

Advanced Inspection of Composites

Advanced Inspection Capabilities

Metals Testing Company (MTC) has a range of advanced ultrasonic (UT) data acquisition and analysis tools at our disposal to assist in meeting the unique demands of composite inspections.

The purpose of this technical brief is to provide examples of some of these tools including: multiple C-Scans, variable gates, FFT C-Scans, and Power C-Scans as described below.

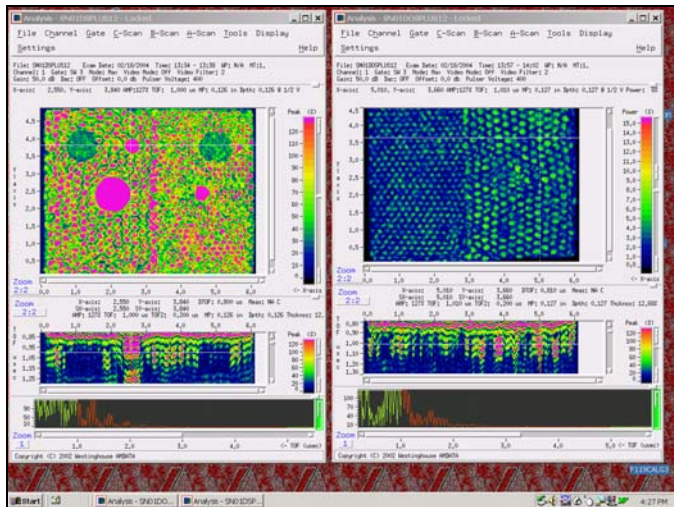


Figure 1- Composite Calibration Standard
Back Side Peak C-Scan on left; Front Side Power C-Scan on right

Multiple C-Scans & B-Scan Views

A valuable tool for composite bond testing is the ability to evaluate a material using multiple types of C-Scans and B-Scan views. Figure 1 shows a Peak C-Scan and Power C-Scan applied to two sides of a calibration standard. The Peak C-Scan allows simulated defects both in the layers of the composite as well as at the composite to honeycomb bondline to be detected in a single C-Scan. Three indications are also readily detected from the B-Scan side view, located below the C-Scan. Variations in the sample's adhesive between the smaller and larger honeycomb cells are also detected.

The Power C-Scan image shows its honeycomb bondline interface to be free of recordable indications. It also clearly images the smaller and larger honeycomb cell areas.

Fast Fourier Transform (FFT) C-Scans

A state of the art capability is to interrogate UT data via an FFT C-Scan. It effectively analyzes the return frequency of each RF waveform. By doing such an analysis, minute variations can be detected independent of amplitude or Time-

of-Flight values. As grain or material variations are likely to fall into this category of detectability, it is an ideal tool for production and R&D related activities.

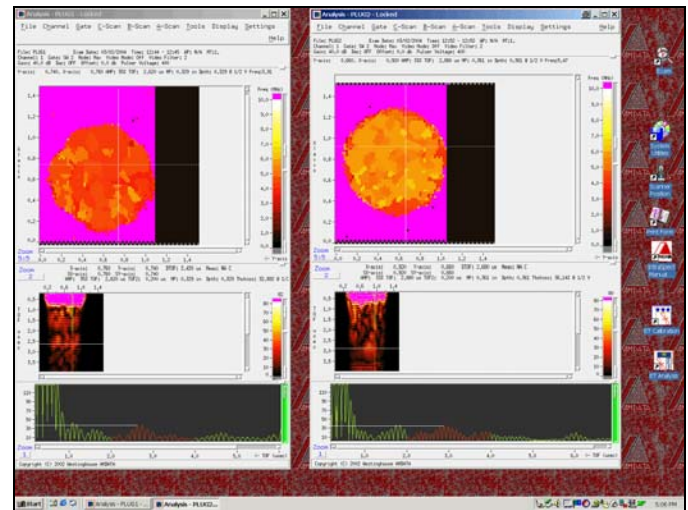


Figure 2 – FFT of Production Composite Materials

An example of such a variation is illustrated in Figure 2. As can be seen, the two materials are significantly different from an FFT interrogation even though neither has a strong amplitude signal.

Variable Gates & Power C-Scans

Lastly, each inspection can be electronically re-scanned to interrogate different volumes of interest in each RF data set. An example of such an evaluation is shown in Figure 3 below. A composite plug is analyzed using both multiple gates and Power C-Scans. Different indications in each volume are detected and located.

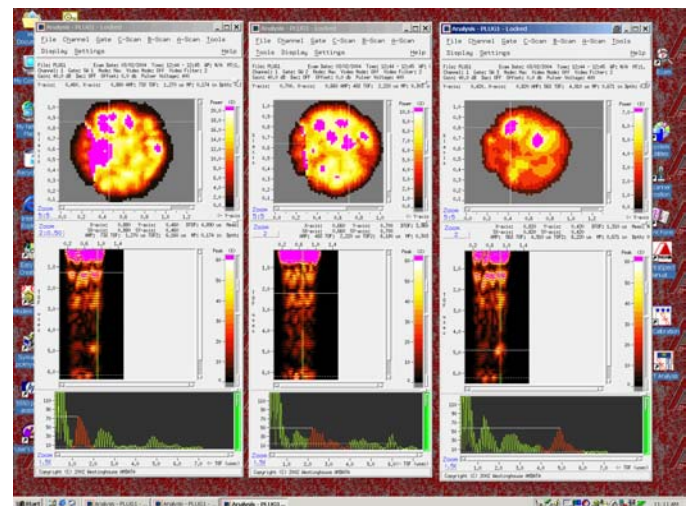


Figure 3 – Interrogating multiple volumes within a Composite

Metals Testing Company
80 Kimberly Drive, PO Box 69
South Windsor, CT 06074
(USA)



Metals Testing Company

TEL: (860) 289-8225
FAX: (860) 289-5970
e-mail: mtc62@aol.com
website: www.mtc62.com
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