Application Note

Thickness Measurement of Aerospace Composites

In the aerospace industry, many structural components such as wing panels and radomes are made with fiberglass and advanced composites that need accurate thickness control. Composites are often stronger than conventional materials and weigh less. Advanced composites are typically made by combining graphite or carbon fibers with epoxy, polyamide, or polyimide resins.

Aerospace inspectors can use gauges to take instant, nondestructive thickness measurements on parts such as wings, fuselage, ducts, panels, and fan blades. Ultrasonic thickness gauging can be performed during fabrication or after installation to help ensure correct wall thickness.

Note: The inherent nature of composite materials can produce varying degrees of anisotropy and sound velocity variation. Carefully evaluate the composite material to check that the sound velocity is uniform enough to permit the required measurement accuracy.

Equipment: Aerospace inspectors can use ultrasonic thickness gauges or the Magna-Mike™ Hall-effect thickness gauge for composite thickness measurement.

In general, the thickness of most composite materials for aerospace applications in the range of 0.050–0.750 in. (1.25–20 mm) can be measured with the handheld 38DL PLUS™ or 45MG (with single element software) ultrasonic gauges and a transducer—commonly an M106 2.25 MHz contact transducer. Certain composites that are very scattering or thicker than approximately 0.750 in. (20 mm) may require gauges with the HP (high penetration) software option and a lower-frequency transducer. In challenging cases, waveform display monitoring is recommended to permit on-site operator adjustment of setup parameters. To measure the wall thickness on composite materials thinner than 0.125 in. (3 mm), delay line transducers such as the M202 may also be recommended.

The 72DL PLUS™ ultrasonic thickness gauge is another useful tool for composite thickness measurements. It offers a large touch screen, fast measurement, and many connectivity options. The 72DL PLUS High-Frequency model works with transducers up to 125 MHz and is ideal for measuring coatings on composites in the aerospace industry.

Inspectors can also use the Magna-Mike 8600 Hall-effect thickness gauge if there is access to both sides of the test piece for a probe and a target ball, as in a manufacturing environment. The Magna-Mike gauge offers the advantage of couplant-free measurements that are independent of sound velocity variations. With an appropriate probe and targets, it can measure up to 1.00 in. (25.4 mm).

Products used for this application

38DL PLUS

The 38DL PLUS advanced ultrasonic thickness gauge uses dual element transducers for internal corrosion applications and has features that include THRU-COAT technology and echo-to-echo. It uses single element transducers for very precise thickness measurements of thin, very thick, or multilayer materials.

45MG

The handheld 45MG ultrasonic thickness gauge is packed with measurement features and software options. This unique instrument is compatible with the complete range of Olympus dual element and single element transducers, making this gauge an all-in-one solution for virtually every thickness gauge application.

72DL PLUS

The 72DL PLUS advanced precision ultrasonic thickness gauge uses a single element transducer up to 125 MHz. It features a large high-resolution touch screen display and is ideally suited to measure the thickness of very thin materials, including multilayer paint, coatings, and plastic. It can simultaneously display the thickness of up to 6 layers.

Magna-Mike 8600

The Magna-Mike Hall-effect thickness gauge uses a magnetic probe to perform accurate measurements on nonferrous and thin materials such as plastic bottles.

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