



Methods of Ultrasonic Inspection in the Automobile Industry – Adhesive Joints

Ultrasonic Application Solutions

Application

New construction types and joining methods in modern car manufacturing require new or adapted inspection techniques and equipment to address the traffic safety concerns.

For the modern construction of car bodies the GE European Solutions Center develops special ultrasonic techniques. This includes the design of special probes, systems and software. This report focuses on a special solution for **adhesive joints**.

More and more adhesive joints are being used in the automobile and aircraft industries for metal plates joints as well as combinations of steel and polymers.

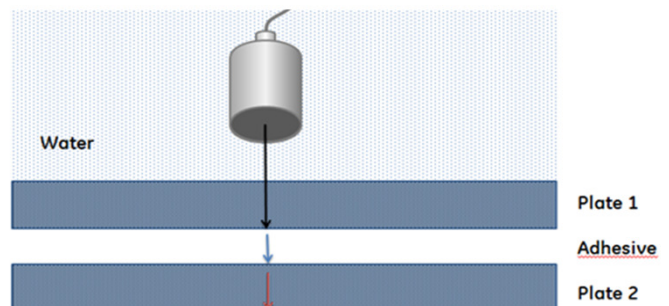


Figure 1: Testing setup for adhesive joints

Solution

According to figure 1, two glued steel plates with a thickness of 1 mm were inspected. Principally, there are two possibilities:

If a relatively **high sound frequency** is used, for example 20 MHz, then we obtain a good echo sequence from the first plate, which is highly attenuated by the adhesive if the adhesion is good, see figure 2. In case of a bad adhesion or missing adhesive there's no sound damping, which leads to a long echo sequence.

A disadvantage of this method is however, that only the first interface between plate and adhesive can be inspected, because the high frequency sound does not interact with the adhesive material.

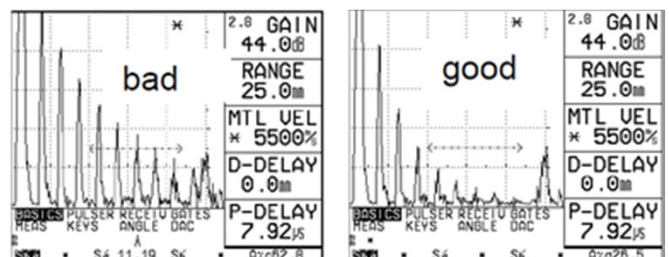


Figure 2: Echoes from a 20 MHz probe

Results

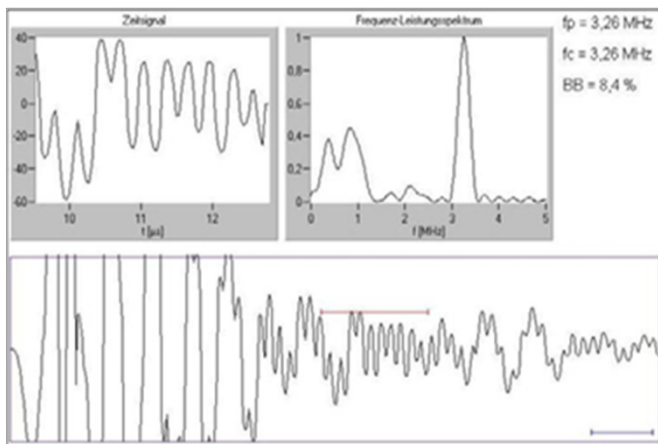


Figure 3: A-scan showing good adhesion

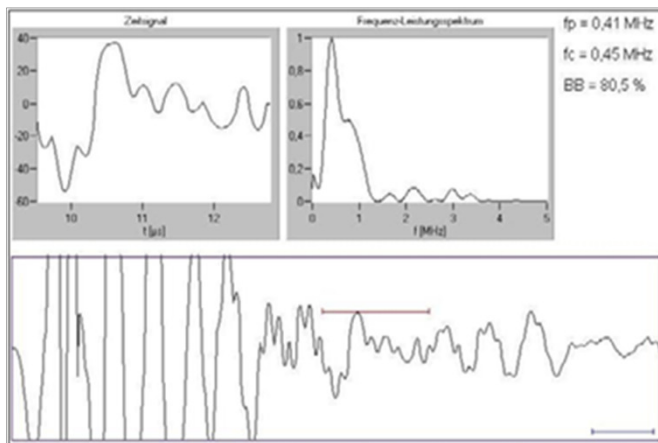


Figure 4: A-scan showing bad adhesion

General solution information

Flaw detectors

- USM 36
- USM Go+

Probe

- H 20 M

Part numbers			
USM Go +	0113214	USM 36	0037400
H 20 M	0053045		



If we apply a **low frequency**, for example 2 MHz, an interaction with the adhesive can be observed. However, it is not possible to resolve echoes in the time domain. For this case the spectral analysis in the frequency domain is used.

As example, figures 3 & 4 present each in the lower case the A-Scans of the interfering signals of the plate and the adhesive. A gate is set to the interference of the adhesive. The time range of the gate is presented once more in the left upper side and the resulting frequency spectrum is presented at the right side.

Your benefit

- Ensure a high quality rating
- Reduce field failures and potential liability
- Save money by eliminating destructive testing and by improving your process

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