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Fraunhofer Institute for Nondestructive Testing IZFP

HIGH-FREQUENCY ULTRASONIC TECHNOLOGY FOR INSPECTING PRESS-HARDENED STEELS
OPTIMIZING THE QUALITY OF THE LASER WELDING SEAM

3d profile of a laser beam welding seam
between the joined components were varied during the test, which yielded more than 170 individual welding samples.

As part of a second step, destructive inspection methods such as tensile shear strength, hardness profile and metallography testing were utilized to determine the quality of the relevant properties. Quantitative testing was carried out with common reference methods, as well as with the high-frequency ultrasonic inspection technique (75 MHz nominal frequency) which is to be validated.

In a third step, the ultrasonic process enabled the quick and efficient determination of the optimal welding parameters.

Results

Amongst other quality characteristics, the width of the joining cross-section and the length of the welding seam were used to determine the resilience. Other characteristics include the welding seam and root geometry, the existence and position of defects and the welding seam profile.

The tests validated the use of the ultrasonic inspection method for determining all of the relevant quality characteristics. They also demonstrated the suitability of the ultrasonic inspection for determining typical defects that occur during laser beam welding such as “false friends”, “interleaves” and “pores” (top left), as well as pores with a minimum diameter of approximately 0.2 millimeters (top right).