



A: Sound Source, B: Acoustic Coupling Medium, C: Ultrasonic Wave Fronts, D: Specimen, E: Imbedded Flaw, F: AO Sensor, G: Flaw is Revealed

ACOUSTOGRAPHY | Ultrasonic Composite Inspection System

OVERVIEW

Acoustography is a “full field”, ultrasonic area inspection technique similar to radiography, but without the hazard. At the heart of the Acoustography method is a novel two-dimensional (2-D) high-resolution proprietary ultrasonic area detector, called an Acousto-optic (AO) Sensor that converts ultrasounds directly into a visual image, which can then be electronically captured using a digital camera allowing for digital archiving and image enhancement.

For Through-Transmission Ultrasound (AO-TTU) inspection, the test specimen is ultrasonically illuminated using a sound source from one side. The ultrasound beam is differentially attenuated as it propagates through the test specimen, casting an ultrasonic “shadow” that is instantly (in seconds) converted into a visual image by the AO sensor. AO-TTU inspection methods are performed similar to conventional UT, employing a water tank system. Acoustography is also being adapted for single-side (pulse-echo) inspection without an immersion tank.

Now the inspection of composite brackets and clips can be C-Scan imaged on both flat and radius area in near real time minimizing inspection time of each full field area test in under 10 seconds. Multiple shots can be stitched to provide a complete C-Scan image of the part for analysis as done by conventional C-Scan image analysis.

UPGRADING EXISTING C-SCAN IMMERSION SYSTEMS

Acoustography can be adapted to attach to an existing C-Scan immersion system by providing a through-transmission fixture that is equipped with the sounds source and the AO sensor. The data acquisition package consists of the electronics to drive the Acoustography and the data acquisition software (UTwin™ AO).

NEW ACOUSTOGRAPHY SYSTEMS

Customized system configurations will depend on the composite structure configuration and size. MISTRAS will recommend the best solution to meet the customer’s requirements.

FEATURES

- Acousto-optic (AO) sensor contains a layer of proprietary Liquid Crystal (LC) material
- LC molecules (size~20 Angstroms) reorient when exposed to ultrasound
- Ultrasonically exposed area becomes birefringent, showing contrast change
- The AO transfer curve depicts the AO sensor’s change in brightness as a function of ultrasound intensity
- This allows the ultrasound intensity distribution (i.e. ultrasound image) to be converted directly into a visual image

BENEFITS

- Ideal for inspection of Clips and Brackets Flat and Curved areas
- Inspection time is less than 5 seconds with image processing; only one shot required with 5”x5” FOV
- Upgradeable to Existing UT Systems
- Customized to Customer’s Applications

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