Part Quality Inspection Application: Resonant Acoustic Method NDT

In the world of manufacturing today, the liability of shipping a defective part can be catastrophic for you, your customer, and the consumer. Resonant Acoustic Method NDT (RAM NDT) is designed to help you deliver fully inspected parts, economically and on time, giving you and your customer confidence in the quality of your parts.

The principle of Resonant Inspection is simple: every part has a unique resonant signature or pattern that reflects its structural integrity. A deviation from the expected signature or pattern can indicate the presence of a flaw. For example, a bell with a crack no longer has a clear ring or the ability to hold its tone.

The resonances of a structure are defined by its mass, stiffness and damping. These resonant frequencies can be measured in most rigid materials including most metals, ceramics, and composites. NDT-RAM systems detect frequency shifts which can be caused by imperfections such as cracks, porosity and voids, as well as variances in modularity, dimension, geometry, weight, density and manufacturing processes.

**TYPICAL USES**
- Production - In-Line Inspection
- Field Service - Troubleshooting
- Quality Control - Spot Checking
- Engineering - Development

**BENEFITS**
- 100% inspection - ensures that every part is objectively tested
- No part preparation required for inspection
- High throughput - approximately 3 seconds per part, typical*
- Simple to learn and use application software
- Reduces scrap costs associated with false rejects
- Greatly lowers operating expenses by eliminating consumables
- Industrial package - NEMA4 enclosure allows factory floor operation
- Versatility - same system can test many different parts
- Eliminates quality recall/containment costs
- Financially justified - ROI analysis available
Who needs NDT Resonant Inspection?

Manufacturers or users of metal parts who...
- have substantial inspection costs
- require 100% parts inspection
- desire to improve part quality
- produce and/or use safety-critical parts
- have customers demanding higher quality
- have substantial scrap costs due to false rejects

What does NDT Resonant Inspection detect?

- Cracks and chips
- Porosity and voids
- Nodularity
- Residual stress
- Variations in hardness
- Bonding, welding, or brazing failures
- Machining or heat-treating processes

RAM NDT provides confidence and peace of mind. It is simple, reliable and affordable. Here’s how it works...

**IMPACT THE PART**

An industrial impactor taps each part with a measured and repeatable force, producing sound.

**MEASURE THE RESPONSE**

A microphone is used to transform the sound (heard and unheard) into electrical signals for analysis.

**PROCESS THE DATA**

The smart digital controller uses a Fast Fourier Transform (FFT) method to determine frequency characteristics.

**QUANTIFY THE RESULTS**

NDT-RAM software compares the results to criteria limits and accepts or rejects the part accordingly.

Changes in mass, stiffness & damping due to certain defects can cause...

- resonant frequency peaks to shift in both frequency and amplitude.
- resonant frequency peaks to shift frequency but maintain amplitude.
- peak shifts with more pronounced splits in resonant frequency.
- resonant frequency peak energy to disappear completely.

NDT-RAM’s Graphical User Interface

Graphical features provide easy visual data evaluation

Clear indication of pass/fail by criteria range

Data shows color-coded spectra for good and bad parts against acceptable criteria ranges

NDT-RAM’s Report Generation

Allows you to fine tune criteria by using standard spreadsheets to evaluate statistical data taken for each part tested. Data from NDT-RAM can be exported to Microsoft® Excel® for statistical analysis. Shown below is a typical scatter plot of resonant frequencies in a given criteria range for a lot of 5000 parts.

Structurally similar parts exhibit consistent resonant frequencies

Statistical outliers indicate presence of a structural defect

www.ndt-ram.com  800-860-4867  Cincinnati, OH  USA

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NDT-RAM’s Graphical User Interface

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NDT-RAM Software Showing Resonant Frequencies and Sort Result

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Investigate Mode supports up to 1500 part spectra, labeled good, bad or unknown.

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**Part Quality Inspection Application:**

**NDT-RAM**

- Fully automated system for turnkey in-line inspection
- Fast throughput - approximately 3 seconds per part, typical
- Customizable conveyor configurations
- Adaptable to existing process automation

**NDT-AUTO**

- Fully automated system for turnkey in-line 100% inspection

**NDT-DTF3**

- Fully automated system for high volume sort of small parts

**NDT-SEMI**

- Core NDT system components for implementation with existing automation

**NDT-MAN**

- Manual system for laboratory or spot checking use

**NDT-TS2**

- Semi-automated test station for manual part placement with automated testing

**Major System Components**

<table>
<thead>
<tr>
<th>Component</th>
<th>AUTO</th>
<th>DTF3</th>
<th>SEMI</th>
<th>MAN</th>
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<tr>
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*Part throughput rate dependent upon part size, belt size, data acquisition setup parameters, and other part handling requirements.

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**Successful Applications**

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- Field Service - Troubleshooting
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**Contact Information**

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