and downtime, resulting in a 20% to 30% daily throughput increase compared to other systems.

PRODUCTIVITY

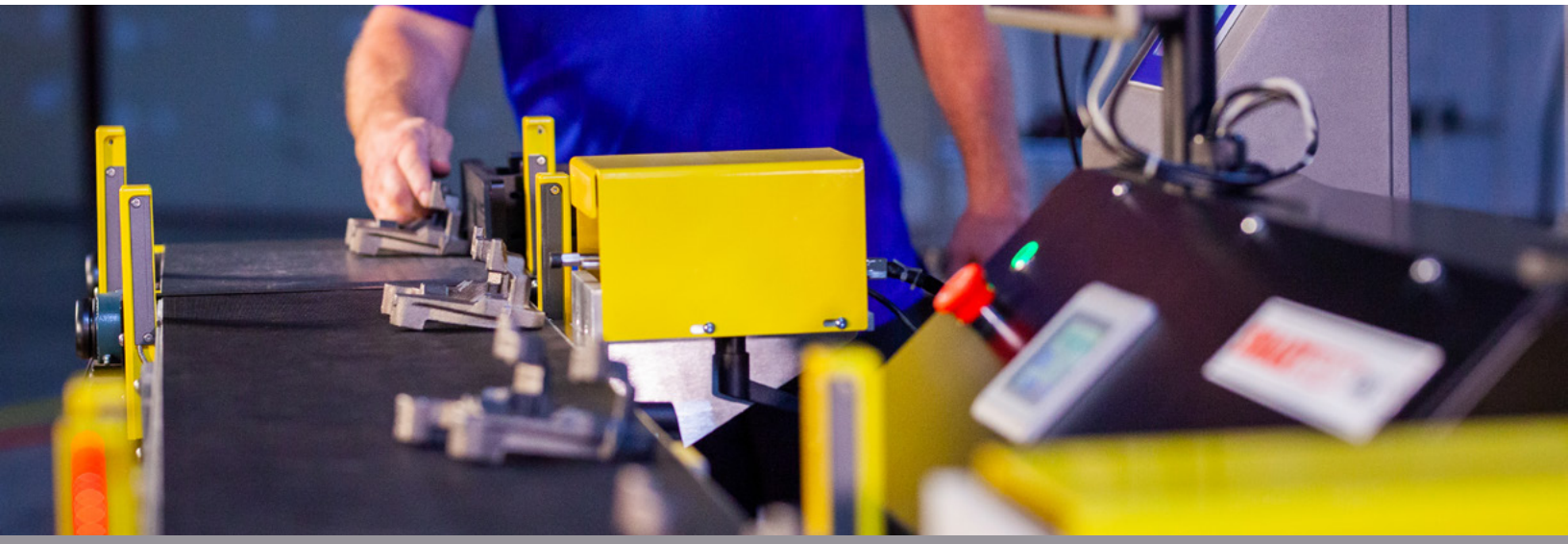
AMS's in-house experience provides greater productivity, delivering as much as 40% higher daily yields with improved defect detection. With the introduction of the SmartTest™ Acoustic Resonance Inspection system, our own in-house work center productivity went from 60%-65% to 90%-95%.

BENEFITS OF ACOUSTIC RESONANCE INSPECTION/TESTING

SmartTest™ acoustic resonance testing is one of the most advanced and versatile non-destructive testing methods available. In a single measurement, it can test for a wide range of defects, including cracks, tears, laminations, voids/porosity, contaminants, oxide inclusions, cold shuts, and chips. It can also identify missed procedures and operations, malformed features, as well as variations in heat treatment, density, nodularity, hardness, and part dimensions.

ARI delivers the following advantages:

- Suitable for online or offline operation
- Automation-friendly
- Works with any rigid component
- Requires no part cleanup or preparation
- Very fast operation, only 1 to 2 seconds per part
- Evaluates the entire part structure
- Detects process-and material-related issues
- Detects both external and internal flaws



APPLICATIONS & INDUSTRIES

The SmartTest™ ARI system from AMS offers enhanced defect detection by identifying additional failure modes compared to other systems. With the most accurate waveform available, it can reveal smaller flaws with improved reliability, productivity, and quality. The SmartTest™ analyzer features higher horsepower for ultra-fast cycle times, and the SmartTest™ actuator eliminates the use of a force sensor for reduced downtime and human error, and zero maintenance.

Featuring “positive capture sensing” of rejected parts, the SmartTest™ ARI system provides a closed-loop solution that prevents rejects from escaping. This along with its many other features enables the SmartTest™ system to eliminate lost production time for maximized profitability and throughput.

AMS’s SmartTest™ ARI system is well-suited for the following applications:

- Sintered Metal
- Firearms
- Ductile Iron
- Automotive
- Casting
- Specialty Vehicle
- Forging
- Medical Devices
- Machining
- Fittings, Couplings, Valves, Tools, & Pumps
- Fasteners

WHY SMARTTEST(TM) FROM AMS?

AMS approaches NDT with our "Think ahead. Stay ahead." approach, which we use to ensure our clients' success. Proactive use of SmartTest™ Advanced Resonance is high speed, inexpensive, highly effective and can improve a company's bottom line in several ways:

- Improves product quality
- Lowers PPM scores
- Improves plant productivity
- Reduces cost of quality
- Reduces scrap cost
- Lowers warranty costs
- Less frequent incident investigations & reporting
- Lowers containment costs
- Limits missed deliveries
- Limits third party defect investigation
- Lowers product recall costs
- Provides higher customer satisfaction

Companies of every size face component quality-related issues every day. At AMS, our number one priority is to help every customer avoid these risks. By providing a proactive evaluation of materials, we are able to address problems before they become ***PROBLEMS***. In developing the SmartTest™ ARI system, we set out to achieve the highest yield, best defect detection, and maximum daily throughput with no compromises.

To learn more about our SmartTest™ solution and how it's superior to other ARI systems, contact us today.

ABOUT US

Since our founding in 1995, AMS has specialized in high-speed, high-volume detection of structural flaws with non-destructive testing. Our SmartTest™ Acoustic Resonance Inspection systems deliver industry-leading defect detection, throughput and productivity via unique-to-us hardware and software features that maximize results across all categories. Achieve NEXT-LEVEL results with SmartTest™.

CONTACT US

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