GE
Sensing & Inspection Technologies

Pulsec™

Portable Pulsed Eddy Current Instrument

The Pulsec offers PEC (Pulsed Eddy Current) technology in a compact battery operated instrument. This portability, combined with a GE Sensing & Inspection Technologies array probe and powerful layer-by-layer diagnostic imaging provides an efficient and easy to use Eddy Current inspection solution for the aerospace industry.

Pulsec™
Always on Spot

Pulsed Eddy Current (PEC) technology has several key advantages over conventional single and multi-frequency eddy current inspection techniques.

First, there is the greater depth of penetration thanks to the low frequencies contained in the drive pulse. Second, there is the better depth resolution of the GiantMagnetoresistive (GMR) pick-up sensor. Third, imaging and post- processing capabilities provide easier detection & analysis.

Pulsec at a Glance

Pulsec is a powerful yet portable NDT instrument designed primarily for detecting sub-surface corrosion and cracks* in aerospace structures.

- Pulse excitation with a low frequency bias over a wide frequency range, providing an improved signal to noise ratio at deeper penetration into the material.
- Rich data depth unequalled in portable instruments (typically 100 to1 frequency selection). More detailed information leads to a better analysis.
- Choice of array probes:
    - Ergonomic hand held x-encoded linear array probe (1" active area)
    - Compact 2" linear array probe with encoder for hand inspection or connection to mechanical scanning equipment
- Layer by layer imaging & internal data analysis in real time.
- Post-processing & data analysis with storage and data transfer capability.

* *Crack detection capability may be affected by probe configuration & orientation of the defect.*

2 inch linear array probe and
X Encoded probe

The Principle

Pulsed Eddy Current (PEC) technology has many of the same advantages as conventional eddy current technology. Because it is also an induced electromagnetic technique, it is generally used to inspect conductive material. In contrast to the ultrasonic inspection method, neither conventional nor Pulsed Eddy Current require direct contact with the material; as a result inspections may be carried out through non-conductive coatings such as paint.

The drive coil is one significant area where the Pulsec differs from conventional eddy current instruments. The Pulsec's drive coil is excited by a broadband impulse that is rich in low frequencies. These induce transient eddy currents in the test material. Just as with standard eddy currents, the lower frequencies penetrate deeper into the material. By employing a time-based analysis of the time required for these currents to return, the instrument gives the operator useful information about the material's properties across the full depth of penetration. This is presented in a 'layer by layer' C-scan array, providing improved data interpretation.

The Advantages

Pulsec™ has severeal advantages over conventional single channel or multiple-frequency Eddy Current inspection:

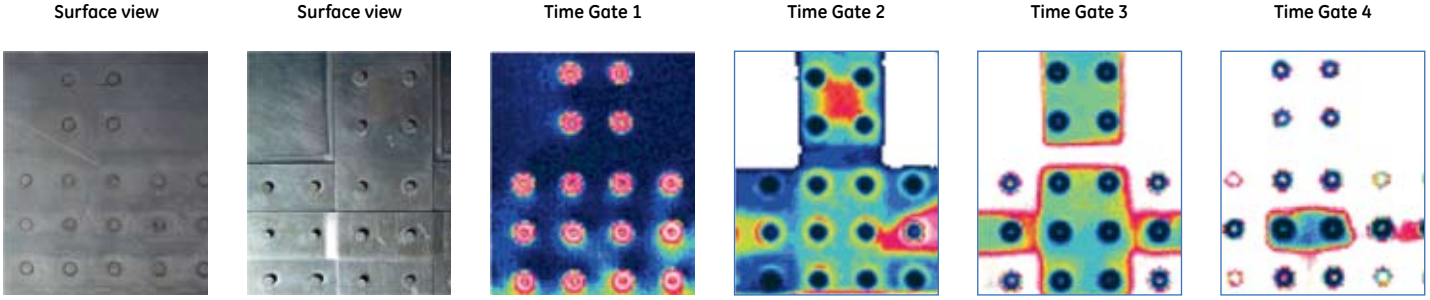
- Compared with single and multi-frequency testing, data is generated and collected over a wide frequency and depth range.
- Rich data sets from the wide frequency range in the pulse can be processed and analyzed in a layer-by-layer fashion. This provides unique detection and interpretation for multi-layer structures.
- Improved results and imaging compared to the conventional impedance phase plane representation.
- The operator does not have to select a specific inspection frequency because a wide range of frequencies is generated and received.
- The Pulsec makes it easier to select an optimum single inspection frequency for follow-up testing or analysis.

