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Bonding Inspection of Aluminum and Carbon Fibres

Ultrasonic Application Solutions

Application

In modern industries it is becoming more and more crucial for manufacturers to use light but safe materials and bonds. Furthermore, the manufacturing process requires an easy way to inspect these materials. Therefore, the GE European Solutions Center developed an ultrasonic inspection method which helps to **measure the quality of adhesive bonds** between aluminum and carbon composite materials from the aluminum side.

In this case it is the knowledge of the sound velocities of different materials, backwall echoes and interface echoes that provides the solution.

The velocity difference between aluminum and adhesive as well as the difference between aluminum and air are clearly high. Here, the differences in the interface amplitudes are only 2dB. Thus, they are not high enough to be clearly classified as disbonding and spotting the distinction between good and bad quality joints is not easy (see fig 2). That is why a new evaluation basis is set.

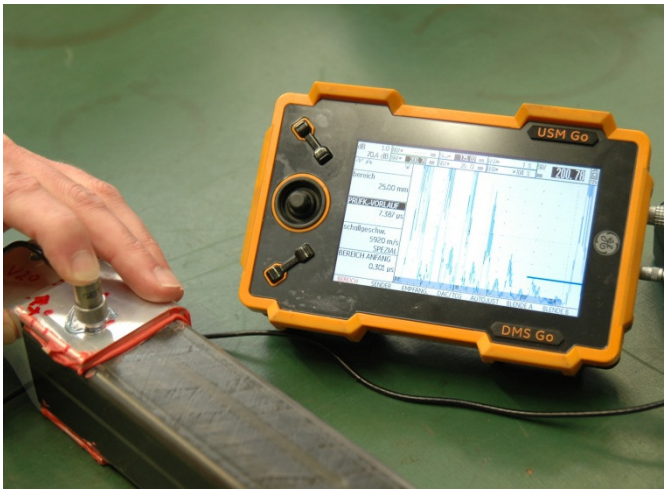

Figure 1: Inspection of bonded materials

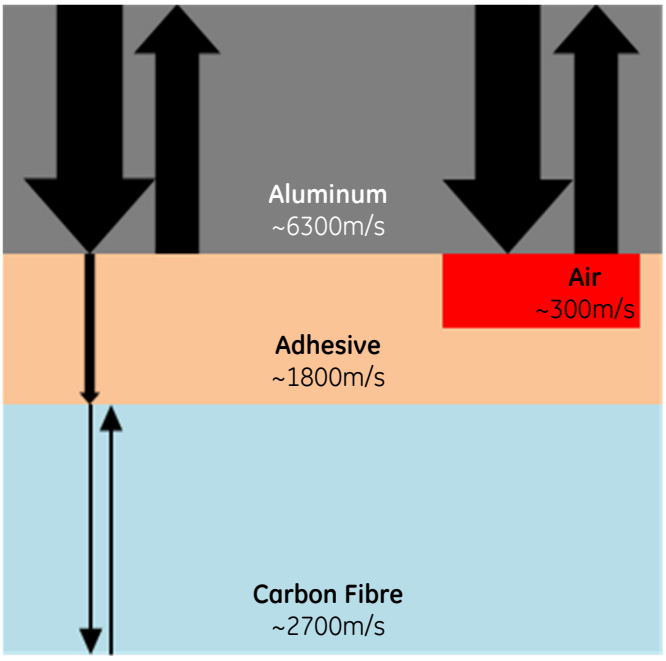

Figure 2: Schematic demonstration of interface echoes of ultrasonic waves in these materials

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Solution

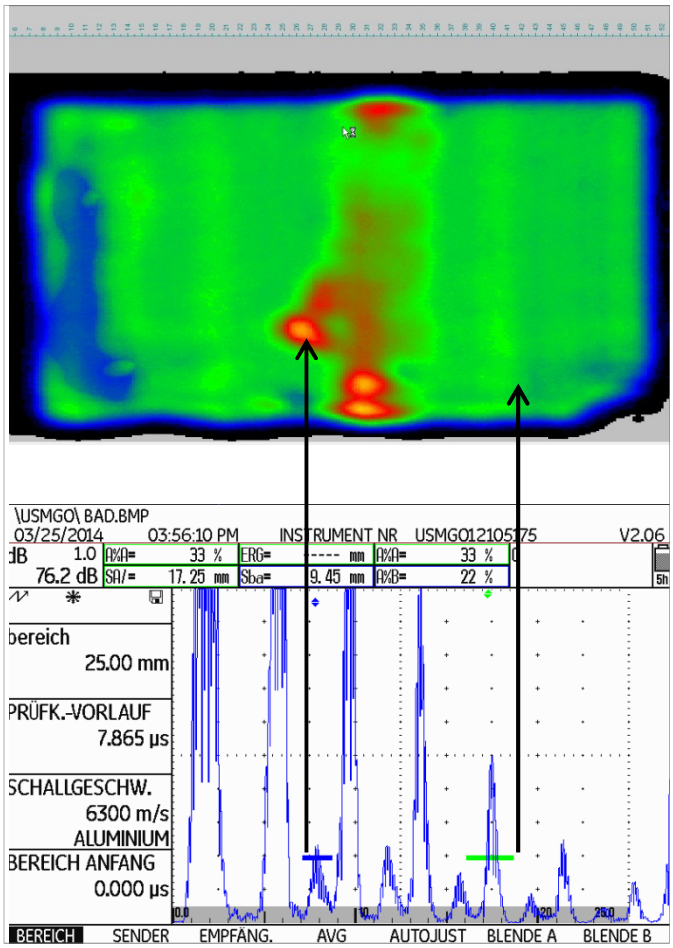

Figure 3: A-scan & C-Scan aluminum - adhesive

If a 10 MHz probe is used to get an adequate number of backwall echoes, the 3rd or 4th echo can be used for evaluation. As fig. 3 (green) shows, the multiple attenuation results in greater visibility. Consequently, the difference between good and bad quality bonding gets higher.

Another method that can be used in this case is the adhesive-carbon interface echo (see fig. 3, blue). Both effects can also be seen in the C-scan image.

All in all, a certain type of aluminum and adhesive can be recommended in order to get best possible inspection results and to simplify the inspection process.

General solution information

- This method allows the detection of disbonds between each component layer
- In this case, milled aluminum and single-component adhesive give the best inspection results

Your benefit

- Pre-testing your materials results in the best possible process and inspection results
- Save money by improving your inspection methods
- Reduce potential liability

Part numbers

USM Go	0109706	H 10 M	0053041
G 10 MN	0053047		

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Contact the GE European Solutions Center for your individual inspection problems:

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