Array Technology

GE Sensing & Inspection Technologies' Pulsed Eddy Current technology is based on GMR elements. GMR is the phenomenon where the resistance of certain materials drops dramatically as a magnetic field is applied. Sensors based on this technology offer high sensitivity, flat frequency response and a small footprint, all of which are ideally suited for manufacturing high resolution Pulsed Eddy Current arrays.

Typical inspection result

The two red areas in Time Gate 2 show areas of corrosion, Time Gates 3 and 4 show the internal structure.



Technical Specifications

Measurement System	
Probe Support	1 inch scan width 32 element probe with internal encoder. 2 inch scan width probe with 64 elements. Hybrid Coil Driver/GMR Pickup
Resolution	Normal = 1.5 mm (1/16"), Low = 3 mm (1/8"), High = .75 mm (1/32")
Scanning Speed	Normal = 30 mm/sec (1.2"/sec), Low = 120 mm/sec (4.5"/sec) , High = 30 mm/sec (.6"/sec)
Typical Detectability for 4 layer Aluminum Testing	1 mm (0.040") depth (between 1st Layer): 5% material loss or greater 2 mm (0.080") depth (between 2nd & 3rd Layers): 10% material loss or greater 3 mm (0.120") depth (between 3rd & 4th Layers): 20% material loss or greater 4 mm (0.160") depth (underside of 4th Layer): 20% material loss or greater
Analog	Bandwidth DC to 100 kHz
Acquisition Depth	0—10 mm (0—0.394 in)
Data Acquisition	
Data Channels	One—three
PRF (Pulse Repetition Frequency)	1 kHz maximum
A/D Resolution	16 bit
Rate	1M samples/sec maximum
Samples per A-Scan	500
Pulse Shape Selection	Square, Triangular and ¼ Sine Wave
Pulse Drive	20 mA to 4 A (Max. 15 V)
Processor	1.1 GHz
Internal Memory	1GB
Hard Disk	40GB Drive
Storage Capacity	300 jobs at 100MB/job
Positional Input	2 incremental encoder channels
Data Input/Transfer with Remote Input/Output Accessory Options	USB® HUB, USB ThumbDrive®, USB-HD
Connectors	
Probe	D-type 17 Socket + 4 Co-Axial
Interface	Two PS2, one VGA, two USB
Supports	USB ThumbDrive, remote keyboard and mouse
Software	
Offline Analysis Reporting Software	
Packaging & Operating Environment	
Housing	Molded plastic enclosure with protective TBR boot
Sealing	IP52 compliant with internal circulation cooling fan
Display Size	264 mm (10.4 in) diagonal
Display Type	Transmissive TFT SVGA
Display Resolution	800 x 600
Operating Temperature	0°C to 40°C (32 °F to 104 °F)
Weight	6 kg (13 lb)—with battery
Dimensions	335 W x 270 H x 150 D mm (13.2 W x 10.6 H x 5.9 D inch)
Power	
Power Source	Battery and external AC charger/power supply
Battery	Dual Li-Ion battery pack 2x 12.6v 6.8 A hr
Battery Life	6 Hours
Charge Time	4 Hours
Power Supply/Charger	Universal Type 100 to 240 VAC, 50 to 60 Hz
Power Consumption	25 W

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